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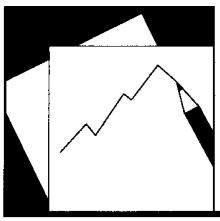

IMF Working Paper

What drives the global land rush?

Rabah Arezki, Klaus Deininger and Harris Selod

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What drives the global land rush?

Prepared by Rabah Arezki, Klaus Deininger and Harris Selod [1]

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Abstract

This paper studies the determinants of foreign land acquisition for large-scale agriculture. To do so, gravity models are estimated using data on bilateral investment relationships, together with newly constructed indicators of agro-ecological suitability in areas with low population density as well as indicators of land rights security. Results confirm the central role of agro-ecological potential as a pull factor. In contrast to the literature on foreign investment in general, the quality of the business climate is insignificant whereas weak land governance and tenure security for current users make countries more attractive for investors. Implications for policy are discussed.

JEL Classification Numbers: F21, O13, Q15, Q34

Keywords: Land Acquisition, Large-Scale Agriculture, Foreign Investments Agro-Ecological Potential, Land Availability, Land Governance, Property Rights

Author's E-Mail Address: rarezki@imf.org; kdeininger@worldbank.org; hselod@worldbank.org.

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[1] The authors are, respectively, Economist, International Monetary Fund; Lead Economist, and Senior Economist, World Bank, Washington DC; Contact address: 1818 H St NW, Washington DC, USA, 20433. Email: rarezki@imf.org, kdeininger@worldbank.org or hselod@worldbank.org. We thank Charlotte Coutand and Caroline Silverman for helping with data coding, Daniel Monchuk, Siobhan Murray, as well as Gunther Fischer and Mahendra Shah (International Institute for Applied Systems Analysis) for their contribution to the construction of indicators of land availability, Jean-François Eudeline for building the synthetic indicator of tenure security, and Thierry Mayer and Jacques Ould Aoudia for their guidance and suggestions regarding the use of data on governance. We are also grateful to D. Byerlee, W. Martin, J. Swinnen, for insightful discussions and suggestions and participants of the 2010 AAEA and NARSC conferences for useful comments. The views expressed in this paper are those of the authors and do not necessarily reflect those of the International Monetary Fund or of the World Bank , its Board of Directors or the countries they represent. Financial support from the TF-ESSD Trust Fund, PROFOR, the Bill and Melinda Gates Foundation, the Hewlett Foundation and CEPREMAP is gratefully acknowledged.

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I. INTRODUCTION

After decades of stagnant or declining commodity prices when agriculture was considered a 'sunset industry', recent increases in the level and volatility of commodity prices and the resulting demand for land have taken many observers by surprise. This phenomenon has been accompanied by a rising interest in acquiring agricultural land by investors, including sovereign wealth and private equity funds, agricultural producers, and key players from the food and agri-business industry. Investors' motivations include economic considerations, mistrust in markets and concern about political stability, or speculation on future demand for food and fiber, or future payment for environmental services including for carbon sequestration. Some stakeholders, including many host-country governments, welcome such investment as an opportunity to overcome decades of under-investment in the sector, create employment, and leapfrog and take advantage of recent technological development. Others denounce it as a "land grab" (Zoomers 2010). They point to the irony of envisaging large exports of food from countries which in some cases depend on regular food aid. It is noted that specific projects' speculative nature, questionable economic basis, or lack of consultation and compensation of local people calls for a global response (De Schutter 2011). In a context of diametrically opposite perceptions, the objective of the present paper is to provide greater clarity on the numbers involved and the factors driving such investment. This is done by quantifying demand for land deals, and exploring the determinants of foreign land acquisition for large-scale agriculture using data on bilateral investment relationships. This work is an important first step to assess potential long-term impacts and discuss policy implications.

The analysis of large-scale land deals is relevant for a number of key development issues. One such issue is the debate on the most appropriate structure of agricultural production. The exceptionally large poverty elasticity of growth in smallholder agriculture (de Janvry and Sadoulet 2010, Loayza and Raddatz 2010) that is reflected in rapid recent poverty reduction in Asian economies such as China, and the fact that the majority of poor are still located in rural areas led observers to highlight the importance of a smallholder structure for poverty reduction (Lipton 2009, World Bank 2007). At the same time, disillusion with the limited success of smallholder-based efforts to improve productivity in sub-Saharan Africa (Collier 2008) and apparent export competitiveness of "mega-farms" in Latin America or Eastern Europe during the 2007/8 global food crisis have led to renewed questions about whether, despite a mixed record, large scale agriculture can be a path out of poverty and to development.

Whatever the envisaged scenario, renewed pressure on land raises the issue of whether there is sufficient competition and transparency to ensure that land owners or users are able to either transfer their land at a fair price or hold on to it as opposed to having it taken away without their consent and in what may be perceived an unfair deal. This resonates with recent contributions to the literature that suggest that resource abundance can contribute to more broad-based development only if well-governed institutions to manage these resources exist (Oechslin 2010). This is borne out by empirical evidence both across countries (Cabrales and Hauk 2011) and within more specific country contexts where resource booms may have fuelled widespread rent-seeking and corruption (Bhattacharyya and Hodler 2010) or even violence (Angrist and Kugler 2008) rather than economic development.

To better understand this phenomenon and its potential impact, an empirical analysis of the factors driving transnational land acquisition is needed. To this end, we constructed a global database with country-level information on both foreign demand for land and implemented projects as documented in international and local press reports. We complement it with country-specific assessments of the amount of potentially suitable land and other relevant variables. We then use bilateral investment relationships from the database to estimate gravity models that can help identify determinants of foreign land acquisition. Results confirm the central role of agro-ecological potential as a pull factor but suggest that, in contrast to what is found for foreign investment more generally, rule of law and good governance have no effect on the number of land-related investment. Moreover, and counter-intuitively, we find that countries where governance of the land sector and tenure security are weak have been most attractive for investors. This finding, which resonates with concerns articulated by parts of civil society, suggests that, to minimize the risk that such investments fail to produce benefits for local populations , the micro-level and project-based approach that has dominated the global debate so far will need to be complemented with an emphasis and determined action to improve land governance, transparency and global monitoring.
The paper is organized as follows. Section 2 puts recent land demand into broader context, highlighting the importance of governance in attracting investments. It draws on an analysis of how foreign direct investment (FDI) is treated in the macro-literature to suggest a methodological approach, and outlines how we address specific data needs. Section 3 presents our cross-sectional data on land demand, outlines the econometric approach, and briefly discusses relevant descriptive statistics. Key econometric results in section 4 support the importance of food import demand as motivations for countries to seek out land abroad (‘push factors’) and of agro-ecological suitability as key determinants for the choice of destination (‘pull factors’). They also highlight the extent to which weak land governance

seems to encourage rather than discourage transnational demand for land. Section 5 concludes by highlighting a number of implications for policy.

II. CONCEPTUAL FRAMEWORK AND EMPIRICAL EVIDENCE

In a historical perspective, the surge of demand for land in the wake of the 2007/2008 commodity price was but one of a series of booms in farm land. Putting it into context also helps to understand the role of technical, economic, and institutional factors in shaping the nature and eventual impact of such investment. We also summarize methodological lessons from the macro-literature on bilateral investment to empirically investigate this phenomenon and discuss some of the specific variables that need to be considered in the empirical analysis, including cultural and physical proximity, and endowment with fertile land, and (land) governance.

A. A broader perspective

Large trans-national land acquisitions, though rarely via market processes, were first observed in the context of conquests and colonial expansion. However, as the purposes frequently included promoting the colonists' own operations using cheap labor, the share of land actually utilized often remained small (Conning and Robinson 2007). In fact, many of the ventures established in this context survived only because they benefited from subsidies and market distortions in their favor (Binswanger *et al.* 1995). Subsequent spikes in acquisition of large tracts of land resulted from changes in the cost of transport such as those associated with steamships and refrigeration, or with technology shifts that made use of lands which had previously thought to be beyond the frontier viable economically. While specific circumstances varied immensely, some general lessons emerge.

First, numerous studies document the long-term effects of the way in which land was accessed in developing countries (Banerjee and Iyer 2005, Iyer 2010) as well as in developed countries (Libecap and Lueck 2011). This implies that the institutions established to make land available had impacts in the long term and shaped outcomes, in particular the economic and social development of original land users, for decades and sometimes centuries to come. The differential impact of Central America's 19th century commodity booms provides an interesting illustration. Partly because the economic viability of large farms depended on a cheap labor force with limited outside options, large scale investments in countries pursuing

a strategy of smallholder land ownership–such as Costa Rica and Colombia–was much more favorable than in ones–such as El Salvador or Guatemala–whose strategy focused on establishing large plantations. Literacy rates have differed sharply between the two groups ever since the late 19th century and significant gaps have emerged with respect to other human development indicators and the establishment of democracy. Where a large farm strategy had given rise to 'landlord dominance', it took more than a generation longer, i.e. some 40 years, for democracy to take hold than in countries where the structure of production focuses on smallholders (Nugent and Robinson 2010). More recently, policies that required to demonstrate "productive" use of land in Brazil, together with capital subsidies, have encouraged both deforestation (Pacheco and Poccard Chapuis 2009) and very capital-intensive modes of production that have a limited impact on employment generation and poverty reduction.

