

# Determinants of foreign land acquisitions in low- and middle-income countries

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## Abstract

This article analyses the determinants of growing demand for agricultural land in developing countries. We propose some determinants that are specific to foreign acquisitions of agricultural land as a subset of agricultural foreign direct investment (FDI) and empirically examine the corresponding locational choice. Using a gravity model and a data set on land acquisitions worldwide, we find that the determinants partly overlap with those for other forms of FDI but are specific in certain regards. Rich investors target (poorer) economies with abundant land and water resources, and the effects of the quality of institutions are ambiguous.

**Keywords:** Foreign direct investment (FDI), large-scale land acquisitions, agricultural investments, gravity model

**JEL classifications:** F21, O13, Q15, Q32

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## 1. Introduction

The increasing global interest in agricultural land, primarily in developing countries, has attracted considerable attention in recent years. There has been an upsurge in purchases and leases of land by foreign investors from the public and private sectors with the intention to set up commercial farms for the production of agricultural commodities. Recent data suggests that quite a number of these acquisitions of agricultural land by foreign investors have already led to the establishment of farming operations (Nolte et al., 2016). Both the land acquisition and the establishment of a commercial farm are typically associated with capital inflows that qualify as agricultural foreign direct investment (FDI).

A lack of data means that evidence on the drivers and implications of these land acquisitions and investments remains scarce, and the findings are so far inconclusive. Some broad patterns have been revealed by the analysis of the actors involved in these transactions. Seaquist et al. (2014) find that most countries participate in the ‘global land trade’, but that only a few countries account for the majority of land acquisitions. The investors are from the Global North and the emerging economies of Asia and the Middle East, which are typically countries with relatively little cultivable land and with

high-tech agricultural sectors. The target countries, located in the Global South and Eastern Europe, are relatively well endowed with cultivable land but have low agricultural productivity. These observations lend support to the hypothesis that some sort of ‘agricultural outsourcing’ to countries with abundant and possibly underutilised land may be at work.

The empirical results on the factors driving FDI rely almost exclusively on data on FDI in industry and services. However, FDI in the natural resource sectors or agriculture has received only minimal attention (a few exceptions are Asiedu and Lien, 2011; Aleksynska and Havrylychuk, 2013; Hajzler, 2014). This is also due to the lack of data on agricultural FDI, which is often not published because of confidentiality reasons. To the best of our knowledge, hardly any previous empirical studies have looked at the determinants of farmland acquisitions. An exception is Arezki et al. (2013) analysis of the determinants of large-scale agricultural investments using a gravity framework. That study confirms the prominent role of the agro–ecological potential of target countries. Also, while the impact of the business climate turns out to be negligible in their study, weak tenure security is associated with increased demand for land. The authors conclude that the insignificance of the yield gap and the importance of weak land governance suggest that interest in land may be driven more by speculation about rising land prices than by actual investment projects aiming to undertake agricultural production.

In the present article, we argue that there are indeed good reasons to hypothesise that the importance of some FDI drivers may be different for acquisitions of agricultural land. The availability of relatively cheap and fertile land should play a key role and farmland acquisitions could be understood as demonstrating the competitive advantage of land-rich countries in the competition to receive FDI (Burger et al., 2013). Acquisitions of agricultural land can be viewed as indicating a new trend in FDI—targeted at the agricultural sectors in developing countries. While agriculture is declining in importance in terms of its contribution to global value added, it remains the main source of livelihood for the world’s poor. In principle, farmland acquisitions may contribute to higher agricultural productivity in receiving countries and possibly involve positive spillovers, either within the agricultural sector or through backward and forward linkages to the rest of the economy. Therefore, examining farmland acquisitions, understanding its determinants and comparing them to those of FDI in manufacturing generates interesting insights from both an international and a development economics perspective.

This article makes two main contributions. First, it puts the increased interest in agricultural land in the context of FDI. From a theoretical point of view, we analyse whether the factors underlying acquisitions of agricultural land are different from those underlying FDI in the manufacturing sector. Secondly, using data from the Land Matrix Global Observatory, we empirically examine the locational choice of farmland acquisitions. Thus, the study adds to that of Arezki et al. (2013), both conceptually by explicitly taking a locational choice perspective and empirically by taking advantage of improved data on farmland acquisitions.

We find that the determinants of foreign farmland acquisitions partly overlap with those for other forms of FDI but are specific in certain regards. In particular, rich investors target (poorer) economies with abundant land and water resources and the effects of the quality of institutions are ambiguous. Better institutional quality in host countries can even be associated with less land acquisitions: host countries tend to have

low levels of investor protection and investors seem to tolerate higher levels of corruption. Robustness checks using count regression or samples restricted to smaller deals can partly explain deviations from previous studies. Specifically, our results suggest that the effect of weak tenure security identified by Arezki et al. (2013) operates through the extensive margin.

The remainder of the article proceeds as follows. Section 2 discusses which factors determine acquisitions of agricultural land as a specific subset of agricultural FDI; Sections 3 and 4 present the data and the methodology; Section 5 discusses the empirical results; and Section 6 concludes the article.

## 2. Determinants of acquisitions of agricultural land

From a theoretical point of view, FDI flows are determined by three major factors.<sup>1</sup> First, the organisational choice of individual firms plays an important role. This choice depends largely on firm-specific factors, such as productivity and intangible assets (such as technologies, managerial skills and brands), and can hence only be tested empirically using firm-level data (Helpman, 2006; Melitz and Ottaviano, 2008; Beugelsdijk et al., 2010; Ottaviano, 2011).

Secondly, as the traditional literature has stressed, profit-maximising multinational firms seek low-cost production locations. The locational choice can have various motivations, such as resource-seeking, market-seeking, efficiency-seeking and strategic-asset-seeking objectives. These motivations differ for different types of investment and have changed over time. While resource- and market-seeking objectives were previously the determining factors for FDI flows, strategic-asset-seeking and efficiency-seeking objectives are now often paramount—although market-seeking factors continue to be recognised as a key driver of FDI flows in the manufacturing sector (Dunning, 1998; Dunning and Lundan, 2008, 145–197).

Thirdly, firms assess whether it is worthwhile to internalise production abroad through FDI or whether it makes sense to trade with or license a foreign producer (Dunning, 1998, 2009). The decision to internalise production is driven by a variety of factors that have been discussed in the more recent literature. For instance, the governance of international transactions plays an important role. Incomplete contracts—such as those regarding the protection of intellectual property rights—can be overcome by internalising market transactions (Antràs, 2005). Furthermore, trade barriers influence the decision to enter a foreign market through FDI. While trade barriers in manufacturing have been reduced to a minimum under agreements such as the Global Agreement on Tariffs and Trade (GATT), trade restrictions remain commonplace in agriculture (Josling et al., 2010; Dennis and İşcan, 2011). Moreover, market failures may explain why firms decide to set up a subsidiary through FDI. For instance, input and factor markets in the rural areas of poor-target countries are highly imperfect. Capital markets are underdeveloped, the supply of technical inputs such as

1 Dunning develops these factors in his OLI framework, which consists of three components driving investment decisions: ownership (O), which encompasses all the company's advantages over its rivals; location (L), which includes advantages stemming from the location of production abroad; and internationalisation (I), which describes the advantages to the firm of 'internalizing' production rather than outsourcing it. Only if all these criteria are met does it make sense for a company to invest abroad (Dunning, 1998, 2009).

fertilizer is limited and even labour markets are sometimes hardly existent (Sexton, 1990; Josling et al., 2010). This has created a shortage of target-country suppliers that could, in theory, be contracted and licensed to export the desired product. Investors can overcome these input- and factor-market imperfections. However, trade or FDI in such contexts involves high transportation and initial investment costs—for example, for roads and irrigation (Dorward et al., 2004; Dethier and Effenberger, 2012). Where states fail to provide basic infrastructure, these costs must be borne fully by the investor. This implies that investors will wish to secure the returns on these investments, which, in turn, partly explains why production is internalised (Collier and Venables, 2012). Finally, institutions and policies have been stressed as important determinants of a firm's decision to internalise. For instance, Busse and Hefeker (2007) analysed the linkages between political risk, institutions and FDI inflows in developing countries. Their cross-country data confirms the importance of political risk and institutional indicators for investment decisions. Similarly, Gastanaga et al. (1998) studied the effect of host-country policies on FDI flows for 49 less-developed countries. Pooled cross-section and time-series data reveals that institutional characteristics have significant effects on FDI. In particular, the authors identify detrimental effects resulting from corruption and the negative linear influence of corporate tax rates. Such effects have been shown by studies such as those by Wei (2000) and Cuervo-Cazzura (2006). However, the more recent literature challenges this relationship. Explanations include corruption distance (Wu, 2006) and different types of corruption (Egger and Winner, 2005; Cuervo-Cazurra, 2008).

