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The impact of land property rights interventions on investment and agricultural productivity in developing countries

A systematic review

June 2016

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Agriculture

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The impact of land property rights interventions on investment and agricultural productivity in developing countries: a systematic review

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Summary

Background

Secure and predictable access to land as a productive resource is key to the livelihoods of millions of farmers around the world. Secure land tenure enables farmers to invest in long-term improvements to their farms and soils in the expectation that they will reap the benefits of those investments without fear that their land be confiscated arbitrarily. Formal and informal land rights are therefore seen as key to improving the conditions of the poor in developing countries in terms of economic growth, agricultural production, food security, natural resource management, gender-related inequalities, conflict management and local governance processes more generally.

Existing evidence on the effects of land property rights interventions is mixed and to a considerable degree dependent upon the initial land rights conditions. In many cases where existing rights are already secure through stable informal and customary systems, the formalization of rights through land titling, one form of strengthening rights, may have little impact. In other cases, mechanisms for formalizing property rights where no formal institutions had previously existed are argued to have increased productivity and slowed forest loss.

Much of the literature underscores the complexity of attribution and the importance of context to understanding relationships between security, registration and productivity, and to understanding gender dimensions. They also suggest tenure security alone is not a ‘silver bullet’ leading directly to higher farmer incomes, or that it is solely attributed to tenure reforms– i.e. context matters.

No known systematic review or meta-analysis on the relationships between land property rights and productivity or welfare has been undertaken to date, and concerns have been highlighted by others over inconsistent effects and design limitations in some studies of tenure reform. This has therefore provided strong motivation for a systematic review that serves as an independent review of the quality and reliability of findings offered in the available literature.

Objectives

The objectives of the review are as follows:

1. to understand the quantitative and qualitative impacts of interventions to strengthen land property rights on agricultural and livelihood outcomes in rural areas of low and middle income countries
2. to assess whether these effects are different for men and women, and under what circumstances
3. to assess specific mechanisms that enable or limit productivity improvement (barriers and facilitators)

This review sought to examine the specific impacts of two types of land rights interventions:

- Conversion of communal or non-demarcated rural land to freehold title and registration of such rights in an official registry; and

- Statutory recognition and codification of customary or communal rural land rights, and registration of these rights in an official registry.

The search strategy involved searches of 16 online databases, grey literature, hand searches of 27 key journals and bibliographic snowballing. The searches were carried out in October 2012 and the non-impact evaluation, or qualitative, results were revisited again in July of 2013 after feedback on an initial draft of the report.

Selection criteria

The review synthesizes quantitative evidence only from studies that: used randomized experiments or quasi-experimental methods employing strategies for causal identification and using some method for removing biases due to non-random assignment of treatment; estimated the impact of either conversion to freehold title or statutory recognition of land rights; measured at least one intermediate outcome defined in the study, or final outcomes (productivity of land use, welfare of pre- and post-policy rights holders in terms of income/ consumption or poverty, gender-based welfare outcome measures, or income/ consumption or poverty); estimated impacts with outcome data measured at the individual or household level; were undertaken in developing countries (as defined by the World Bank); and that measured outcomes at some point between 1980 and 2012.

The qualitative criteria aimed to provide context and address possible answers to how and why interventions may or may not have been successful overall or for certain groups in particular. Eligibility of non-impact evaluation studies was determined via a two-stage screening process to facilitate the review of only the most relevant studies while quickly filtering out inappropriate research based on the Critical Skills Appraisal Programme (CASP) tool. This involved similar criteria to the quantitative search, albeit with different methodological requirements. Specifically, studies were filtered based on clearly defined research objectives, links to relevant literature, context and sample selection, data collection, methods, as well as quality and relevance of their analyses. Other types of reform were not eligible for inclusion in the review, including those relating to justice, capacity-building, outreach, and inheritance.

Data collection and analysis

Data extraction sheets were devised to facilitate comparison of interventions discussed in studies meeting the inclusion criteria. For quantitative studies, estimated effects on any of the intermediate and final outcomes were extracted. For all studies, quotes from the study on how the intervention seemed to have affected any of the intermediate outcomes were extracted.