Second, agriculture is a business that faces technical challenges, long gestation periods, low margins, and a dependence on the vagaries of weather and variation in micro-climatic conditions. In many developing countries, these are exacerbated by past neglect of public spending on technology and infrastructure and institutional challenges. Overcoming these and making a profit can be difficult even for ventures that are technically and economically viable in principle. In fact, many well-intended or well-resourced schemes, including the "bonanza farms" established in the Dakotas in 1860-1900 (Drache 1964), Brazilian rubber plantations established by Henry Ford in the 1920s (Grandin 2009), and efforts in the 1960s to establish large-scale agriculture in the Lakeland Downs of Australia's far Northeast ended in spectacular failure and reverted back to smallholder cultivation. As a result, land that had been acquired at high cost during the boom was later often transferred at a fraction of the initial acquisition price. The challenges of "greenfield" investments in developing countries are also evident from the fact that even not-for profit institutions with access to large amounts of capital and expertise such as the Commonwealth Development Corporation only managed success rates of some 20%.[2] This would not be a problem in a well-governed institutional environment where failure is signaled quickly and avenues for smooth liquidation are available. It can, however, create problems, including attempts by unsuccessful entrepreneurs to make local communities bear the cost of failure if these conditions do not apply.

[2] This figure is from G. Dixie, in a World Bank personal communication. Even in plantation crops such as bananas or oil palm, where large-scale cultivation offers advantages, the record of transnational investments is mixed and large companies are often accused of non-competitive behavior and getting embroiled in local politics, as in Guatemala in the 1950s (Brockett 1988).

Third, a number of examples highlight that targeted support to public goods in priority sectors can have positive impacts if deployed in a transparent way and in the context of a strategy to exploit a hitherto underutilized resource in line with the country's comparative advantage. In Uruguay for instance, the provisions for subsidies and tax breaks in the 1987 forestry law helped attract FDI to establish a globally competitive forestry industry that generated employment and income, provided environmental benefits, and increased land values (Morales Olmos 2007).[3] In Brazil, long term investments in technology to generate varieties and tillage methods suited to the *cerrado's* low latitudes and acid soils provided the basis for expansion into vast areas of the country's hinterland that had not been cultivated in the 1970s, and generated large economic benefits. Still, this process was far from straightforward and many lessons regarding the need for public investment, institutional pre-conditions, and environmental protection emerged (World Bank 2009). In Peru's Pacific region, transparent auctions of some 235,500 ha of public land that aimed to bring in large agricultural investment with strong technical vetting brought in almost US$50 million in investment over the past 15 years, helping the country to emerge as a major high-value agro-exporter of horticultural produce, and generating many jobs (Hernandez 2010). In contrast, offering land below its true opportunity cost is unlikely to attract the right types of investors, and–to the extent that this involves taking it from local communities without proper process or adequate compensation—may create large social problems. In Indonesia, efforts to foster development of the palm oil industry by giving away forested land for free have failed to lead to sustainable investment in numerous cases. Instead, it contributed to the loss of land with high biodiversity, to rent seeking, and to conflict (Koh and Wilcove 2008).[4] In Sudan, the transfer of land for free neglected traditional users' rights and led to conflict and soil mining rather than to the establishment of a competitive farm sector (Johnson 2003).

Fourth, agricultural cultivation has traditionally been dominated by small farms and increases in the average farm size driven largely by higher non-agricultural wages. New technological developments in crop breeding, tillage, and information technology all make labor supervision easier. They may also reduce the diseconomies of scale that have traditionally been associated with large agricultural operations and transmit benefits from vertical coordination throughout the value chain to the stage of production (Deininger and Byerlee 2011). This is in some sense similar to plantation crops where such integration has long provided a strong competitive advantage to larger operations. In some cases, this can lead to

[3] Subsidies and tax breaks targeted forest plantations or processing industries on marginal lands that had previously been used for cattle ranching.

[4] By some estimates up to 12 million ha have been allocated to oil palm and deforested but not planted (Fargione *et al.* 2008).

situations where efficient, diversified, and vertically integrated operators can lease farmers' land at prices higher than what these could obtain from self-cultivation (Regunaga 2010). At the same time, many technical innovations are less scale-biased than often thought–as information technology, for example, can also be used to better coordinate smallholder farmers. Moreover, very large units of production emerge in many cases because of their superior ability to deal with market imperfections (access to finance), lack of public goods (education), and weak governance. If other markets work, removal of these constraints would then give rise to smaller operational farm sizes. While more detailed research is needed, anecdotal evidence suggests that in many settings farms are very large not because of inherent advantages of the technology but because of the superior ability of large operators to deal with other market imperfections.

B. Insights from the macro literature

The recent nature of the phenomenon implies that empirical analysis has thus far been limited. In fact, most of the literature on land markets in developing countries focuses on transfers among locals, usually small farmers (Deininger 2003, Deininger and Feder 2001) that may be of limited relevance in this context. While we know of no cross-country study addressing foreign land acquisition, the literature on foreign investment flows offers relevant methodological and substantive lessons.

Methodologically, the empirical literature on the determinants of capital flows has distinguished between pull and push factors to explain the magnitude and distribution of capital flows to developing countries (Calvo *et al.* 1996).[5] By taking into account country-specific factors such as cultural and geographical proximity, the analysis of bilateral flows between specific investor and host countries can add significant insights to our understanding of transnational investments (Benassy-Quere *et al.* 2007). Gravity models that empirically relate FDI between two countries to the size of each partner, bilateral distance and a set of variables accounting for relative costs are consistent with a strand of theoretical literature on trade and capital flows (Markusen and Venables 1998). They allow us to establish a synthesis of modeling structures relying on both horizontal and vertical motives for FDI (Markusen

[5] Push factors (e.g. business cycle in G7 countries) explain the magnitude of capital flows. Pull factors relate to domestic country characteristics (e.g. economic performance) that help explain the distribution of capital flows across developing countries.

and Venables 2000) and have thus been widely used in the literature to explain bilateral FDI (Wei 2000).[6]

Substantively, a key stylized fact is that, while liberalization of capital markets over the past decades has considerably increased capital flows to developing countries (Prasad et al. 2008), the volume of such flows remained well below the level that would be predicted by neoclassical theory in order to equalize returns to capital. This finding is commonly referred to as the Lucas paradox (Lucas 1990). In fact, countries with weak rule of law, high political or default risk, underdeveloped financial markets, or high transaction cost and deficiencies in governance may attract only limited investment flows even if they offer high rates of return (Shleifer and Wolfenzon 2002). In this respect, institutional factors have been shown to play an important role in unilateral models to explain the magnitude and nature of capital flows towards developing and emerging economies in a cross section of countries (Alfaro *et al.* 2008).

At the same time, the magnitude and nature of capital flows varies across countries (Schnitzer 2002). Different forms of investment differ from each other with the main trade-off being between the length of commitment implied in such investment (or conversely the ease of withdrawing funds) and the ability to exercise managerial control (Sawant 2010). The share of FDI in total capital flows is likely to be higher in countries with weak governance because, in such cases, investors will demand ways of investing that will provide them with greater control (Hausmann *et al.* 2007).[7] Given its long time horizon and the associated potential to transfer technology, knowledge, and skills, direct foreign investment (FDI) rather than portfolio investment is often seen as more conducive to local development. Indeed, cross-country analysis points to a positive effect of FDI on GDP growth (Borensztein *et al.* 1998).

C. Implications for analyzing farmland investment

Applying the above framework to cross-border farmland investment, while straightforward in principle- requires complementing traditional models with specific variables in three areas. First, as much of the initial demand for land seems to have been driven by fear of high dependence on food imports and threats of political instability, bilateral variables such as

[6] Horizontal motives for the location of multinational firms abroad relates to their desire to be closer to markets. Vertical motives explain the same decision from a desire to take advantage of different production costs for different stages of production (Helpman 1984).

[7] The OECD defines FDI as "an activity in which an investor resident in one country obtains a lasting interest in, and a significant influence on the management of, an entity resident in another country. This may involve either creating an entirely new enterprise ("greenfield" investment) or, more typically, changing the ownership of existing enterprises via mergers and acquisitions." A takeover by a foreign firm is considered FDI if the foreign firm holds at least 10% of the voting rights on the board.

physical, cultural, and geopolitical proximity (e.g. language or past colonial relationship) will need to be complemented with information on countries' dependence on food imports. This is dealt with in a straightforward way by using standard FAO figures.

Second, as the attractiveness of a country for farmland investment will depend on the availability of non-cultivated land with high agro-ecological potential that is easily accessible, a measure for potential agro-ecological suitability of land, overlaid with current land use, is needed. Past attempts to measure the amount of land potentially available for agriculture suffered from conceptual and technical limitations (Young 2000, Ramankutty *et al.* 2008). If potentially suitable land is either covered by forest or home to traditional communities, much of what could potentially be available for agriculture may at the same time provide environmental and social benefits. A proper definition of potentially "available" land will thus have to exclude protected areas, forests, and areas that are already occupied. To make this operational we use the agro-ecological potential for rainfed cultivation[8] as defined by the Global Agro-ecological Zoning project (Fischer et al. 2002). To make this information useful for our purpose, we overlay this with information on actual land use and population density drawing on a variety of databases[9] to derive a measure of land with high potential for rainfed cultivation that is currently not utilized and that excludes forests, protected areas, and areas with a population threshold above a certain maximum. Details of the methodology are discussed in Fischer and Shah (2010). Aggregate results, by region and for the world in total, are illustrated in Table 1. If defined this way, the area of total "available" land amounts to some 445 million ha, compared to about 1.5 billion ha already under cultivation (Deininger *et al.* 2011a). Most of this land is in sub-Saharan Africa, Latin America, and Eastern Europe (201, 123, and 52 million ha, respectively) although in the latter, relatively higher shares of land are in proximity to markets. As land availability is a key driver of the "land rush", we expect this variable to be positive and highly significant.

Third, while the link between foreign investment and governance has long been highlighted, special attention to land governance may be warranted.[10] To address this issue, we draw on three complementary indicators for general and land governance. First, we use the *Doing*

[8] We focus on rainfed cultivation as issues related to riparian rights and seasonal availability of water in a certain area as well as the investment needs for irrigation would require a more in-depth treatment.