These theoretical arguments have typically been developed with an implicit focus on manufacturing but they also apply to other industries, in principle. However, the weight of certain (groups of) determinants may well differ between manufacturing and agricultural FDI. In the following, we present four reasons why agricultural FDI may be driven by different determinants.

First, investments in land and agriculture are related to the politically sensitive areas of food and energy supply. Governments all over the world are concerned about food prices and food supplies, particularly in poorer countries (Cotula et al., 2009). The increasing use of agricultural produce for the production of energy adds to these concerns (Dauvergne and Neville, 2009). Therefore, governments may strategically secure access to resources for agricultural production, either directly or by supporting the foreign operations of domestic firms. In the context of foreign farmland acquisitions, it is not uncommon to find state-owned investors, particularly from the Middle East. Ultimately, if the strategic considerations of ensuring food and energy supply in investor countries are the main motivation for acquisitions of agricultural land, the market-seeking objectives that are believed to play a prime role for FDI in manufacturing (Dunning, 1998) should be less important.

Secondly, land and water are very specific production inputs. While some production factors, particularly labour with specific skills and capital, are mobile, this is not the case for (some) natural resources. In addition, land and water can hardly be substituted in most agricultural production. Demand for agricultural products is growing due to rapid population growth, increasing incomes and environmental factors such as land degradation and desertification (Deiniger and Byerlee, 2011; Zoomers, 2010; Lambin and Meyfroidt, 2011). Accordingly, land (and water) resources are increasingly being put under pressure on a global scale. In sum, the immobility and non-substitutability of land and water resources and their growing scarcity leads us to assume that, for

investments in agriculture, the choice of production location is largely driven by resource-seeking factors.

Thirdly, low land prices are particularly likely to attract farmland acquisitions—relative to FDI in manufacturing (Collier and Venables, 2012). The (relative) abundance of the immobile factor land in certain countries and input-market failures (particularly frequent in rural areas in developing countries) imply that land productivity and hence land prices are low. Indeed, land productivity is much lower in large areas of sub-Saharan Africa (Adesina, 2010) and may be a pull-factor for investors who expect high returns on their investment through increases in the productivity of the acquired land. In many instances, however, investors acquire land that is not yet under agricultural production, particularly forests and shrub/grasslands (Messerli et al., 2014). Here, low prices may partly fail to reflect either the value generated from communal uses or ecological functions that are not internalised by proper institutions. In fact, institutional failure, specifically the lack of marketable land rights, enables governments to use their legal authority as ‘owners’ of the land to assign ‘underutilized’ land to investors for low prices (Cotula et al., 2009). Low prices for land also give rise to speculation (Collier and Venables, 2012).

Fourthly, the importance of institutions and policies, as discussed above, also holds for farmland acquisitions, but there are some noteworthy peculiarities. Acquisitions of land take place within a highly complicated land-administration system and a politicised environment (Boone, 2014; Nolte, 2014). The distinguishing characteristic of acquisitions of agricultural land vis-à-vis non-agricultural investments is that the former involve the acquisition of land as a key input factor—typically through a long-term lease contract. While the acquisition of capital (or greenfield investment activities) on the part of foreign investors is usually subject to an important array of formal rules and requirements, the acquisition of land (especially in low- and middle-income countries) takes place under land governance systems characterised by land use rights that are often vaguely defined through overlapping formal and informal rules (Lund, 2006). Therefore, investors may be tempted to take advantage of ambiguous rules (Nolte and Vāth, 2015) or—to use a term coined by Toulmin (2009)—to engage in ‘institution shopping’. Furthermore, we expect investor country institutions to condition their preference of institutional quality in host countries (Holburn and Zelner, 2010). For instance, investors from countries with well-functioning institutions and an open press may be more likely to respond to public pressure and opinion (or anticipate this opinion and behave differently in the first place). Firms from such places may also be more likely to submit themselves to investment principles and guidelines. Investors from corrupt countries are more likely to invest in corrupt target countries.<sup>2</sup>

These four departures from the determinants of FDI in manufacturing do not imply that farmland acquisitions are entirely different. We expect factors that influence trade and information costs to matter equally for acquisitions of agricultural land, specifically geographical distance, common official language and former colonial relationship. However, we also expect some differences—for example, that resource-seeking factors play a more pronounced role while market-seeking factors are less important. We

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2 Another way to take different institutional set-ups into account is institutional distance between host and investor countries, see for instance Wu (2006).

assume that target countries with inefficient agricultural production are likely to be targeted, and that institutions play a major role in investment decisions.

## 2.1. Hypotheses

From these insights, we derive testable hypotheses about what determines acquisitions of agricultural land. We expect that a number of determinants that explain overall FDI flows will play a role for this specific subset of agricultural FDI, as well. First, we anticipate a negative relationship between farmland acquisitions and the distance between two economies, while a joint official language and a former colonial relationship should be conducive. Secondly, market-seeking factors, which are thought to be important for FDI in manufacturing, are expected to be less important. Lastly, we conjecture that institutions play a crucial role. We expect a positive relationship between the general institutional quality in a host country and acquisitions of agricultural land.

In line with the considerations above, we hold that some particularities of farmland acquisitions are noteworthy. First, acquisitions of agricultural land seek to deal with imbalances in food supply in the investor country; therefore, we expect that the net importers of agricultural commodities are more likely to acquire agricultural land. Secondly, we expect farmland acquisitions to be resource-seeking—in contrast to market-seeking FDI in the manufacturing sector. Accordingly, we expect that land and water endowments in host countries are positively correlated with acquisitions of agricultural land. Thirdly, investors are attracted by low agricultural productivity in target countries (and low land prices). Low agricultural productivity is believed to be positively correlated with acquisitions of agricultural land, as this allows for relatively quick productivity increases. Lastly, in addition to the hypotheses on institutions derived from the FDI literature, we expect ambiguous effects of the institutional quality of host countries. We hypothesise that ‘bad’ institutions in some areas—for instance, weak land governance—may be associated with more farmland acquisitions. At the same time, other institutions of good quality, such as a conducive business environment, may still lead to more investment in land and agriculture.

## 3. Data

Official FDI statistics are not usually broken down by sector; hence official data on agricultural FDI are scarce or non-existent (FAO, 2013, 20). There is no official data source for cross-border acquisitions of agricultural land specifically, and this gap is currently filled by non-governmental initiatives, most importantly the Land Matrix Global Observatory.

We have used Land Matrix data as of 20 May 2016 to construct our dependent variable.<sup>3</sup> While Arezki et al. (2013) used three different data sources, we took advantage of the fact that the quality of the Land Matrix data has improved. The improvements relate to methodological changes and the decentralisation of data

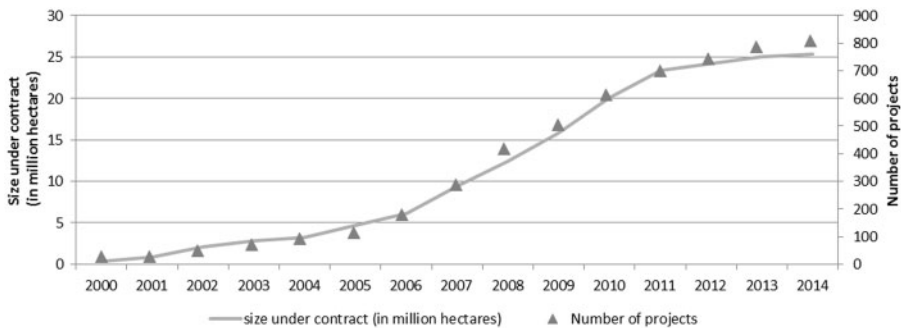
3 We use a sub-set of the whole Land Matrix database and restrict our sample to agricultural deals involving at least one foreign investor. This sample includes a total of 947 deals, 732 of which have only one investor and 215 of which have multiple investors (190 with two and 25 with three).

collection leading to higher quality and quantity of data (Nolte et al., 2016).<sup>4</sup> These improvements in data quality also make it possible to use the size of projects instead of the number of projects. We consider the acquired size a better estimate of the actual investments into land than the mere number of projects.<sup>5</sup> While keeping in mind that Land Matrix data is likely to be biased (see below), we believe it is still the most accurate estimate currently available; this view is shared by many scholars and international organisations drawing on the same data source (Rulli et al., 2013; Messerli et al., 2014; Seaquist et al., 2014).