For outcomes measured in terms of monetary value (productivity, value of credit received, and consumption), we carried out our quantitative analysis in monetary terms as well. When natural logarithms were not used (for example, value of credit received), we used a standardized difference that standardizes the outcome relative to the control group standard deviation. For binary outcome measures (indicators for long term investment, formal borrowing) of treatment effects in terms of absolute changes, a variety of analyses were carried out including consideration of the natural logarithm of the risk ratio. When a study included multiple estimates of the same treatment effect, we used the one judged to have minimal risk of bias.

Quantitative studies were coded in terms of risk of bias in estimating impacts, and were assessed using the IDCG Risk of Bias Tool. Because of high inter-study heterogeneity in effect sizes, random effects synthesis and random effects meta-regression on moderator variables were used. Furthermore, given the low number of studies (20 quantitative studies), only bivariate meta-regressions of effect estimates on moderators were performed.

For the qualitative component of this review, an aggregative metasummary approach was undertaken, focusing on quantitatively identifying the frequency of qualitative results found in the research via a five stage process of findings extraction, category grouping, theme abstraction, identification of frequency and intensity of findings, and results interpretation. This approach avoids the synthesis of concepts and creation of lines of argumentation.

Results

The quantitative results presented are based on a corpus of 20 studies focusing on the impact of freehold titling. We were not able to identify any quantitative evidence of sufficient quality examining the investment or productivity effects of statutory recognition of customary land rights. The studies on freehold titling provide evidence mostly consistent with conventional economic theories of property rights. The limited quantitative evidence base suggests benefits of land tenure interventions, measured in terms of productivity and consumption expenditure or income, and suggests that long-term investment and increases in perceived tenure security are plausible channels through which tenure recognition may contribute to welfare for those who receive title. The credit channel finds no support, although the evidence base is very thin. When looking at the contextual factors that moderate the effects of tenure recognition, we find gains in productivity are significantly greater outside Africa and in wealthier settings, although strong correlation between the two makes it impossible for us to determine whether this is a “wealth effect,” or something we characterize as the “Africa effect”, defined as the effect of relatively high pre-existing levels of tenure security that characterize customary tenure arrangements.

The evidence base is too thin to say how productivity and investment effects are moderated by our other contextual factors of interest, including length transpired since the intervention, levels of democratic governance, population density, agricultural systems, or cash crops. The quantitative evidence base has very little to say about consequences of such policies for social outcomes like displacement, conflict, or gender equality. Thus, while tenure recognition appears to improve land productivity and the material welfare of those who have access to registered land, we do not have a clear sense of the dynamics that follow from such policies in terms of overall access to land. We also have no quantitative evidence on policies that certify communal property rights, one of the forms of property rights enhancement that motivated our interest in this review.

The qualitative side of the review analysed nine studies that catalogued a broad spectrum of both positive and negative experiences with land tenure interventions, the diversity of which made it difficult to draw out conclusive trends. They did however confirm that social impacts resulting from tenure interventions can be significant, unpredictable and in some instances have negative consequences such as displacement or diminished property rights for women. While the quantitative studies assess on-farm outcomes of titling beneficiaries only, the qualitative studies consider impact of titling programs on both beneficiaries and the broader population including those who may not have received title. This contradistinction is important to bear in mind. The potential for negative social impacts found in qualitative

studies further indicates the importance of assessing broad social outcomes and particularly in collecting data on those who may lose out as a result of land property rights reforms.

Authors' conclusions

The findings of this systematic review underscore the importance of tenure security. In addition to being a pre-condition to farm investments that foster productivity and increase farm incomes, growing investor interest in farmland as well as contextual changes– population growth, changing settlement patterns, political conflict, environmental degradation and climate change– are among the factors underscoring the need to better secure tenure rights in developing countries. In principle, tenure security can be delivered through tenure conversion, from informal tenure to freehold title, but also by extending greater legal recognition to informal or customary tenure arrangements, the latter approach being especially relevant to sub-Saharan Africa. Either approach has potentially different measurable effects on productivity and investment, though the effects in both cases may be positive. Any tenure reform may have negative social effects, including on women's access to land and on displacement of the poor or others facing social and financial barriers to participating in the reformed regime for assigning rights.