[9] Our measure of agricultural land outside the forest and protected areas is constructed from various bases, including Global Land Cover 2000 (http://www-gem.jrc.it/glc2000) PAGE Global Agricultural Extent (http://www. ifpri.org / dataset / pilot-analysis-global-Ecosystems-page), Global Forest Resources Assessment 2000 (http://www.fao.org/forestry/32203/en) and World Database on Protected Areas 2009 (http://www.wdpa.org / download.aspx). The extent of arable land outside forest and protected areas and in sparsely populated areas (that is to say less than 25 inhabitants per km2 or more than 4 hectares per capita) uses LandScan 2003 Global Population (http://www .ornl.gov /Landscan/).

[10] Key relevant aspects of land governance are the clarity with which rights are assigned and the accessibility of textual and spatial information on rights, the way in which state land is managed, disposed of, and acquired, the way land is taxed and land use is regulated, and the existence, accessibility, and impartial nature of institutions for conflict resolution (Deininger *et al.* 2011b).

Business database which ranks the extent to which countries' legal and regulatory environment and uses the results to construct an index of "weak investor protection".[11] A low value of this index reflects weak protection of investors' rights. A second measure ranks countries' regulatory quality, rule of law, control of corruption, political stability, absence of violence, and voice and accountability in descending order in terms of percentiles of the distribution based on the World Governance Indicators (Kaufmann *et al.* 2004). Low values characterize countries with poor governance. Finally, for land governance, we use a newly developed cross-country database assembled by the French Development Agency.
Key variables of the land governance indicator include tenure security and recognition of existing land rights (even if not formalized), the existence of a land policy, and levels of land-related conflict. We use the first component from a principal component analysis of these variables as an indicator of overall tenure security. Low values describe countries with high levels of tenure insecurity. Whether good (land) governance increases a country's attractiveness for land-related investment is difficult to anticipate the direction of the effect as there are two countervailing forces. On the one hand, given the long time horizon of any agricultural investment, security of property rights is likely to be a key determinant of long-term investment decisions as investors will not tie up large amounts of resources in a country where weak or unclear rights create a danger of opportunistic government behavior and creeping expropriation (Schnitzer 1999) once investments are sunk. The opposite could, however, also be true, i.e. large investors may find it easier to establish and defend property rights if (land) governance and the state's enforcement capacity and presence are weak. Some investors unfamiliar with customary tenure systems may indeed believe that it will be easier and more 'secure' to acquire land directly from governments rather than by engaging in a dialogue with local rural populations. Others are quite outspoken about the perceived need and desire to enforce property rights through private militias--despite the problematic historical precedents. [12]

[11] The index consists of a weighted average of indices measuring the transparency of transactions, the liability of company directors and shareholders, and the power of administrators to hold directors accountable for misconduct. The underlying premise that excessive regulation and red tape deters investment and foster corruption is not uncontroversial and has been challenged because it only measures inputs but not the quality of public goods, e.g. property rights, provided (Arrunada 2007) and because it presumes an Anglo-Saxon model that may be less applicable in other institutional contexts (Fauvarque-Cosson and Kerhuel 2009).

[12] For an interesting perspective on this, see the story of Jarch capital in Southern Sudan as reported in various media (e.g. Funk, 2010).

III. DATA, ECONOMETRIC APPROACH, AND DESCRIPTIVE STATISTICS

Country- as well as cross-country level data on large scale land acquisition suggests that the phenomenon has reached large proportions. Press reports provide a consistent source of information that can be drawn upon to analyze the drivers of the phenomenon. We argue that a Poisson model is the most appropriate structure to econometrically explore the determinants of investment demand as well as of projects with actual production, and discuss descriptive statistics for key independent variables.

A. Recent trends in large scale land deals

Official data on land deals from registries would, in principle, provide the best source of information on the phenomenon (at least for signed deals). However, efforts to obtain such data even for a subset of countries illustrate that, partly because of institutional weaknesses, such information is remarkably difficult to obtain (Deininger et al. 2011a). In 6 countries where reasonably reliable information could be obtained, often by aggregating up from regional registries, we find support for the notion of a recent and marked increase in land transfers (Table 2). Total confirmed land transfers over the 2004-2009 period amounted to 4.0 million ha in Sudan, 2.7 million ha in Mozambique, 1.2 million ha in Ethiopia and 1.6 million ha—although mainly through renegotiation of existing agreements—in Liberia. Comparing these figures to the estimated total available area in each country reveals that this respectively amounts to 8.6%, 16.6%, and 25.4% of the total suitable non-forested non-protected area with a population density of less than 25 inhabitants per km^2 for Sudan, Mozambique, and Ethiopia, respectively.

Given the difficulties of obtaining consistent data from official sources, we use information from press articles to get a global picture of the recent demand for large scale land acquisition. Our sample is based on such reports published between Oct. 1, 2008, and Aug. 31, 2009, as reported by the NGO GRAIN.[13] Figure 1 plots the evolution of the IMF food price index and the number of recorded press reports on cross-border land acquisitions. The "land rush", or at least media awareness of it, started with the 2007 2008 commodity price boom. While commodity prices soon returned to more moderate levels, investors' interest in land persisted. Using data on the size of projects where available in such reports, Table 3 compares regional rates of land expansion in the 1961-2007 period to demand for land by

[13] The data can be accessed at www.farmlandgrab.org.

investors. Press reports suggest that such demand disproportionately focused on Africa where almost 70% of the area of interest to investors was located but also that it was quantitatively large: compared to an annual rate of area expansion in Africa of some 1.8 million ha in 1961-2007, demand for land in Africa in 2009 alone amounted to some 39.7 million hectares--greater than the total agriculturally cultivated area of Belgium, Denmark, France, Germany, the Netherlands, and Switzerland combined.

Two comments are in order to interpret this figure. First, it refers to demand for land deals rather than actual transactions or area brought under production. Second, as reports of land acquisitions are less likely in countries where press freedom is limited or where land acquisition is not "new" or "noteworthy", it may be biased downward and covering only the largest projects. Efforts to cross-check the information from press reports with administrative data in the countries where such information is available supports thisin the sense that while not all the projects mentioned in press reports could be identified in official data–presumably because some had never made it beyond expressions of interest–most lands actually transferred could be traced to press reports. Preliminary results from a recent effort to more systematically cross-check press reports confirm this finding.[14] For each project, we code origin and destination country,[15] size, commodities involved, investor type, and whether any activity had started.[16] The universe comprises of 464 projects, 21% of which have started production.[17] Of these, 405 have information on crops and 203 on the area involved.[18] Among the latter projects, one quarter aims to cultivate more than 200,000 ha each and a median size of 40,000 ha per project illustrates investors' ambitions.

B. Econometric specification

As we are interested in explaining the number of planned or actual projects in a host country, overall, or from a specific investor country, we use a count model and resort to a Poisson

[14] Results will soon be posted on ILC's website http://www.commercialpressuresonland.org/monitoring-land-transactions.

[15] In Sub-Saharan Africa, key target countries are Sudan, Ethiopia, Nigeria, Ghana and Mozambique, which account for 23% of projects. 21% of projects are in Latin America and the Caribbean (mainly Brazil and Argentina), 11% in Europe and Central Asia (Kazakhstan, Russia, and Ukraine), and 10% in South Asia East (Philippines, Cambodia, Indonesia, Lao PDR). Projects originate from a limited set of countries including China, the Gulf states (Saudi Arabia, UAE, Qatar, Kuwait, Bahrain), North Africa (Libya and Egypt), Russia, the UK and the US.

[16] The coding was done by two separate data entry operators who referred to the original articles.

[17] Some 30% of projects were at an early exploratory stage, in 18% permission had been granted but no activity started, 30% were at initial level of development and only 21% had started production, often at a much lower level than envisaged.

[18] Most (37%) focus on food production, followed by annual/industrial crops and biofuels (21% each), with the remainder going to livestock, parks, and forest plantations. In sub-Saharan Africa and Latin America, food production is of greater importance.

regression, to model the occurrence and count of investment projects in a host country or an origin-destination pair. Indexing host and destination countries by j and i, respectively, we let N_j denote the number of investment projects received by host country j and N_{ij} the count of investments made in j by investors from country i. Assuming that N_j follows a Poisson distribution λ_j, we can write

$$Prob(N_j) = [e^{-\lambda}{}_j \,.\, \lambda_j{}^{N}{}_j] \,/\, [N_j!]$$

Specifying λ_j as a linear function of explanatory variables $\boldsymbol{X}_j$, allows us to express the expectation of N_j conditionally on $\boldsymbol{X}_j$. Denoting the conditional expectation by L_j, we obtain

$$L_j = E[\, N \mid \boldsymbol{X}_j] = e^{\boldsymbol{X}_j \cdot \beta_j}$$

where $\boldsymbol{X}_j$ is row vector of explanatory variables including a country's the amount of "available" land, the yield gap,[19] the maximum potential value of agricultural production, our index of tenure security, and the strength of investment protection and β_j is a column vector of corresponding coefficients. Taking logs then allows us to formulate a model that can be estimated as

$$l_j = \boldsymbol{X}_j \beta_j$$

where l_j is the logarithm of L_j and parameters β_j, are estimated by maximum likelihood under the assumption that different realization of the count variable L_j, i.e. the number of investment projects are independent from each other. As we estimate in logarithms, coefficients can easily be interpreted as elasticities and each element of the coefficient vector β_j can then be interpreted as the change in the log of the conditional expectation of the number of investment projects resulting from a one-unit increase in the value of the corresponding element of $\boldsymbol{X}_j$.