The Land Matrix records acquisitions of land that entail a transfer of rights to use, control or own land through sale, lease or concession; that cover 200 hectares or more; that are targeted at low- and middle-income countries; and that have been concluded since the year 2000. While acquisitions of land are not an entirely new phenomenon, land acquisitions since about 2000 are considered quite distinct, as the scale and the scope of the phenomenon have changed (Deiniger and Byerlee, 2011; Cotula, 2013) in the context of the triple crisis of finance, food and fuel (McMichael, 2012).

Figure 1 shows the increase in land acquisitions since 2000 according to Land Matrix data.

Because the total number of land acquisitions is not known, the Land Matrix can be considered to be a sample of land acquisitions. It is important to note that the Land Matrix data is likely to be biased, and most of these biases are introduced by the use of



**Figure 1.** Agricultural land acquisitions since 2000.

Source: Land Matrix Initiative (2016).  $N = 812$  projects on 25.5 million hectares for which a year is given.

4 In contrast to the data set used by Arezki et al. (2013), the Land Matrix data now distinguishes the different negotiation and implementation status of deals. Consequently, we have only included deals for which we know a contract has been concluded. We further know which of these deals have started production (see Table 1). In addition, the Land Matrix has decentralized data collection and strengthened internal quality assurance. This leads to higher quality data (rectify erroneous deals and duplications) and to higher quantity (more deals enter the data base). As a result, we have used a different but improved data set: Arezki et al. (2013) had 848 deals on 54 million hectares, while we have 947 deals—knowing that at least one contract has been concluded. However, the total area has decreased: the 947 deals amount to 26.9 million hectares. This can be explained by the fact that we only considered the area that actually comes under contract, while the older data set included first media mentions of deals that were never concluded.

5 As data on financial flows that are related to foreign agricultural investment is not available, we have relied on flows of physical units of land.

**Table 1.** Land acquisitions according to implementation status (only acquisitions with a concluded contract)

Implementation status	Number of concluded deals	Contract size (in million hectares)	Size under production (in million hectares)
Project not started	59	2.7	n.a.
Startup phase (no production)	99	2.0	n.a.
In operation (production)	577	16.9	6.0
Project abandoned	37	1.1	n.a.
No information	175	4.2	n.a.
Sum	947	26.9	6.0

Source: Land Matrix Initiative (2016).

media reports as an important source.<sup>6</sup> This may result in certain regions, investors or sectors being over-represented, while others may be neglected.

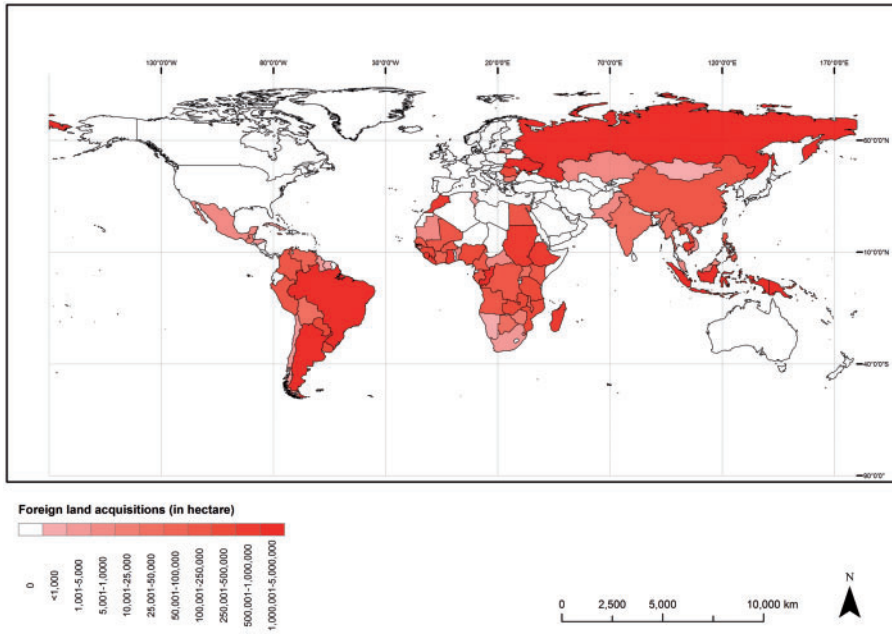
While the acquisition of large tracts of land in a foreign country qualifies as a purchase of foreign assets, we can speak of FDI only if the acquisition translates into an actual farming business with lasting investor interest and significant investor influence (OECD, 2009). While data on land acquisitions are difficult to obtain, it is even more difficult to collect information about the status of an agricultural investment project.<sup>7</sup> Some acquisitions of land may be motivated by pure speculation motives and, in contrast to investment projects in manufacturing, agricultural projects involve a higher risk of failure and typically need much longer to reach full operation (Deininger and Byerlee, 2012). However, Table 1 illustrates that an important number land acquisitions are now turning into investments, although they often bring under cultivation only a fraction of the originally acquired land. In our sample, a large share of the land acquisitions—subsequently also referred to as ‘deals’ or ‘projects’—have started the agricultural operations on the ground: 676 out of 947 deals (99 in ‘start-up phase’ and 577 ‘in operation’; see Table 1). For a further 175 cases, there is no information on the implementation status; some of these cases may be land acquisitions out of speculation motives.

Most foreign land acquisitions with subsequent farming operations involve foreign investment, and can therefore be considered agricultural FDI. While the precise capital flows associated with the establishment of farming operations are difficult to trace, anecdotal evidence on specific investment projects (Cotula et al., 2014; Nolte and Văth, 2015), as well as the long duration of the leaseholds between 25 and 99 years (German et al., 2013; Nolte et al., 2016), support the notion that foreign investors—once a project is

6 Records are derived from a variety of sources, including research papers and policy reports by international and local organisations and NGOs, personal information contributed through the Global Observatory website, field-based research projects, official government records, company websites and media reports. Most deals have more than one source attached.

7 The status of land deals and the associated investments is constantly changing. The Land Matrix uses two variables to describe the status of a deal: the negotiation status and the implementation status. The negotiation status includes ‘intended’, ‘concluded’ and ‘failed’ deals; we have only used concluded deals. The implementation status further distinguishes between ‘project not started’, ‘start-up phase (no production)’, ‘in operation (production)’ and ‘project abandoned’. It is very difficult to follow the implementation of a project.





**Figure 2.** Worldwide occurrence of foreign land acquisitions.  
*Source:* Authors’ own image based on data from Land Matrix Initiative (2016).

**Table 2.** Origin of host and investor countries

	Host countries*		Investor countries	
	# of concluded deals	Size (in 1000 ha)	# of concluded deals	Size (in 1000 ha)
Africa	399	11,177	69	953
Asia	279	4483	487	13,718
Europe*	93	4594	313	6990
Latin America and Caribbean	141	4480	40	1422
North America	n.a.	n.a.	123	3810
Oceania	35	2213	6	55
Total	947	26,948	1038**	26,948

*Source:* Land Matrix Initiative (2016).

\*Host countries are limited to low- and middle-income countries.

\*\*Deals that have more than one investor are counted twice (or thrice); the area is attributed to each investor with equal shares.

implemented—build-up a long-lasting relationship that typically includes a strong influence on the farming operations and farm management.