For the bilateral case, we replace l_{ji} with l_{ji} i.e., the number of planned or realized investments by investor origin country i in host j. Similarly, we replace $\boldsymbol{X}_j$ with $\boldsymbol{X}_{ij}$ which can be partitioned into destination characteristics ($VarDest_j$) origin attributes ($VarOrig_i$), and bilateral variables ($VarBilat_{i,j}$) characterizing the specific origin-host pair. Formally, the bilateral count model (Poisson regression) is

$$l_{i,j} = VarOrig_i \,.\, \alpha_i \;+\; VarDest_j \,.\, \beta_j \;+\; VarBilat_{i,j} \,.\, \gamma_{i,j}$$

where variables are defined as above. In our empirical application, $VarOrig_i$ includes food dependence and the population of the country of origin, includes the same variables as in the

[19] The yield gap measures the difference between the potential yields that could be observed given existing technology and currently observed yields (see Fischer and Shah 2011 for details).

unilateral case and $VarBilat_{i,j}$ includes the physical distance between the two countries and the existence of a historic colonizer / colonized relationship.

Two common problems with log-linear gravity models relating to international trade and investment are a the presence of zeros and heteroskedasticity of errors both of which can lead to bias and inconsistency of the OLS estimates are inconsistent and biased. Our use of the Poisson pseudo-maximum-likelihood estimator follows the suggestion of using this estimator as the best way of dealing with these issues (Silva and Tenreyro 2006). It has, however, been argued that in trade models, large numbers of zeros may pose greater challenges than heteroskedasticity of errors and that, in this case, a simple Tobit will be preferable to a Poisson if the deviation from the assumed distribution of residuals is modest (Martin and Pham 2011). We thus complement the Poisson regressions with standard Tobit regression models, the results of which are reported in appendix tables.

C. Key independent variables

Means of key country characteristics, endowments, and institutional quality, are reported in Table 4 for the entire sample, and separately for all countries of origin, for countries of origin that are not also a destination country, for all destination countries, and for destination countries that have at least one project under production (as opposed to only the target of interest in farmland). Origin countries have higher GDP than destinations (much higher in the case of 'exclusive' origin countries that are not targeted at all for investment). They are net food importers, with net imports of US$ 12 per capita (US$ 211 for exclusive origin countries) while destination countries show net exports of US$ 30 per capita (US$ 99 per capita in destination countries with at least one operating project).

Figure 2 provides a graphical illustration of the information on potential output per ha, a direct reflection of land quality. Aggregating to the country level suggests that, surprisingly, destinations and origins do not differ widely from each other in terms of absolute land availability at this level of aggregation though it is worth noting that destination countries with implemented projects are larger and have more abundant land for cultivation and land under forests (respectively 6.5 and 13.1 million hectares). On the contrary, origin countries have no such land left, as is most clearly visible for "exclusive" ones, (with 0 and 0.1 million hectares respectively for land for cultivation and land under forest). There is some difference in agro-ecological potential between the country categories: as one would expect if such investments were to follow comparative advantage, potential output values from cultivation of uncultivated land are higher in destination than origin countries, and highest in those with

implemented projects. Also, with origin countries obtaining more than half of the attainable yield already compared to about one third in destinations, there appears to be potential for catch-up growth using existing technology. Interestingly, this potential is even greater in destination countries with implemented projects than in other destination countries. Data on governance suggest that, overall, regulatory quality, protection of investors' rights, and land governance are significantly weaker in destination countries. Interestingly, there is no significant difference in governance between destinations with and without implemented projects.

IV. ECONOMETRIC RESULTS

Analyzing the determinants of large agricultural investment in unilateral and bilateral models suggests that (i) agro-ecological suitability is indeed a critical factor for both demand and actual implementation; (ii) the difference between potential and actual production (i.e. the "yield gap") affects land demand but not project implementation; and (iii) while conventional governance variables are at most weakly significant, a measure of land governance that incorporates the security of local land rights is highly significant, strongly suggesting that demand for land is significantly higher in settings where such rights are only weakly protected.

A. Unilateral relationships

Regressions for the count of projects involving large-scale land acquisition at the country of destination (unilateral case) are reported in Table 5 (where the top panel refers to all projects and the bottom panel to projects with some production only). While we only report results from the Poisson model, qualitatively similar results are obtained if we estimate the equation by OLS instead. Our results are also robust to a correction of the variance-covariance matrix of the "sandwich" estimator to take into account possible problems of omitted variable and intra-group correlation of residuals. In all cases, the potentially cultivable area outside of forests or the potential value of output on suitable non-forest area is highly significant, suggesting that land availability is a primary motivation for such investment. The coefficients of 0.496 and 0.688 for area (in col. 1) or 0.526 and 0.684 for potential output value (in col. 2)

suggest that, other things being equal, a 10% increase of potentially suitable area or output value would increase the number of projects by between 5.1% and 7.1%.[20] Surprisingly though, the coefficients for potentially cultivable area under forest or for the value of output in these areas are not significantly different from zero. Although this does not imply that the land rush does not pose environmental risks, it is consistent with the notion that, except in some limited circumstances (e.g. oil palm in Indonesia), investor interest tends to be focused on areas that have already been cleared.

While the coefficient for the yield gap is positive and (marginally) significant in some regressions for all projects, it lacks significance in the regressions for projects under production only. This would suggest that, even though investors may be attracted to countries with high yield gaps where, in principle, the return to investment could be higher, they have thus far not generally anticipated being able to capitalize on this potential by introducing new technology. This is in line with the notion that introducing new technology to close yield gaps requires complementary (public) investment in infrastructure and support services.

Finally, the results regarding the role of governance variables are of interest in two respects. On the one hand, and in contrast to the literature on FDI, the coefficients on standard governance variables are not significant.[21] We report results for investor protection only, noting that qualitatively similar findings emerge if other standard governance variables are included. While the point estimate is negative as expected, it is insignificant throughout, suggesting that a more conducive investment climate will not make it easier to attract land-related investment. On the other hand, the effect of land governance is striking. Instead of land acquisition projects being contingent on good land governance and the associated strong protection of rights, we find that weak land governance makes a country more attractive for land-related investment. Furthermore, the effect is quantitatively important: a one standard deviation deterioration in the land governance index (equivalent to the difference between Angola and Brazil) would be predicted to increase the number of investment projects by 33% even with other factors held constant (such as land abundance which would be associated with weaker land governance). Although more detailed work at project level would be required to establish a causal link, a correlation along these lines suggests that, for much of the investment demand considered here, long-term security of tenure has been less of a

[20] The reported coefficient should be interpreted as the change in the logarithm of the conditional expectation of the number of projects associated with a unit increase in the explanatory variable. As the regressor is expressed in logs, we have in the first case for instance dN/N=exp(0.0495)-1=0.051.

[21] Note that we do not include GDP per capita in our regressions. One reason is that we want to focus on the effect of some specific characteristics of the agricultural sector rather than on the effect of overall economic performance, Another reason is that income per capita is often seen as an outcome of institutions and governance structure (Acemoglu *et al.* 2001) which are already included in our regressions.

concern for investors. Taken at face value, this coefficient means that expressed concerns of civil society about the interests at play being mostly extractive with little concern about long-term benefits to local populations may not be entirely misplaced. Interestingly, the significance of the coefficient disappears when considering only countries that have projects under production (panel 2). This is consistent with the notion that, in countries with weak land governance or weak recognition of local land rights, successful implementation of projects is difficult for a number of reasons, including resistance by local people at various stages of project implementation. Alternatively, it could imply that the phenomenon is too new to be observed in operations or that much of the interest evident in press reports may be speculative.

B. Bilateral relationships

Poisson regressions for bilateral investor/host relationships in Table 6 (for interest in land acquisition) and in Table 7 (for actual implementation) allow a richer categorization of the phenomenon by considering investor and host country characteristics separately and by controlling with bilateral variables. The results from a standard tobit which are reported in appendix tables A1 and A2 to complement the Poisson regression allay fears that our results could be driven by our specification only. As the substantive results from the tobit are identical to the ones from the Poisson model, we limit our discussion to the Poisson specification. Overall, we note that the bilateral regressions confirm some of the conclusions from the unilateral approach, they also provide important and new insights on the drivers of the land rush.

On the demand side, the amount of food imports per inhabitant and overall population size are key determinants of interest for land acquisition, suggesting that countries with large populations that depend on trade for food consumption are more likely to engage in investment projects requiring large-scale acquisition of land. It also suggests that a desire to acquire land increasingly complements more traditional means of dealing with imbalances in food supply through markets and storage. Distance is a significant predictor of interest in acquiring land as in most gravity models, together with a past colonial relationship, although the significance of the latter vanishes when considering projects with actual production.

Regarding host country characteristics, bilateral regressions point towards a significant improvement over unilateral regressions. They support the attractiveness of countries with large amounts of high potential agricultural land (but not forest land) or with the value of the output that can be obtained from such land, two variables which are highly significant throughout. For instance in regression (1) of Table 6, the coefficient of suitable non-forest land is 0.4664, which implies that an increase by 10% of potentially cultivable land in a host

country would increase the number of projects in that country by almost 5%, all things else being equal (dN/N=exp(0.04664)-1=0.048). Similarly, the coefficient on the yield gap is large and significant in the regression for total demand but not for country relationships for projects under production, suggesting that low yields and the associated opportunity to catch up or leapfrog to the frontier increases a country's attractiveness as a target for land acquisition. Translating potential into reality, however, is not as straightforward as it may appear in the abstract, partly because closing yield gaps requires a combination of factors, not all of which are easily modifiable by investors or modified without jeopardizing the economic viability of a venture.