Figure 2 provides an overview of where land is acquired and Table 2 indicates the origin of hosts and investors. Our data set comprises 947 deals amounting to almost 27 million hectares distributed over 77 host countries. To put these figures into perspective, the currently reported total size of 27 million hectares under contract amounts to about

2% of global arable land. The hotspots for land acquisitions are located in sub-Saharan Africa, Latin America, Southeast Asia and Eastern Europe. The investors originate from 72 countries, with the largest group coming from Asia, followed by the European countries.

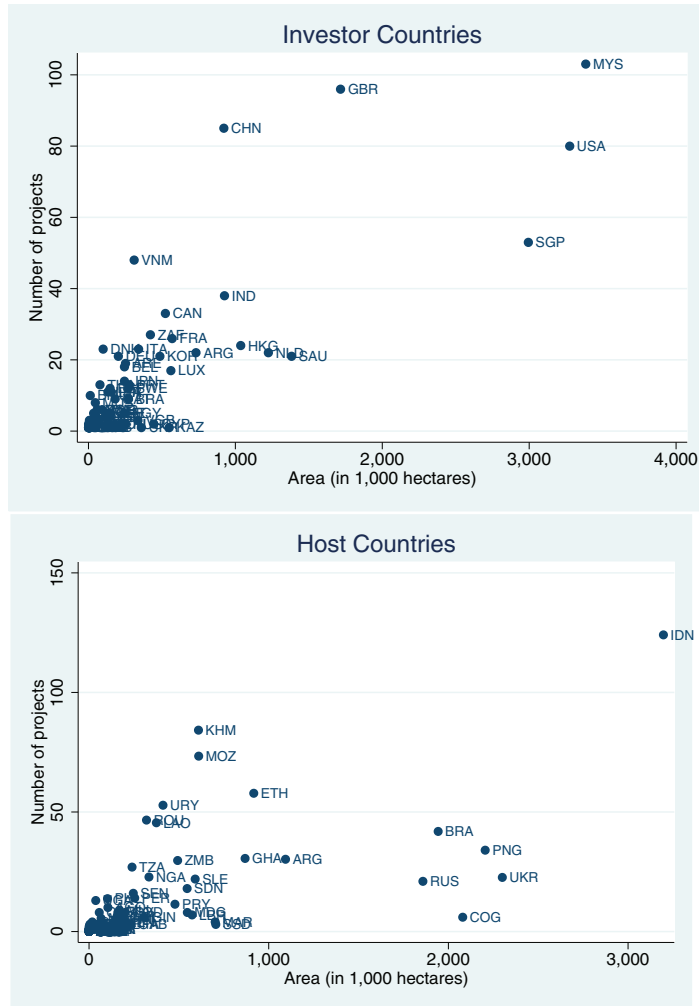
Figure 3 further investigates the distribution of the number and size of land acquisitions by host and investor countries. The graphs plot the total area acquired and the number of deals in (for host countries) and by (for investor countries) each country. They show that most host and investor countries are in the bottom left of the graphs, suggesting relatively few and small projects. For host countries, there is a quite distinct group of countries with many (more than 50) land acquisitions, but only a moderate total area (below 1 million hectares): Mozambique, Ethiopia, Cambodia and Uruguay. Ghana and Argentina are countries in which about 30 projects can be found with a total area of  $\sim 1$  million hectares. Then there is a group of countries with relatively few acquisitions (fewer than 50) but a very large total area (exceeding 1.5 million hectares): Russia, Brazil, Papua New Guinea, Ukraine and Republic of the Congo. With more than 100 deals on more than 3 million hectares, Indonesia is an outlier as a host country, as is Malaysia as an investor country, both in terms of size and number of land acquisitions. These outlier positions are related to palm oil investments. Two further investor countries—the USA and Singapore—stand out in terms of total area acquired and number of deals; the latter because of its role as a financial hub in Asia where investment funds and holdings tend to be located. In addition, Great Britain and China are important investors, particularly in terms of the number of projects. Vietnam has many projects, particularly in neighbouring countries, although these tend to be relatively small. Finally, Saudi Arabia, the Netherlands, Hong Kong (again an investment hub) and India emerge as important investor countries, all with a total of 1 million hectares (or just below) of land acquired.

To validate our results on foreign land acquisitions, we repeat our analysis with bilateral FDI data. To have a comparable data set, we use UNCTAD data on bilateral FDI flows and construct a cumulative figure of all bilateral flows from 2001 to 2012 (in millions of US dollars).<sup>8</sup> We use exactly the same country pairs as in the land acquisition data set. This means we use a very peculiar sample composed of investor–host country pairs that allow only hosts from low- and middle-income countries.

The Land Matrix and FDI data is complemented with additional variables to test our hypotheses. All explanatory variables are taken from the year 2000—the same year the Land Matrix started recording land acquisitions—to avoid problems of reverse causality. A complete list of variables is included in Table 3.

As explanatory variables, we include standard gravity model variables, including some bilateral variables (distance between two economies, common official language and a former colonial relationship) and GDP as a proxy for market size. We further include a dummy that turns 1 if a country is a net importer of agricultural products to test whether the food demand in investor countries is driving land acquisitions. To

8 United Nations Conference on Trade and Development (UNCTAD) only covers this time period, which is slightly shorter than the period covered by the Land Matrix (2000 to 2016). We add up all flows in the host economy per year and treat missing and negative values as zeros. The cumulative figure is compiled from individual country sheets obtained at <http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics-Bilateral.aspx>.



**Figure 3.** Host and investor countries and the number and size of deals.  
 Source: Authors' own image based on data from the Land Matrix Initiative (2016).

measure resource endowments, we include the agricultural area as well as water resources. Agricultural productivity is measured by the net production value for agriculture per 100 hectares for permanent crops. To measure general institutional quality, we use an indicator composed from the World Governance Indicators. As the individual indicators are highly correlated, we compose one general institutional indicator with principal component analysis.<sup>9</sup> To measure specific institutions, we include a number of alternative variables: the control of corruption rank (and as a crosscheck the corruption perception index); the rank of political stability to measure

9 Using the Stata command 'pca' and rotated results ('rotate').

**Table 3.** Definition of explanatory variables and source

Label	Explanation	Source	Year
<b>Main specification (see Table 6)</b>			
Weighted distance (log)	Weighted distance between host and investor	CEPII	n.a.
Common official language	Host and investor have a common official language (dummy)	CEPII	n.a.
Former colonial relationship	Host and investor have a past colonial relationship (dummy)	CEPII	n.a.
GDP (log)	GDP (absolute) in international \$constant 2005 PPP in 2000	WDI	2000
Net agricultural products imports	Dummy that becomes 'one' if country imports agricultural products	FAOStat	2000
Agricultural area (in 1000 ha) (log)	Agricultural area	FAOStat	2000
Water resources (log)	Total annual actual renewable water resources (m <sup>3</sup> /year)	FAO Aquastat	
Agricultural productivity (log)	Net production value for agriculture, in constant 2004–2006 1000 international \$divided by area for permanent crops in 100 ha.	FAO	2000
Institutions	All six indicators of the World Governance indicators are used to compose one indicator via principal component analysis. We scale it between 0 and 1.	WGI	2000
<b>Additional institutional variables (see Table 7)</b>			
Political stability	Percentile rank of the political stability indicator between 1 (low) and 100 (high political stability)	WGI	2000
Control of corruption	Percentile rank of the control of corruption indicator between 1 (low control, high levels of corruption) and 100 (high control, low levels of corruption)	WGI	2000
Changes in control of corruption	Difference in the percentile rank of control of corruption between 2006 and 1996.	WGI	1996/2006
Corruption perception indicator	Corruption in the public sector, indicator between 0 (highly corrupt) and 10 (highly clean).	Transparency International	2011
Land tenure insecurity	Scaled between 1 (low insecurity) and 4 (high insecurity)	IPD	2012
Investor protection	Ranked according to the protecting investor index, with higher values indicating better outcomes	Doing Business Survey	2012
Changes in political stability	Difference in the percentile rank of political stability between 2006 and 1996.	WGI	1996/2006

(continued)

Table 3. Continued

Label	Explanation	Source	Year
Risk of expropriation	Dummy that turns 1 if there occurred past expropriations of resource-based FDI in a host country between 1989 and 2006.	Hajzler (2012)	1989–2006
Number of deals	Number of deals the host has in total	Land Matrix	2000–2016
Regional trade agreements		CEPII	n.a.
Total land area	Total land area (in km <sup>2</sup> )	WDI	2000
Robustness checks			
GDP per capita	GDP/population	WDI	2000
Population	Population	WDI	2000
Capital stocks in the agricultural sector	Net capital stocks (agriculture, forestry and fishery)	FAO	2000

protection of property rights, which can also be considered an alternative measure of general institutional quality; we consider the land tenure insecurity index as a specific measure of land governance; data from the Doing Business survey to capture the business environment; and a dummy for host countries in which past expropriations of resource-based FDI occurred between 1989 and 2006 (Hajzler, 2012). We also look into changes in institutions and hence include a variable that measures the difference in political stability between 1996 and 2006.<sup>10</sup> To control for agglomeration effects (Menghinello et al., 2010), we also include a variable that counts all the projects in a host country. If a country already hosts projects, other investors might follow suit. We also control for regional trade agreements and the total land area of a country.