Finally, coefficients on governance variables that are traditionally included in gravity models of investment (Control of corruption, and Political stability) are negative though not consistently significant suggesting that even once other factors are accounted for, investment tends to be higher in environments with weak governance. The coefficient on host countries' quality of land governance, which accounts in particular for the extent to which local rights are recognized, is highly significant and negative. For projects in production only, the significance of coefficients on standard governance variables disappears but the negative coefficient on land governance remains. This would imply that countries with weak governance are not only more attractive to prospective investors but that they are also more likely to actually have initiated production. Our data unfortunately do not provide evidence to suggest whether the level of production is in line with development plans or if locals actually receive benefits. The significant impact of weak governance suggested by our model could, of course, be due to the fact that this is the first wave of a new phenomenon, transparency on investment opportunities is lacking, and investors still have little experience of such investments. Nevertheless, concerns may be justified given the large amounts of transferred land in some countries and the necessity to identify and close down non-viable projects and prevent them from causing negative externalities. Unless more empirical evidence to allay such concerns is available, calls for a more proactive international response are likely to persist.[22]

[22] Although agricultural investment has many properties that set it apart from other sectors, there are obvious parallels to mining and other types of extractive industries that could provide lessons on the nature of a global response to improve transparency.

V. CONCLUSION AND POLICY IMPLICATIONS

While the "land rush" has led to an animated debate, an overall view of the phenomenon and the drivers underlying it has thus far been missing. Combining press reports on demand for land acquisitions with a characterization of endowments at country level allows us to identify factors underlying demand for agricultural land and actual projects. Dependence on food imports emerges as a strong driver of demand for land acquisition which is more likely to be located in countries with ample supply of land that are far from the technology frontier. While cultural affinity plays a role, weak land governance and protection of local land rights seem to be associated with higher rather than lower levels of investment even once other factors are controlled for. We conclude by highlighting implications from this rather surprising result.

First, while this result reinforces the importance of industry standards and vigilance at project-level,[23] it also highlights that, if they are to be effective and if a race to the bottom is to be prevented, they may need to be complemented with an effort to increase transparency and address land governance at the country level. Second, given the size of the phenomenon, a global effort –ideally spearheaded by an international institution- to document cross-national investments above a certain size and in a consistent way that draws on national data seems urgent in order to protect rights and initiate more evidence-based dialogue and accumulation of norms and experience. Finally, reports stressing large numbers of failed investments have given rise to legislation or calls for limits on land purchases by foreigners in a number of countries such as Brazil, Argentina, and Ukraine. However, if a sizeable share of relevant deals involves nationals rather than foreigners (Deininger *et al* 2011), this may exacerbate rather than resolve governance challenges by, for example, limiting competition. Instead of protectionist measures, priority efforts to improve land governance[24] -e.g. by recognizing local rights, educating right holders, and allowing their voluntary and transparent transfer- are likely to be a more appropriate policy response.

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[23] FAO's voluntary guidelines (http://www.fao.org/nr/tenure/voluntary-guidelines/en/) devote considerable space to this issue and a separate effort at formulating principles for Responsible Agricultural Investment is underway (http://www.responsibleagroinvestment.org/rai/node/256). Institutional investors have adopted their own principles (www.unpri.org/farmlandprinciples), mirroring commodity-specific standards such as those promoted by the roundtable on responsible palm oil. More specific guidelines include multilateral banks' safeguards or performance standards which have been adopted by the vast majority of financial institutions as "Equator Principles".

[24] Key areas of emphasis could be (i) demarcation of state land (including forests and protected areas and clarification of the rights on these lands as well as ways in which they can be transferred to investors) and regular monitoring of new encroachment; (ii) provision of a minimum level of information (coordinates, size, projected investments, job creation, taxes and other benefits expected to local communities) to be made available publicly in a way that facilitates third party verification; (iii) clear procedures for contract enforcement and arbitration, including the dissolution of non-performing enterprises by any of the parties involved; (iv) education on rights and ways to enforce them before interests in acquisition materialize.

REFERENCES

Alfaro, L., S. Kalemh-Ozcan and V. Volosovych. 2008. "Why doesn't capital flow from rich to poor countries? An empirical investigation." *Review of Economics and Statistics 90* (2): 347-68.

Angrist, J. D. and A. D. Kugler. 2008. "Rural windfall or a new resource curse? Coca, income, and civil conflict in Colombia." *Review of Economics and Statistics 90* (2): 191-215.

Arrunada, B. 2007. "Pitfalls to Avoid When Measuring Institutions: Is Doing Business Damaging Business?" *Journal of Comparative Economics 35* (4): 729-47.

Banerjee, A. and L. Iyer. 2005. "History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India." *American Economic Review 95* (4): 1190-213.

Benassy-Quere, A., M. Coupet and T. Mayer. 2007. "Institutional determinants of foreign direct investment." *World Economy 30* (5): 764-82.

Bhattacharyya, S. and R. Hodler. 2010. "Natural resources, democracy and corruption." *European Economic Review 54* (4): 608-21.

Binswanger, H. P., K. Deininger and G. Feder. 1995. "Power, Distortions, Revolt and Reform in Agricultural Land Relations." *Handbook of development economics 3B* 2659-772.

Borensztein, E., J. De Gregorio and J. W. Lee. 1998. "How does foreign direct investment affect economic growth?" *Journal of International Economics 45* (1): 115-35.

Brockett, C. D. 1988. *Land, power and poverty: agrarian transformation and political conflict in Central America*. Boston: Unwin Hyman.

Cabrales, A. and E. Hauk. 2011. "The Quality of Political Institutions and the Curse of Natural Resources." *Economic Journal 121* (551): 58-88.

Calvo, G. A., L. Leiderman and C. M. Reinhart. 1996. "Inflows of capital to developing countries in the 1990s." *Journal of Economic Perspectives 10* (2): 123-39.

Collier, P. 2008. "The Politics of Hunger How Illusion and Greed Fan the Food Crisis." *Foreign Affairs* 87 (6): 6

de Janvry, A. and E. Sadoulet. 2010. "Agricultural Growth and Poverty Reduction: Additional Evidence." *World Bank Research Observer 25* (1): 1-20.

De Schutter, O. 2011. "The Green Rush: The Global Race for Farmland and the Rights of Land Users." *Harvard International Law Journal 52* (2): 503-59.

Deininger, K. 2003. *Land Policies for Growth and Poverty Reduction. A World Bank Policy Research Report*. Oxford and New York: World Bank and Oxford University Press.

Deininger, K. and D. Byerlee. 2011. "The rise of large farms in land abundant countries: Do they have a future?" *World Development forthcoming*.

Deininger, K., D. Byerlee, J. Lindsay, A. Norton, H. Selod and M. Stickler. 2011a. *Rising global interest in farmland: Can it yield sustainable and equitable benefits?* Washington, D.C.: World Bank.

Deininger, K. and G. Feder. 2001. "Land Institutions and Land Markets." *Handbook of Agricultural Economics (B.Gardner and G.Raussser, Eds)* 288-331.

Deininger, K., H. Selod and A. Burns. 2011b. *The Land Governance Assessment Framework: Identifying and monitoring good practice in the land sector.* Washington, D.C.: World Bank.

Drache, H. M. 1964. "The day of the bonanza; a history of bonanza farming in the Red River Valley of the North." . Fargo, ND: Institute for Regional Studies.

Fargione, J., J. Hill, D. Tilman, S. Polasky and P. Hawthorne. 2008. "Land clearing and the biofuel carbon debt." *Science 319* (5867): 1235-8.

Fauvarque-Cosson, B. and A. J. Kerhuel. 2009. "Is Law an Economic Contest? French Reactions to the Doing Business World Bank Reports and Economic Analysis of the Law." *American Journal of Comparative Law 57* (4): 811-29.

Fischer, G., H. v. Velthuizen, M. Shah and F. Nachtergaele. 2002. *Global agro-ecological assessment for agriculture in the 21st century: Methodology and results*. Laxenburg and Rome: IIASA and FAO.

Fischer, G. and Shah, M. 2010. " Farmland Investments and Food Security, Statistical Annex", Laxenburg, Austria, Report prepared under World Bank IIASA contract - Lessons for the large-scale acquisition of land from a agricultural land use analysis.

Funk, M. 2010. "Will global warming, overpopulation, floods, droughts and food riots make this man rich? Meet the new capitalists of chaos." *Rolling Stone 21* 62-6.

Grandin, G. 2009. *Fordlandia: The Rise and Fall of Henry Ford's Forgotten Jungle City*. New York: Metropolitan Books.

Hausmann, R., F. Sturzenegger, A. Sibert and C. Tille. 2007. "The missing dark matter in the wealth of nations and its implications for global imbalances." *Economic Policy* (51): 471-+.

Helpman, E. 1984. "A Simple Theory of International-Trade with Multinational-Corporations." *Journal of Political Economy 92* (3): 451-71.

Hernandez, M. 2010. "Establishing a framework for transferring public land: Peru's experience." . Washington DC: Paper presented at the Annual Bank Conference on Land Policy and Administration, April 26 and 27, 2010.

Iyer, L. 2010. "Direct Versus Indirect Colonial Rule in India: Long-Term Consequences." *Review of Economics and Statistics 92* (4): 693-713.

Kaufmann, D., A. Kraay and M. Mastruzzi. 2004. "Governance matters III: Governance indicators for 1996, 1998, 2000, and 2002." *World Bank Economic Review 18* (2): 253-87.

Koh, L. P. and D. S. Wilcove. 2008. "Is oil palm agriculture really destroying tropical biodiversity." *Conservation Letters 1* (1): 60-4.

Libecap, G. D. and D. Lueck. 2011. "The Demarcation of Land and the Role of Coordinating Property Institutions." *Journal of Political Economy 119* (3): 426-67.