#### 4. Methodology

To test our hypotheses, we employ gravity model specifications that are widely used in empirical analyses of bilateral trade flows and FDI. In contrast to the trade literature, the FDI literature has not yet found a consensus on empirical specifications and is perceived as undertheorised (Blonigen and Piger, 2014). Despite these shortcomings, we believe that the rather *ad hoc* specifications of the FDI literature can offer important empirical insights on the correlates of these flows (see, for instance, Chakrabarti, 2001; Eicher et al., 2012; Blonigen and Piger, 2014).

A testable gravity equation is typically derived by taking logarithms of both sides of the multiplicative form of the gravity model (Burger et al., 2009). The traditional literature has used ordinary least square (OLS) to estimate these log-normal gravity specifications; more recently, Santos Silva and Tenreyro (2006) proposed employing Poisson estimators, which can handle heteroscedasticity and are considered a ‘promising workhorse for the estimation of gravity equations’. These authors suggested using a Poisson-pseudo maximum likelihood (PPML) estimator. This approach has

<sup>10</sup> We follow Arezki et al. (2016), who specifically looked into changes of institutions over time.

some critics (Martínez-Zarzoso, 2013) but is generally approved of (e.g. Arvis and Shepherd, 2013; Arezki et al., 2013; Haberly and Wojcik, 2014). We have followed the literature and used a PPML estimator.

To describe our data set, we introduce some simple notation. Let  $y_{ij}$  be the sum (in hectares) of all land acquired by investors from country  $j$  (referred to as investor country) in country  $i$  (target or host country) with  $i = \{1, \dots, C\}$ , with  $C$  being the number of countries in the world and with  $i = \{1, \dots, P\}$  where  $P$  is the number of low- and middle-income countries in the world. We have only considered international investments  $y_{ij}$  for all  $i \neq j$ .<sup>11</sup>

We constructed a bilateral data set of  $y_{ij}$  with  $i = \{1, \dots, P\}$  and  $j = \{1, \dots, C\}$ . Hence, we consider all investor country–host country pairs, while excluding the possibility of land being acquired in high-income countries. The data set ultimately consists of 30,806 possible investor country–host country combinations<sup>12</sup> and includes 146 possible target countries (77 of which are actually the targets of investment) and 212 possible investor countries (68 of which actually do invest). We regress pairs of land acquisitions  $y_{ij}$  with  $i = \{1, \dots, P\}$  and  $j = \{1, \dots, C\}$  using a set of variables from target country  $X_i$ , investor country  $X_j$  and characteristics of pair  $X_{ij}$  as well as an error term  $\epsilon_{ij}$ . PPML enables us to use the dependent variable, the sum of all land acquired from country  $j$  in country  $i$ , without logarithmic transformation.

$$y_{ij} = \alpha_0 + \alpha_1 X_i + \alpha_2 X_j + \alpha_3 X_{ij} + \epsilon_{ij}$$

Investigating our dependent variable further, we noticed that it is skewed to the right (excess of zeros) and overdispersed (variance is greater than the mean): 30,412 observations are zero observations and only 395 are non-zeros. The sum of all land acquired varies: most observations are rather small in size, but we also found 42 host–investor pairs with cumulative deals between 50,000 and 100,000 hectares and 63 pairs with deals even amounting to more than 100,000 hectares (see Table 4). Both problems—zero inflation and overdispersion—are addressed by the PPML estimator.

Correspondingly, we constructed a data set of bilateral FDI flows  $FDI_{ij}$  between an investor country  $j$  in a host country  $i$  for the same set of countries.

We use two main specifications. The first tests a basic gravity equation with GDP, bilateral variables and regional dummies.<sup>13</sup> The second specification adds a number of explanatory variables testing hypothesis on resource endowments, agricultural productivity and institutions.

11 This study examines the determinants of foreign investment in agricultural land. Note that large-scale farmland acquisitions often involve domestic investors.

12 146 target countries \* 212 investor countries = 30,952. When we deleted the 146 domestic pairs, we ended up with 30,806 possible combinations. We constructed our list from the World Bank list of economies as of July 2013. However, in the regressions, we lost a large share of these possible combinations due to limited data availability for the independent variables. Please see Online Appendix A available as Supplementary data for a list of host and investor countries.

13 Land ownership structures and land governance stand out among regional particularities that matter for land acquisitions. In many African countries, communal land rights play an important role, as do use rights by smallholders, while land is often owned by the state (Boone, 2014).

**Table 4.** Dependent variable: sum of all land acquired per host–investor country pair

Sum of all land acquired (in ha)	Number of host–investor country pairs
0	30,412
200–1000	43
1001–5000	73
5001–10,000	51
10,001–20,000	47
20,001–50,000	75
50,001–100,000	42
Greater than 100,000	63

Source: Land Matrix Initiative, 2016.

## 5. Results

### 5.1. Descriptive insights

For a first descriptive assessment of the determinants of land acquisitions, we compare some key characteristics for the host and investor countries with regard to acquisitions of agricultural land, and the host and investor countries for FDI. We present the means of these country characteristics weighted by the share of area, respectively FDI flows, acquired in or by host and investor countries in Table 5. The first two columns show that host countries of farmland acquisitions are closer to the Equator, much poorer, and have smaller populations and population densities than investor countries. The availability of water and agricultural area are slightly higher in per capita terms for hosts. While investors are clearly—on average—exporters of agricultural commodities, host countries almost exhibit balanced trade in these goods. Investors have higher agricultural productivity and capital stocks in agriculture. In addition, host countries have much lower institutional quality, as highlighted by the variable for general institutional quality as well as the variables on corruption, political stability, land tenure insecurity (higher values here indicate higher land tenure *in*security) and investor protection. Host countries have experienced an improvement in political stability but a decrease in control of corruption (opposite for investor countries).

To contrast target countries of farmland acquisitions with those of aggregate (mainly non-agricultural) FDI, we compared the host countries of farmland acquisitions to host countries of all FDI (columns 1 and 3 of Table 5). (All) FDI host countries tend to be further from the equator, bigger, and richer, with higher populations and population densities. Considering the per capita terms, resource endowments of hosts in farmland acquisitions are slightly higher. Institutional quality is slightly higher for (all) FDI hosts; however, hosts of farmland acquisitions experienced an improvement in political stability and have higher protection of investors. Generally speaking, host countries of acquisitions of agricultural land are quite similar to (all) FDI host countries.