Lipton, M. 2009. *Land Reform in Developing Countries: Property Rights and property Wrongs*. New York: Routledge (or Taylor and Francis).

Loayza, N. V. and C. Raddatz. 2010. "The composition of growth matters for poverty alleviation." *Journal of Development Economics 93* (1): 137-51.

Lucas, R. E. 1990. "Why Doesnt Capital Flow from Rich to Poor Countries." *American Economic Review 80* (2): 92-6.

Markusen, J. R. and A. J. Venables. 1998. "Multinational firms and the new trade theory." *Journal of International Economics 46* (2): 183-203.

Markusen, J. R. and A. J. Venables. 2000. "The theory of endowment, intra-industry and multi-national trade." *Journal of International Economics 52* (2): 209-34.

Martin, W. and C. S. Pham. 2011. "Estimating the gravity model when zero trade flows are frequent." Policy Research Working Paper. Washington DC: World Bank.

Morales Olmos, V. 2007. *The economic impact of the forest sector in Uruguay*. Athens, GA: University of Georgia.

Nugent, J. B. and J. A. Robinson. 2010. "Are Factor Endowments Fate?" *Revista de Historia Economica 28* (1): 45-82.

Oechslin, M. 2010. "Government Revenues and Economic Growth in Weakly Institutionalised States." *Economic Journal 120* (545): 631-50.

Prasad, E., K. Rogoff, S. J. Wei and A. Kose. 2007. "Financial globalization, growth, and volatility in developing countries." In Harrison, A., ed., *Globalization and Poverty*. Cambridge, MA: National Bureau of Economic Research.

Pacheco, P. and R. Poccard Chapuis. 2009. "Cattle ranching development in the Brazilian Amazon: Emerging trends from increasing integration with markets." . Bogor, Indonesia: Center for International Forestry Research.

Regunaga, M. 2010. "The soybean chain in Argentina." Implications of the organization of the commodity production and processing industry case studies. Washington DC: World Bank, Latin America and the Caribbean Chief Economist Office.

Ramankutty, N., A. Evan, D. Monfreda and J. Foley. 2008. "Farming the planet: Geographic distribution of agricultural lands in the year 2000." *Global Biogeochemical Cycles 22* (3): 1-19.

Sawant, R. J. 2010. "The economics of large-scale infrastructure FDI: The case of project finance." *Journal of International Business Studies 41* (6): 1036-55.

Schnitzer, M. 1999. "Expropriation and control rights: A dynamic model of foreign direct investment." *International Journal of Industrial Organization 17* (8): 1113-37.

Schnitzer, M. 2002. "Debt v. foreign direct investment: The impact of sovereign risk on the structure of international capital flows." *Economica 69* (273): 41-67.

Shleifer, A. and D. Wolfenzon. 2002. "Investor protection and equity markets." *Journal of Financial Economics 66* (1): 3-27.

Silva, J. M. C. S. and S. Tenreyro. 2006. "The log of gravity." *Review of Economics and Statistics 88* (4): 641-58.

Vollrath, D. 2009. "The dual economy in long-run development." *Journal of Economic Growth 14* (4): 287-312.

Wei, S. J. 2000. "Local corruption and global capital flows." *Brookings Papers on Economic Activity* (2): 303-54.

World Bank. 2007. *Agriculture for Development: World Development Report 2008*. Washington, D.C.: World Bank and Oxford University Press.

World Bank. 2009. "Awakening Africa's sleeping giant: Prospects for competitive commercial agriclulture in the Guinea Savannah zone and beyond." . Washington DC: The World Bank.

Young, A. 2000. "How much spare land exisits?" *Bulletin of the International Union of Soil Sciences 97* (1): 51-5.

Zoomers, A. 2010. "Globalisation and the foreignisation of space: seven processes driving the current global land grab." *Journal of Peasant Studies 37* (2): 429-47.

Table 1: Potential supply of land for rainfed cultivation (in million hectares)

Region	Total area	Area close to market (<6 h travel time)	Area far from market (>6 h travel time)
Sub-Saharan Africa	201.5	94.9	106.6
Latin America and the Caribbean	123.3	93.9	29.4
Eastern Europe and Central Asia	52.4	43.7	8.7
East and South Asia	14.3	3.3	11.0
Middle East and North Africa	3.0	2.6	0.4
Rest of World	51.0	24.6	26.4
Total	**445.6**	**263.1**	**182.5**

Source: Deininger *et al.* 2010.

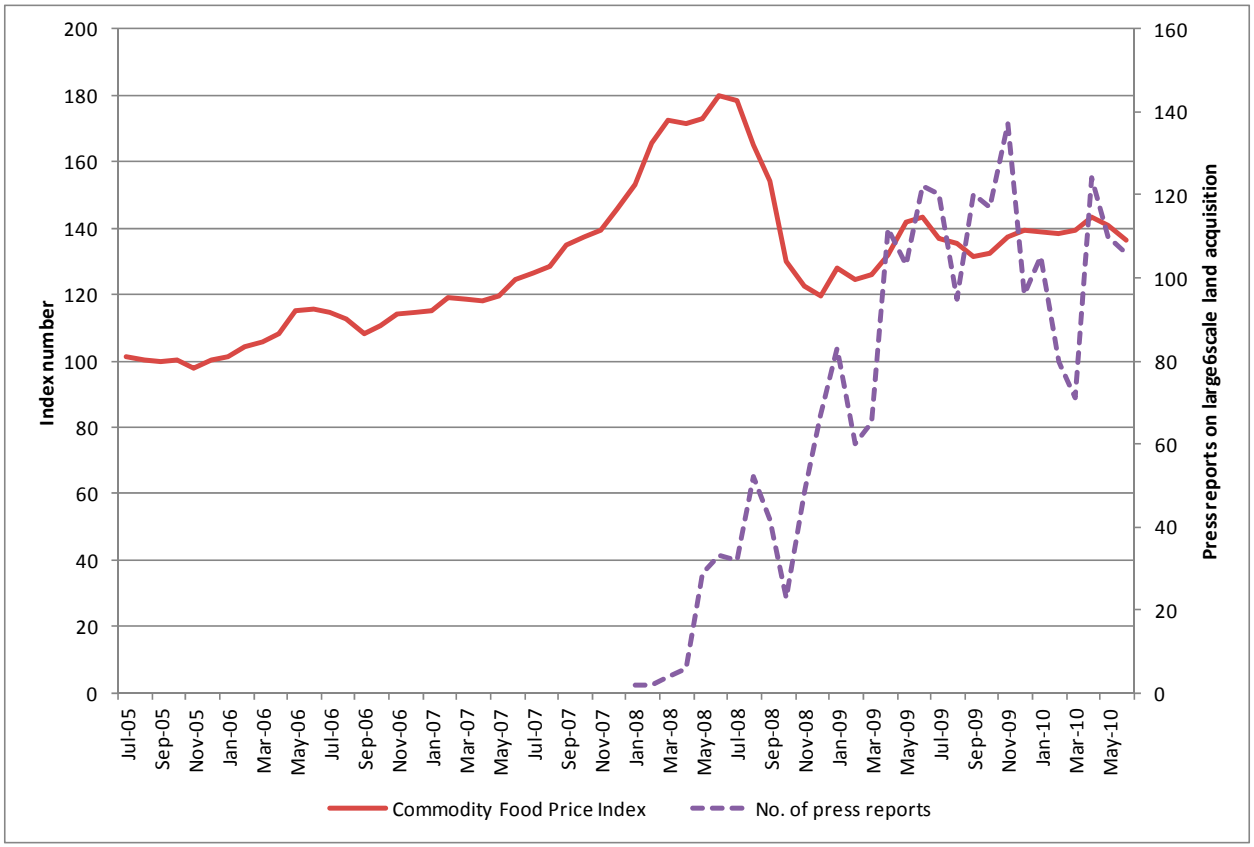
Note: The figures are for currently uncultivated land that is suitable for cultivation of at least one of five key crops (wheat, sugarcane, oil palm, maize and soybean), excluding forests and protected areas, and with a population density of less than 25 people per km^2 (.25 people per hectare)

Table 2: Extent of large land acquisitions in select countries, 2004–09

Country	Projects	Area (1,000 ha)	Median size (ha)	Domestic share area
Cambodia	61	958	8,985	70
Ethiopia	406	1,190	700	49
Liberia	17	1,602	59,374	7
Mozambique	405	2,670	2,225	53
Nigeria	115	793	1,500	97
Sudan	132	3,965	7,980	78

Source: Country inventories from Deininger *et al.* 2011.

Figure 1: Evolution of the Commodity food price index and number of media reports on foreign land acquisitions



Source: IMF Commodity food price index and GRAIN (http://farmlandgrab.org) for press reports.