Comparing the investor countries for farmland acquisitions to those investing in FDI (columns 2 and 4 of Table 5) revealed pronounced differences: the countries acquiring agricultural land are closer to the equator, poorer, and have much higher populations

**Table 5.** Descriptive statistics for different groups of countries

	Farmland acquisitions		FDI	
	Weighted all farmland acquisition host countries**	Weighted all farmland acquisition investor countries***	Weighted all FDI host countries****	Weighted all FDI investor countries*****
	Mean	Mean	Mean	Mean
Distance from Equator (in degrees of latitude)*	18	25	25	37
Land area (in km <sup>2</sup> )	2,509,698	2,348,940	4,852,312	3,573,003
GDP (in bn. internat. \$)	153	1827	543	3383
GDP per capita	3614	24,063	5355	28,805
Population (in mn)	48	1026	86	236
Population density (per km <sup>2</sup> )	74	137	377	148
Agricultural area (in 1000 ha)	61,347	104,325	188,223	134,912
Agricultural area per capita	0.83	0.76	0.50	0.91
Water (m <sup>3</sup> )	1504	873	2117	1220
Water (in l) per capita	0.02	0.01	0.01	0.01
Net agricultural imports (in USD)	-0.72	-1,068,873	7691	-678,261
Agricultural productivity (output per area in 1000 internat. \$)	11,801	89,054	18,489	154,780
Capital stocks in agriculture (per agricultural area in ha)	289	64,260	761	17,470
Institutions	0.29	0.71	0.38	0.81
Control of corruption (percentile rank)	28	73	40	82
Control of corruption changes in percentile rank (2006–1996)	-2.9	-0.2	0.2	0.0
Corruption perception (Transparency International)	3	6	3	7
Political stability (percentile rank)	25	64	31	73
Political stability changes in percentile rank (2006–1996)	3.0	-3.8	-2.1	-8.8
Land tenure insecurity	2	1	2	1
Protecting investors rank	90	131	86	125

Sources: (FAO, 2015a, 2015b; CEPII, 2015; Laitin et al., 2012; Land Matrix Initiative, 2016; Transparency International, 2016; UNCTADstat, 2015; World Bank, 2015a, 2015b).

\*Each degree of latitude is ~111 km apart.

and population densities. In terms of resource endowments, there is no stark difference, and institutional quality tends to be slightly higher for (all) FDI investors.

In sum, these descriptives tend to support the notion that the determinants of acquisitions of agricultural land may be similar to those of overall (mainly other forms of) FDI: investments flow from richer, more populous countries with relatively good institutional quality towards poorer, less populous countries with lower institutional quality close to the equator. However, we can also see that resource availability may play a more important role for agricultural investments. Interestingly, agricultural productivity and capital stocks in agriculture are very low in host countries of farmland



acquisitions. The statistics also suggest some ambiguity in the role of institutions. For example, we observe the biggest improvement in political stability in host countries of farmland acquisitions.

## 5.2. Econometric results

The results of the PPML estimation for land acquisitions and FDI are displayed in Table 6.<sup>14</sup> Looking first at land acquisitions in columns (I) and (II), we can assert that the bilateral variables yield the expected results. Distance has negative effects; for example, a 1% increase in distance reduces the sum of all land acquired by 0.87% (1.1 for the second specification), an effect of similar magnitude to the estimates by Santos Silva and Tenreyro (2006) for trade flows. A common official language and a former colonial relationship are positively correlated with the amount of land acquired.

Secondly, host country GDP turns negative in the second specification but remains insignificant. Hence, our second hypothesis seems to be confirmed: market-seeking objectives are not important for farmland acquisitions, with the market size of host countries losing importance after controlling for other factors. For investors, we find positive effects for GDP; hence, larger economies are more likely to engage in acquisitions of agricultural land.

Thirdly, concerning our hypothesis that investors seek to deal with imbalances in food supply, we were unable to find any support for this with a negative and statistically significant coefficient for the dummy indicating that investors are net agricultural importers. If an investor is from a country that is a net importer of agricultural products, the sum of all land acquired is reduced by more than 80%. This implies that net agricultural exporters, which are likely to have internationally competitive agricultural sectors, tend to acquire more land. The effect for host countries is also negative and weakly significant; hence, if a host country is net importing agricultural commodities, it has a lower chance of hosting farmland acquisitions.

Fourthly, the findings on the variables related to resources support the hypothesis that the resource endowments of target countries matter. For host countries, we do find positive statistically significant effects for the agricultural area and water resources. For investor countries, the agricultural area and water resources are statistically insignificant.

Fifthly we cannot confirm that (highly productive) investors are attracted by low agricultural productivity (and possibly low prices of land): host country agricultural productivity has a positive effect (although not significant).<sup>15</sup>

Sixthly, we cannot find significant effects of our composite institutional indicator for host countries. Thus, better overall institutional quality does not seem to attract land

14 To check the robustness of our results, we run a simple OLS (see Online Appendix B available as Supplementary data) using the same specification as for the PPML estimator. We use a logarithmic transformation of the cumulative hectare size,  $\log(y_{ij} + 1)$ . The results are generally consistent with the results presented above, but the size of the effects is much smaller for the OLS coefficients. One difference is that host institutions turn out positive and weakly significant.

15 We also test for capital stocks in agriculture that are equally not statistically significant for host countries. For investor countries, we find negative and strongly significant effect of capital stocks on farmland acquisitions; that is, higher capital stocks in investor countries' agriculture are associated with lower areas of land acquired. This finding is likely to be related to the importance of investors from developing countries that tend to have lower capital stocks than high-income countries.

**Table 6.** Pseudo-Poisson maximum likelihood estimation

	Dependent variable			
	$y_{ij}$		FDI $_{ij}$	
	(I)	(II)	(I)	(II)
Weighted distance (log)	-0.869*** (0.173)	-1.110*** (0.200)	-1.049*** (0.172)	-1.017*** (0.0908)
Common official language (dummy)	1.106*** (0.311)	0.934** (0.398)	1.554** (0.612)	0.552*** (0.209)
Former colonial relationship (dummy)	0.927** (0.371)	1.032** (0.445)	0.177 (0.477)	1.128*** (0.248)
Host GDP (log)	0.334*** (0.0708)	-0.135 (0.128)	1.013*** (0.119)	0.505*** (0.109)
Investor GDP (log)	0.622*** (0.0539)	0.593*** (0.110)	0.730*** (0.0477)	0.748*** (0.0937)
Host agricultural area (log)		0.635*** (0.246)		0.107 (0.194)
Investor agricultural area (log)		-0.0741 (0.218)		0.221 (0.136)
Host water resources (log)		1.026*** (0.289)		0.0297 (0.0655)
Investor water resources (log)		0.00476 (0.103)		0.138 (0.0870)
Host net agricultural products Imports (dummy)		-0.675* (0.385)		-0.280** (0.130)
Investor net agricultural products Imports (dummy)		-0.842*** (0.314)		-0.149 (0.162)
Host agricultural productivity (log)		0.288 (0.245)		0.0994 (0.112)
Investor agricultural productivity (log)		0.0233 (0.108)		-0.0103 (0.0559)
Host institutions		-1.056 (1.082)		1.579*** (0.440)
Investor institutions		2.175* (1.318)		4.317*** (1.181)
Controls	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	23,790	19,116	23,790	19,116
R-squared	0.111	0.183	0.299	0.558
RESET test (p-value) <sup>21</sup>	0.3108	0.2759	0.0544	0.9387

PPML estimation for farmland acquisitions ( $y_{ij}$ ) and FDI ( $FDI_{ij}$ ), main specification. Constant included but not reported. Controls included but not reported: regional trade agreements (always positive), total land area for host and investor countries (logged) in specification II (for hosts: negative and significant for land acquisitions; positive and significant for FDI; investors: always negative, strongly significant for FDI) and number of deals host (always positive, strongly significant for land acquisitions).

\* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.001$ . Standard errors in parentheses.

acquisitions. However, this result may hide ambiguous effects of different types of institutions; we explore this issue further below. Investor countries' institutions have a positive and weakly significant effect.

Comparing these results with the results for FDI reported in columns (III) and (IV), we note certain differences. First, host countries' GDP remains positive even after adding other variables, and therefore confirms an important role for market-seeking objectives of FDI. Secondly, the proxies for land and water resources remain insignificant and are not systematically linked to decisions on FDI. Thirdly, institutions, both for host and investor countries yield positive and strongly significant results for FDI. Hence, in contrast to farmland acquisitions, good institutions of host countries seem to be conducive to receiving FDI.

To assess the effects of institutions in more detail, we use specification II for land acquisitions and the FDI of the former model but replace the composite institutional indicator by a number of both investor and host institutional variables, including the control of corruption percentile rank, the political stability percentile rank, an index of land tenure insecurity (between 1 and 4) and the rank of the investor protection index of the Doing Business survey. The results are reported in Table 7, (full results are reported in Online Appendix C available as Supplementary data).

This reveals important differences with regard to the effects of different host country institutions on land acquisitions for agriculture vis-à-vis FDI. First, while host country corruption control (i.e. better control of corruption, or less corruption) significantly reduces the amount of FDI a country receives—by ~2% for each percentile rank it climbs in the corruption ranking—there is only a small and insignificant effect for land acquisitions.<sup>16</sup> For our particular sample, which is restricted to low- and middle-income host countries, we find a positive correlation between corruption and FDI. This result could be partly due to an important part of FDI driven by (omitted) mineral resource endowments, which have often been associated with higher levels of corruption (see, for instance, Papyrakis and Gerlagh, 2004). Secondly, political stability in the host country helps to attract FDI, while no significant correlation can be found for land acquisitions. However, when we test for an effect of changes in host countries' political stability (between 1996 and 2006) we find a positive and strongly significant effect for land acquisitions (not significant for FDI).<sup>17</sup> Thirdly, for land tenure insecurity we cannot find significant effects for neither FDI nor land acquisitions. Fourthly, we find opposite significant effects of host countries' institutions to protect investors. There is a negative correlation between land acquisitions and investor protection in host countries while the same correlation is positive for FDI and investor protection, although the effects are relatively small.<sup>18</sup>

16 This result is robust to using the Transparency International Corruption Perception index (see Online Appendix C available as Supplementary data, specification IIb). We also test for an effect of changes in institutions by looking at the changes in the control of corruption rank between 1996 and 2006; even here we find a negative, albeit insignificant, coefficient for host countries of farmland acquisitions and FDI. We report these results in the Online Appendix C (specification IIc) available as Supplementary data.

17 We report these results in the Online Appendix C (specification IIc) available as Supplementary data.

18 We also test a dummy for expropriation that becomes 1 if past expropriations of resource-based FDI took place in a host country (Hajzler, 2012). The effect of this dummy is negative but insignificant for land acquisitions but positive and strongly significant for FDI: if the host country has a history of expropriation, the FDI flows are expected to increase by 51%. Hence, countries in which expropriations happened have a relatively high chance of receiving FDI. This may again be related to (omitted) mineral resources. Results are reported in Online Appendix C (specification IIId) available as Supplementary data.

**Table 7.** Pseudo-Poisson maximum likelihood estimation. Different specifications with additional institutional regressors (excerpt, see full results in Online Appendix available as Supplementary data)

	Dependent variable	
	$y_{ij}$	FDI <sub>ij</sub>
	(IIa)	(IIa)
Host control of corruption	−0.00545 (0.00842)	−0.0217*** (0.00482)
Investor control of corruption	0.00319 (0.0114)	0.0377*** (0.0121)
Host political stability	0.00544 (0.00708)	0.0313*** (0.00476)
Investor political stability	0.0101 (0.00629)	0.00751 (0.00556)
Host land tenure insecurity	−0.0397 (0.154)	−0.0692 (0.111)
Investor land tenure insecurity	0.264 (0.167)	0.382*** (0.147)
Host investor protection	−0.00758** (0.00355)	0.0110*** (0.00133)
Investor investor protection	0.00957** (0.00378)	−0.00185 (0.00166)
Controls	Yes	Yes
Regional dummies	Yes	Yes
Observations	11,520	11,520
R-squared	0.232	0.629
RESET test (p-value)	0.0532	0.2831

Excerpt of PPML estimation with additional institutional regressors for farmland acquisitions ( $y_{ij}$ ) and FDI (FDI<sub>ij</sub>). Specification (II), institutions\_pca replaced by the respective institutional variable.

\* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.001$ .

Standard errors in parentheses.

In sum, the general institutional quality in host countries—in contrast to FDI—does not play a big role. It is specific institutional qualities that explain the positive correlation for FDI: political stability and investor protection. At the same time, investors seem to be willing to tolerate (or even be attracted by) corruption. For land acquisitions, low investor protection appears to be a risk that investors are willing to take.

### 5.3. Robustness checks

To test the robustness of the above results and add further insights, we first use different specifications, then use different data samples restricted to only operational projects and different deal sizes and finally repeat the analysis with count data. In particular, the latter enables us to scrutinise differences in our results compared to those of Arezki et al. (2013). While we can confirm the importance of resources, we cannot confirm their finding that weak land tenure security is associated with increased foreign demand for

land. Moreover, we find a negative (positive) effect on land acquisitions if investors are net importers (net exporters) of agricultural commodities.

First, we include population and then GDP per capita (both in logs) in our basic gravity specifications (III and V) and in our augmented gravity specifications (IV and VI) (see Online Appendix D available as Supplementary data), following other contributions in the empirical FDI literature (Blonigen and Piger, 2014). However, we clearly prefer the above main specification to these robustness checks, especially because the inclusion of one (potential) regressor (here population), in the denominator of another regressor (here GDP per capita), implies problems of interpretability. Generally speaking, our results are robust to the inclusion of these additional variables. Investor countries' population is negatively associated with land acquisitions and FDI—but is significant only in the case of FDI; that is, less populous countries tend to be engaged more in FDI. For host countries, the population effect is insignificant for both land acquisitions and FDI. The coefficient of GDP per capita is positive for investor countries (and significant in the case of FDI); for host countries of land acquisitions, the effect is positive and significant (with the negative effect of GDP turning significant—as compared to specification II in Table 6). In a final specification check, we then include investor- and host-country fixed effects (VII, last column of Online Appendix D available as Supplementary data) to account for multilateral resistance terms (Anderson and van Wincoop, 2003). Results for the bilateral variables remain unchanged, so this specification provides evidence for the general suitability of a gravity model to describe our data.

Results using different sub-samples are reported in Online Appendix E available as Supplementary data (using specifications (I), (II) and (III)). The first sub-sample only includes operational projects that are reported to be in the start-up phase or in production. The results are generally consistent with the results from the full sample and we can therewith rule out that observed acquisitions are mainly driven by land price speculation. We now find positive and strongly significant effects of host countries' agricultural productivity, suggesting that projects are more likely to be implemented in contexts with better agricultural infrastructure and/or more previous commercial agricultural activity. Overall, host country institutional quality—as measured by the composite index and included (Online Appendix E, column II available as Supplementary data)—has a negative and strongly significant effect on land acquisitions. The results on specific institutions (column III) suggest that this result is driven by corruption control (now negative and weakly significant) and the low levels of investor protection (as before) in host countries. We then use a subset of the data that excludes very large projects (those over 100,000 hectares), as well as a sub-sample that is composed only of large projects (those over 100,000 hectares), and, finally, a subset that only includes land acquisitions smaller than 10,000 hectares. Results are generally consistent with our previous results, but some of the effects appear to be conditioned by the size of the projects. Very large projects seem to drive the positive link between agricultural area in host countries and land acquisitions, while host countries' water resources remain significant across all sub-samples. In the samples without large projects and the one that uses only small projects, the effect on investors who are net importers of agricultural commodities loses significance. Further, the effect of host country land tenure insecurity becomes significant for the sample of (relatively) small projects. The effect is large—a unit change in the index (with values of 1 to 4) towards less insecure land tenure results in a 62% increase in the area of acquired land, thus

confirming a key result of Arezki et al. (2013), albeit only for these land acquisitions of smaller size.

A final set of robustness checks uses the same specification with count data: the dependent variable is the number of investments projects  $n_{ij}$  of investor country  $i$  in target country  $j$ . We use a zero-inflated negative binomial regression,<sup>19</sup> as proposed by Burger et al. (2009). Results are generally consistent with the results presented above (see Online Appendix F available as Supplementary data). The differences between the count and the 'size' model can be rationalised by the differences that we have observed for different size categories above. Thus, one difference in the count model is that the effect of host countries' agricultural area is no longer significant and has a negative sign in the main specification. This may simply reflect that the size of potentially available land matters more for larger projects. Host countries' water resources again remain positive and highly significant. The dummy on investors who import agricultural commodities turns positive. This is closer to the result of Arezki et al. (2013) of an important role for net food importers in land acquisitions. Similarly, the count model yields a positive but insignificant correlation between land tenure insecurity and land acquisitions—another key result of Arezki et al. (2013).