Table 3: Historical land expansion and recent land demand expressed in media reports

Region	Cultivated land area (millions of ha)			Annual change (%)		Land demand 2009	
	1961	1997	2007	1961-1997	1997-2007	Mn ha	year eq.
Sub-Saharan Africa	134.6	192.2	218.5	1.60	2.63	39.7	21.8
East Asia & Pacific	183.9	235.7	262.8	1.44	2.72	8.0	4.6
Eastern Europe & Central Asia	291.5	263.6	241.7	-0.77	-2.19	4.6	n.a.
Latin America	102.6	160.9	168.0	1.62	0.71	3.2	2.2
Middle-East & North Africa	77.9	91.3	89.0	0.37	-0.23	1.4	n.a.
South Asia	197.9	212.9	213.5	0.41	0.06	0.7	2.1
North America	235.3	232.5	225.3	-0.08	-0.72	0.2	n.a.
Western Europe	99.4	86.8	83.5	-0.35	-0.32	0.0	n.a.
Oceania	34.0	42.8	46.7	0.25	0.38	0.0	0.2
World total	**1,357.1**	**1,518.6**	**1,549.0**	**4.49**	**3.04**	**57.8**	**13.9**

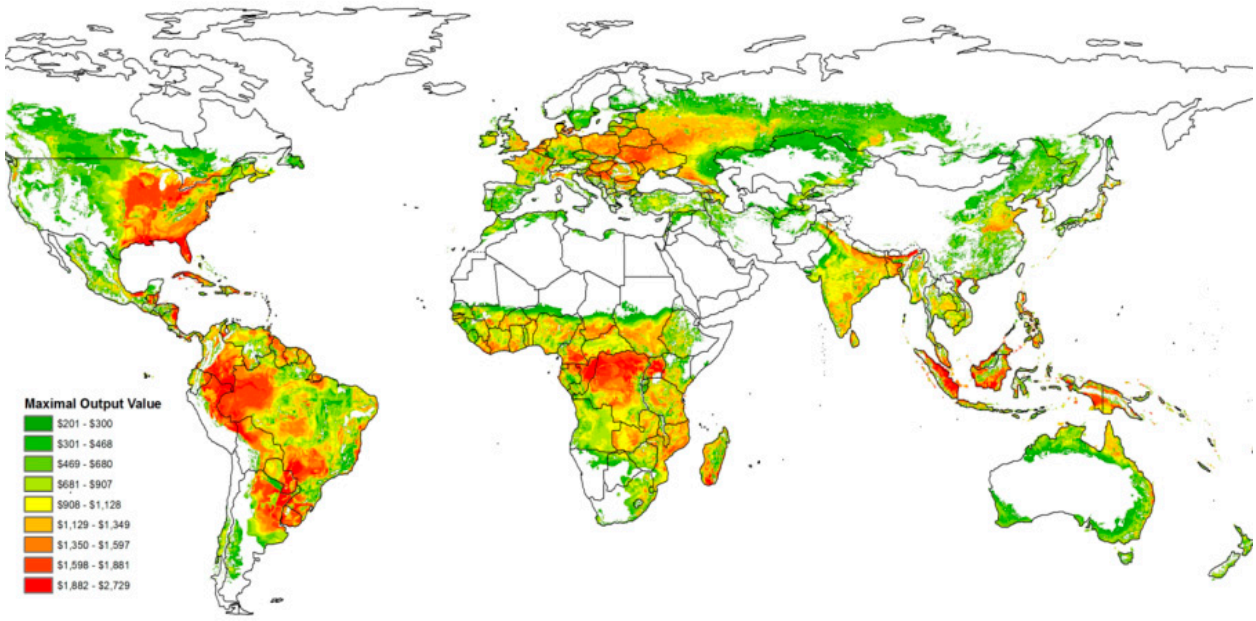
Notes: Cultivated area is land under arable or permanent crops. 'Land demand 2009' refers to intended or actual land acquisitions based on media reports over a period of 11 months (October 2008 – August 2009). The last column ('year eq.') identifies this demand in terms of the number of years using average annual expansion over the 1961-2007 period.

Table 4: Key descriptive statistics, overall and for origin, destination, and destination with projects

Variable	Total	Origin	Origin only	Destination [(a)]		Destination with impl. projects only [(b)]	
Country level variables							
Total Population (mn.)	32	86	26	67		105	*
GDP per capita (USD, 2005 PPP)	11,640	18,028	60,407	6,354	***	7,295	
Value of food imports (mn. USD)	3239	8533	12,514	3,158	***	4,440	*
Value of food exports (mn. USD)	3,180	8,844	9,217	4,052	**	6,215	**
Food Dependence	117	12	211	-30	***	-99	**
Land use and endowment							
Cultivated Land (mn. Ha)	8.7	20.2	3.9	16.5	*	26.1	***
Non-Forest Land Suitable for Cultivation (mn. ha)	3.8	6.5	0.6	7.4	**	12.0	***
Forest Land Suitable for Cultivation (mn. Ha)	5.8	11.6	0.4	11.5	*	18.1	**
Suitable non-forest land w. low pop. dens. (mn. ha)	2.0	3.4	0.0	3.9	**	6.5	***
Suitable forest land w. low pop. dens. (mn. ha)	4.2	8.7	0.1	8.4		13.1	*
Max potential output value on uncultivated, non-forested and non protected land (log mn USD)	7.9	8.3	6.8	8.9	***	9.6	***
Max potential output value on uncultivated, forested and non protected land (log mn USD)	7.2	7.7	5.9	8.1	***	8.8	**
Yield gap (Percent)	0.60	0.47	0.27	0.66	***	0.62	*
Institutional quality					***		
Regulatory Quality Rank (Percent)	49.7	62.5	80.1	38.9	***	40.4	
Rule of Law Rank (Percent)	49.4	59.8	80.0	35.9	***	37.8	
Control of Corruption Rank (Percent)	49.5	58.9	80.5	37.5	***	37.2	
Political Stability & No Violence Rank (Percent)	49.2	49.5	67.5	34.2	***	35.4	
Voice & Accountability Rank (Percent)	49.4	52.2	64.2	36.7	***	39.0	
Weak Investor Protection	85.7	70.6	60	90.4	**	87.8	
Land Tenure Security Index	-0.02	0.61	2.15	-0.98	***	-0.95	
No. of observations (countries)	215	56	23	84		43	

Notes: The table shows unweighted averages of country characteristics. It includes 215 countries of which 107 are either investors or host countries in the period October 1, 2008 to August 31, 2009 and 33 countries are both host countries and investors. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.
(a) Significance of t-test for difference between averages in destination countries and countries of origin only.
(b) Significance of t-test for difference between averages in destination countries with implemented projects and destination countries where no project is under production.
Other notes: Food dependence is defined as the value of net food imports per inhabitant. It is positive for net importers and negative for net exporters; Suitable non-forest land with low population density is the amount of potentially suitable land that is neither currently used for agricultural production nor settled with more than 25 inhabitants per km^2 is calculated as discussed in the text and excludes protected areas (Source: FAO and IIASA); The value of potential output is obtained for choosing the best culture as the market prices and yields. It is expressed in logarithm of the value in millions of dollars (Source: FAO and IIASA); The yield gap is the difference between performance that is technically achievable and the effective yield observed (Source: FAO and IIASA); The variables Regulatory Quality, Rule of Law, Control of Corruption, Political Stability and Absence of Violence, and Voice and Accountability are from the Worldwide Governance Indicators database and are expressed in percentile of the distribution of descending rank (Source: World Bank). A low value thus characterizes a country where governance is poor; The index of weak protection of investors is the rank of the variable Strong investor protection in the Doing Business database and is comprised between 1 and 215 (Source: International Finance Corporation, World Bank). A high value of this index reflects situations where investors are poorly protected; The tenure security index is constructed by the French Development Agency (AFD). This is the first projection on the axis of a Principal Component Analysis of the variables contained in the land based Institutional Profiles (Source: Ministry of Finance and AFD). The index is interpreted as a measure of security of tenure enjoyed by local people. A low value implies high levels of tenure insecurity.

Figure 2: Maximum potential value of agricultural output (in US Dollars per hectare)



Source: Deininger *et al.* 2011.

Table 5: Poisson regressions for the number of projects in a destination country

			All projects		
Potentially cultivable area non-forest	0.4946***				
	[0.121]				
Potentially cultivable area forest	-0.0205				
	[0.070]				
Max. possible output value non-forest area		0.5257***	0.5296***	0.5122***	0.5086***
		[0.108]	[0.110]	[0.139]	[0.140]
Max. possible output value forest area		-0.0159	-0.0405	-0.0523	-0.0658
		[0.060]	[0.060]	[0.064]	[0.064]
Yield gap	0.6033	0.9061*	1.1224**	-0.2444	-0.0245
	[0.416]	[0.474]	[0.524]	[0.710]	[0.696]
Land governance indicator				-0.1735**	-0.1779**
				[0.078]	[0.081]
Weak investor protection			-0.0017		-0.0022
			[0.003]		[0.003]
No. of observations	137	143	135	107	105
Pseudo R^2	0.325	0.297	0.293	0.290	0.292
			Projects with some production only		
Potentially cultivable area non-forest	0.6876***				
	[0.156]				
Potentially cultivable area forest	-0.0083				
	[0.094]				
Max. possible output value non-forest area		0.6840***	0.6894***	0.6199***	0.6148***
		[0.139]	[0.145]	[0.165]	[0.166]
Max. possible output value forest area		-0.0435	-0.0684	-0.0606	-0.0734
		[0.077]	[0.079]	[0.079]	[0.080]
Yield gap	0.1057	0.5362	0.7641	-0.3172	-0.0872
	[0.517]	[0.617]	[0.753]	[1.003]	[1.017]
Land governance indicator				-0.1422	-0.1456
				[0.108]	[0.109]
Weak investor protection			-0.0019		-0.0023
			[0.003]		[0.003]
No. of observations	137	143	135	107	105
Pseudo R^2	0.346	0.271	0.266	0.230	0.229

Notes: Variable in logs. Robust standard errors in brackets. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Constant included but not reported.