Taken together, the robustness checks have confirmed our main results. A few particularities are noteworthy. First, concerning resources, host countries' water resources remain positive and strongly significant throughout all robustness checks, although the positive effect of agricultural area seems to stem from larger projects. Secondly, for operational projects, agricultural productivity of host countries is positively associated with the area of land acquired. Moreover, for these projects, institutional quality, including the control of corruption, is negatively associated with land acquisitions. Thirdly, two main differences between our results and those of Arezki et al. (2013) seem to be related to the different dependent variables: number and size of projects. For the sample with smaller projects, as well as in our count regression, we obtain similar (albeit not as strong and significant) results regarding land tenure insecurity and investors importing agricultural commodities. This suggests that very large-scale investments in land may partly be driven by other factors than smaller investment.

## 6. Conclusion

Acquisitions of agricultural land indicate new interest in the agricultural sectors in developing countries, as well as a move towards the commercialisation of agriculture

19 Given our data that is zero-inflated and overdispersed, this seems to be the best model choice. However, we also tested alternative models and started off with a Poisson regression, then used a negative binomial model. AIC and BIC criteria and the likelihood ratio test confirm that the negative binomial specification fits better with our data. Comparing the negative binomial and a zero-inflated negative binomial model, AIC, BIC and Vuong statistics prefer the zero-inflated negative binomial model.

Zero-inflated models assume that zeros are generated by two distinct processes, which makes sense both from a methodological and a theoretical point of view if one expects many zeros to be missing values. Zero-inflated models assume two latent groups: a group that is always zero (i.e. it never has the chance to have an investment) and a group that has a probability greater than zero to have positive counts (i.e. there is a chance of having investments). Zero-inflated models first estimate a logit regression that indicates how variables influence the 'always-zero-group' and a negative binomial regression/Poisson for those in the 'not-always-zero-group' (Long and Freese, 2006). We display only the results from the 'not always zero group' (see Online Appendix G available as Supplementary data).

worldwide. This article makes two main contributions to a better understanding of the drivers of these farmland acquisitions. First, we have argued that farmland acquisitions are a specific subset of agricultural FDI and have developed corresponding hypotheses on the determinants of this specific subset vis-à-vis FDI in manufacturing. According to these hypotheses, farmland acquisitions should be driven, like any other form of FDI, by the desire to find a low-cost production location, the choice to internalise production, and the organisational choice of the investor. Thus, most determinants of FDI in manufacturing can be transferred to this specific form of agricultural FDI; for example, a common language, a former colonial relationship or the distance between economies. However, we also assume that there are several ways in which acquisitions of agricultural land are different. The quest to secure access to food and energy resources is believed to play a major role in such acquisitions, while market-seeking factors may be less important. Land and water endowments should be salient because these immobile inputs cannot be substituted and because global economic growth places considerable pressure on land and water as key resources. Land prices in many developing countries are low, which reflects the low agricultural productivity and/or land market failures that imply that prices do not reflect the value of the land under potentially higher productivity. Thus, low prices might attract agricultural investments. Finally, land acquisitions take place under land governance systems with vaguely defined and overlapping land rights. Therefore, investors might be tempted to take advantage of this situation and be attracted by these ‘bad institutions’.

Our second contribution is that we tested these hypotheses using a data set on large-scale land acquisitions, which we compared to (ordinary) FDI flows. Descriptive insights suggest that the determinants of acquisitions of agricultural land partly overlap with those for other forms of FDI with a more important role of agricultural resources, particularly the availability of water, for farmland acquisitions. We have further tested these hypotheses using a PPML estimator and a bilateral data set of acquisitions of agricultural land and FDI worldwide. The results suggest that rich investors target (poorer) economies with abundant resources. Indeed, market-seeking objectives play a minor role for land investment. Moreover, standard determinants of trade and FDI flows, such as geographical and socio-political distance, also matter for farmland acquisitions. At the same time, we find no support for the conjecture that investors seek to deal with imbalances in food supply at home. Instead, net exporters of agricultural products are those that acquire land. This may reflect the fact that firms from countries with competitive agricultural sectors are investing in land to internalise production due to difficult conditions in target countries; in particular, credit and input market failures and the lack of the provision of adequate infrastructure. We also find that host countries are exporters of agricultural commodities, which hints at a tradition of agricultural exports that facilitates foreign agricultural investment. These results are particularly strong when we reduce the sample to projects that have already become operational. Evidently and not surprisingly, we can confirm that the availability of land and—even more—the availability of water resources is a key determinant of the locational choice of farmland acquisitions. Furthermore, we find no support for the hypothesis that investors seek to invest in countries with low agricultural productivity. Instead, our results hint at a positive association between host countries’ agricultural productivity and the area of farmland acquired (again stronger for projects in operation). This could speak against large technology spillovers from high-productivity to (very) low-productivity countries through this type of investment. However, the lack

of clear results on this aspect could also be explained by limitations of the proxy used: low agricultural productivity is likely to also capture poor land quality. Further, our results show that the general institutional quality in host countries plays no major role in the locational decision and could even be associated with less land acquisitions. This negative correlation between land acquisitions and institutional quality can be explained by low levels of investor protection—and high levels of corruption for operational projects—in host countries. However, we cannot confirm the result that countries with very bad land governance systems would be particularly attractive to investors. Thus, land investors seem to be willing to tolerate some deficiencies in specific institutions. For FDI, we find a similar ‘tolerance’ (only with low- and middle-income target countries for our particular sample) with regard to corruption, but not for the lack of investor protection. Our series of robustness checks generally confirms these main findings, but also partly explains deviations from previous studies, particularly regarding the role of land tenure insecurity and net food importers as investors. Analyses based on sub-samples restricted to smaller project as well as count regressions yield results closer to Arezki et al.’s findings (2013), suggesting that some aspects of the locational decision of land acquisitions are conditioned by the size of the project.

With these theoretical considerations and empirical insights, we also contribute to a wider debate. Foreign direct investment outside manufacturing—be it in agriculture, mining and also in services—is often politically controversial. Therefore, analysis of locational choices in these sectors not only addresses a gap in the academic literature, but can also contribute to rationalising the policy discourse. For example, our analysis does not support the common perception that land in developing countries is mainly acquired by land and water scarce countries that are securing access to food supplies elsewhere—as implied by the term ‘land grab’ that is often used with reference to these acquisitions. In light of the real-world relevance of the issue, therefore, it may seem surprising that so few studies have analysed the determinants of non-manufacturing FDI. However, a lack of data is to blame here, as it is for many understudied issues, and it is astonishing how little data there is. The present study uses a very peculiar data set on large-scale land acquisitions. While we believe that studying this data set has yielded some very interesting insights on the determinants of this specific sub-set of agricultural FDI, it also places important limitations on our analysis. For example, some of the cases of land acquisition may represent pure speculation on higher future land prices, while other acquisitions—in fact, the vast majority as shown by our data—lead to agricultural production. In addition, we must rely on flows of physical units of land and future work will hopefully be able to draw on data on financial flows that are related to foreign agricultural investment. Moreover, regional differences within national boundaries cannot be accounted for. This may be particularly important for land and water resources; for example, if investors acquire land in the few water-rich and fertile regions in a country that, overall, has little water and little fertile land. Improved spatial data might allow a more fine-grained analysis soon. Such data—ideally with a time dimension—would also enable researchers to analyse whether and how agricultural projects become operational and how they affect land use. For a better understanding of the investment decision and, specifically, the role of land-related institutions, improved information on former (before the land transaction) and current land ownership and use rights will be required. With such data, certain aspects of the investment decisions could be further investigated. For example, certain types of investors may prefer to avoid any complications that arise in situations where private or



communal use rights are overlapping with state ownership, as is often the case in sub-Saharan Africa.

To conclude, our analysis of international locational choices in agriculture through land acquisitions highlights an important and—at this scale—recent facet of globalisation. In some parts of the world, this phenomenon can potentially have major implications for rural and often very poor populations, as well as for the local and global environment. Some results from our analysis—such as the ambiguous effects of institutions and the quest for water resources—are indications that these acquisitions may under certain conditions have detrimental effects.

## Supplementary material

Supplementary data for this paper are available at *Journal of Economic Geography* online.

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