Table 6: Poisson regressions for the number of projects in bilateral relations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilateral variables							
Distance	-0.5900***	-0.6002***	-0.6165***	-0.5921***	-0.5878***	-0.5960***	-0.6171***
	[0.061]	[0.060]	[0.060]	[0.062]	[0.060]	[0.060]	[0.059]
Colonial relationship	1.1699***	1.1558***	1.0550***	1.1714***	1.1726***	1.1840***	1.0545***
	[0.263]	[0.265]	[0.221]	[0.265]	[0.265]	[0.261]	[0.220]
Investor country variables							
Net food imports per inhabitant	3.3056***	3.3913***	3.3203***	3.3733***	3.3758***	3.3843***	3.3208***
	[0.368]	[0.354]	[0.373]	[0.357]	[0.351]	[0.351]	[0.372]
Population	0.7817***	0.7771***	0.7634***	0.7683***	0.7726***	0.7753***	0.7635***
	[0.048]	[0.047]	[0.049]	[0.048]	[0.047]	[0.047]	[0.049]
Host country variables							
Food exports	0.0320	0.0345	0.0974***	0.0203	0.0604*	0.0477	0.0984***
	[0.032]	[0.031]	[0.037]	[0.033]	[0.034]	[0.033]	[0.035]
Suitable non-forest land	0.4664***						
	[0.074]						
Suitable forest land	0.0320						
	[0.043]						
Max. possible output value non-forest area		0.5162***	0.4830***	0.5307***	0.4904***	0.4909***	0.4846***
		[0.072]	[0.089]	[0.074]	[0.076]	[0.077]	[0.091]
Max. possible output value forest area		0.0280	-0.0114	0.0050	0.0328	0.0302	-0.0118
		[0.041]	[0.043]	[0.041]	[0.040]	[0.041]	[0.043]
Yield gap	0.9486**	1.3042***	0.4959	1.3590***	0.9265**	1.0388**	0.5075
	[0.376]	[0.404]	[0.519]	[0.442]	[0.472]	[0.439]	[0.511]
Land governance index			-0.2082***				-0.2136***
			[0.049]				[0.059]
Weak investor protection				-0.0013			
				[0.001]			
Control of corruption (%)					-0.0072*		
					[0.004]		
Political stability (%)						-0.0070*	0.0007
						[0.004]	[0.004]
No. of observations	25,704	26,838	20,223	25,515	26,838	26,838	20,223
Pseudo R^2	0.269	0.265	0.261	0.260	0.266	0.267	0.261

Notes: Variable in logs. Robust standard errors in brackets*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Constant included but not reported.

Table 7: Poisson regressions for the number of operating projects in bilateral relations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilateral variables							
Distance	-0.7253***	-0.7243***	-0.7066***	-0.7121***	-0.7140***	-0.7209***	-0.7107***
	[0.097]	[0.094]	[0.094]	[0.095]	[0.091]	[0.093]	[0.091]
Colonial relationship	0.8934*	0.8914*	0.8718	0.9003*	0.8981*	0.9057*	0.8766
	[0.530]	[0.513]	[0.578]	[0.516]	[0.513]	[0.513]	[0.579]
Investor country variables							
Net food imports per inhabitant ($)	1.9477*	2.2305**	2.1871**	2.2658**	2.2132**	2.2243**	2.1912**
	[1.080]	[0.926]	[0.953]	[0.923]	[0.923]	[0.924]	[0.953]
Population	0.7522***	0.7379***	0.7285***	0.7388***	0.7344***	0.7364***	0.7289***
	[0.083]	[0.083]	[0.085]	[0.084]	[0.082]	[0.083]	[0.085]
Host country variables							
Food exports	0.0705	0.0783	0.1318**	0.0640	0.0981	0.0864	0.1386**
	[0.061]	[0.059]	[0.065]	[0.064]	[0.067]	[0.062]	[0.063]
Suitable non-forest land (mn ha)	0.7015***						
	[0.149]						
Suitable forest land (mn. ha)	0.0154						
	[0.092]						
Max. possible output value non-forest area		0.7000***	0.6124***	0.7121***	0.6769***	0.6872***	0.6218***
		[0.126]	[0.149]	[0.129]	[0.138]	[0.132]	[0.151]
Max. possible output value forest area		-0.0251	-0.0415	-0.0441	-0.0186	-0.0251	-0.0432
		[0.072]	[0.077]	[0.074]	[0.072]	[0.073]	[0.078]
Yield gap	0.5036	1.1073	0.4565	1.1729	.7851	0.9373	0.5484
	[0.681]	[0.754]	[1.002]	[0.817]	[0.886]	[0.811]	[0.983]
Land governance index			-0.1930**				-0.2296**
			[0.095]				[0.117]
Weak investor protection				-0.0015			
				[0.003]			
Control of corruption (%)					-0.0057		
					[0.008]		
Political stability (%)						-0.0041	-0.0048
						[0.006]	[0.007]
No. of observations	25,704	26,838	20,223	25,515	26,848	26,838	20,223
Pseudo R^2	0.254	0.231	0.217	0.228	0.231	0.231	0.218

Notes: Variable in logs. Robust standard errors in brackets. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Constant included but not reported.

Appendix

Table A1: Number of projects in bilateral relations (Tobit model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilateral variables							
Distance	-0.7945***	-0.8322***	-0.8683***	-0.8179***	-0.8238***	-0.8298***	-0.8713***
	[0.090]	[0.090]	[0.098]	[0.093]	[0.090]	[0.090]	[0.097]
Colonial relationship	1.7922***	1.7831***	1.7156***	1.8470***	1.8054***	1.7942***	1.7244***
	[0.367]	[0.372]	[0.370]	[0.376]	[0.373]	[0.372]	[0.370]
Investor country variables							
Net food imports per inhabitant	3.1667***	3.3265***	3.1637***	3.3112***	3.2892***	3.3007***	3.1752***
	[0.634]	[0.638]	[0.684]	[0.644]	[0.636]	[0.636]	[0.681]
Population	0.9259***	0.9302***	0.9272***	0.9232***	0.9252***	0.9278***	0.9281***
	[0.074]	[0.075]	[0.078]	[0.076]	[0.075]	[0.075]	[0.078]
Host country variables							
Food exports	0.0102	0.0109	0.1023**	-0.0132	0.0413	0.0203	0.1117**
	[0.042]	[0.041]	[0.049]	[0.044]	[0.046]	[0.043]	[0.048]
Suitable non-forest land	0.5331***						
	[0.080]						
Suitable forest land	0.0764						
	[0.052]						
Max. possible output value non-forest area		0.6694***	0.6271***	0.6940***	0.6499***	0.6529***	0.6320***
		[0.082]	[0.099]	[0.086]	[0.085]	[0.086]	[0.101]
Max. possible output value forest area		0.0513	0.0006	0.0166	0.0511	0.0520	-0.0014
		[0.054]	[0.055]	[0.054]	[0.053]	[0.053]	[0.056]
Yield gap	1.0761**	1.3286***	0.4109	1.3805***	0.9686*	1.0886**	0.5074
	[0.495]	[0.501]	[0.632]	[0.533]	[0.553]	[0.532]	[0.617]
Land governance index			-0.2618***				-0.3005***
			[0.061]				[0.073]
Weak investor protection				-0.0016			
				[0.002]			
Control of corruption (%)					-0.0077*		
					[0.005]		
Political stability (%)						-0.0061	0.0049
						[0.004]	[0.005]
No. of observations	25,704	26,838	20,223	25,515	26,838	26,838	20,223
Log pseudo-likelihood	-1701	-1735	-1558	-1704	-1733	-1734	-1558

Notes: Variable in logs. Robust standard errors in brackets. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Constant included but not reported.

Table A2: Number of operating projects in bilateral relations (Tobit model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bilateral variables							
Distance	-0.9045***	-0.8857***	-0.8864***	-0.8712***	-0.8746***	-0.8832***	-0.8910***
	[0.120]	[0.115]	[0.122]	[0.117]	[0.115]	[0.115]	[0.122]
Colonial relationship	1.0712*	1.0008*	0.8782	1.0157*	1.0175*	1.0047*	0.9063
	[0.604]	[0.598]	[0.645]	[0.603]	[0.597]	[0.596]	[0.647]
Investor country variables							
Net food imports per inhabitant ($)	1.5390	1.8808**	1.7706*	1.9251**	1.8179*	1.8404*	1.8030*
	[1.018]	[0.959]	[0.964]	[0.959]	[0.956]	[0.958]	[0.951]
Population	0.7674***	0.7406***	0.7361***	0.7422***	0.7343***	0.7381***	0.7381***
	[0.094]	[0.095]	[0.098]	[0.096]	[0.094]	[0.095]	[0.097]
Host country variables							
Food exports	0.0497	0.0835	0.1684**	0.0571	0.1259*	0.0970	0.1829**
	[0.064]	[0.066]	[0.075]	[0.068]	[0.073]	[0.069]	[0.075]
Suitable non-forest land (mn ha)	0.6763***						
	[0.150]						
Suitable forest land (mn. ha)	0.0670						
	[0.094]						
Max. possible output value non-forest area		0.6785***	0.5651***	0.7009***	0.6469***	0.6577***	0.5768***
		[0.128]	[0.152]	[0.130]	[0.137]	[0.136]	[0.155]
Max. possible output value forest area		-0.0513	-0.0612	-0.0795	-0.0436	-0.0480	-0.0677
		[0.077]	[0.076]	[0.076]	[0.074]	[0.075]	[0.079]
Yield gap	0.1034	0.5950	-0.4786	0.6611	0.0905	0.2921	-0.3292
	[0.735]	[0.719]	[0.928]	[0.781]	[0.832]	[0.797]	[0.915]
Land governance index			-0.3112***				-0.3730***
			[0.094]				[0.109]
Weak investor protection				-0.0026			
				[0.003]			
Control of corruption (%)					-0.0104		
					[0.007]		
Political stability (%)						-0.0074	0.0078
						[0.007]	[0.007]
No. of observations	25,704	26,838	20,223	25,515	26,848	26,838	20,223
Log pseudo-likelihood	-503.8	-539.9	-513.4	-532.9	-538.5	-539.1	-512.8

Notes: Variable in logs. Robust standard errors in brackets. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Constant included but not reported.