Though tenure recognition improves productivity in settings where title is the dominant means for securing land rights, as is the case in much of Latin America and Asia, productivity gains may take time to become apparent, the effects may vary substantially across cases, and they likely depend on other supportive conditions, such as the performance of credit, input supply, and product markets.

The study results draw attention particularly to the significant gains in productivity and investment in agriculture in the Latin American and Asian cases due to tenure formalization, and the comparatively weak effects attributable to formalization in Africa. To explain these regional differences we propose the idea of the "Africa effect", based on the fact that most farms in sub-Saharan Africa are held under customary tenure arrangements, which generally provide long-term tenure security to qualified members of land-holding families, groups or communities. As such, customary tenure may provide a level of pre-existing tenure security without formalization, something that is not typical in Latin America or elsewhere. As a result, gains to formalization in Africa may be more limited because tenure insecurity, which formalization seeks to remedy, is often not present to the degree that designers of reform programs assume.

Low gains to investment and productivity in Africa following tenure formalization may also be explained by the low levels of wealth and income of African farming families in comparison to those studied in Latin America or Asia. Understanding the relevance and the relative weight of either effect— the wealth/income effect and the "Africa effect" noted above— in explaining lower levels of investment and productivity following formalization in Africa merits further research.

Our review of qualitative studies and literature on African agriculture suggests levels of rural agricultural productivity in Africa may remain weak due to factors other than tenure insecurity. These factors may include small farm size, the importance of off-farm income to rural households, the high opportunity costs of agricultural labour, and the associated deployment of working-age family members to urban centres for work, among others.

We propose an agenda of needed future research. We believe further research is needed, *inter alia*, on:

- the relationships between household wealth and income, customary tenure, and investment in agriculture in Africa
- the positive and negative effects of tenure recognition on women's tenure security in Latin America, Africa and Asia, and the gains or losses in women's tenure security in comparison to the customary tenure arrangements replaced by tenure formulation in Africa
- the effects on farm-level investments and productivity and the management and productivity of natural resources used in common resulting from tenure reforms extending statutory recognition to customary tenure arrangements.

Policy messages

The results of the study point to a number of key messages for policy-makers to consider:

Tenure security is important. The evidence from the eligible studies suggest that provision of title to smallholders in Latin America and Asia can result in significant increases in investment, agricultural productivity, and farmer incomes. The gains to formalization in Africa appear also to be positive, though much weaker, and the database for Africa is very limited. The greater gains in Latin America and Asia are likely explained by the fact that in these regions titling is the dominant pathway for securing land rights. This is not the case in Africa, where customary tenure arrangements have proven to provide high levels of tenure security, in many settings likely reducing the demand for formalization among land holders. Moreover, levels of wealth and income are lower among African farmers, constraining their ability to invest in farm inputs and infrastructure upon securing title.

Any tenure reform may have negative social effects, including on women's access to land and on displacement of the poor or others facing social and financial barriers to participating in the reformed regime for assigning rights. African customary land rights are a form of usufruct right once common in regions around the world before the systematic introduction of individual systems of private land ownership in Europe beginning in the 18th century. African customary, or usufruct, systems provide access to land as a *social* right, to qualified members of land holding communities. Conversion to title extinguishes the social basis for claiming land rights, a right particularly important to poor households who may lack the financial resources necessary to secure land through the market. An important policy message is that great care should be taken when considering land reform programs in Africa that would convert customary tenure arrangements to arrangements based on freehold title. The economic gains to conversion may be significantly more modest than anticipated, and the social consequences, in terms of the ability of the poor to gain access to land, may be considerable. Moreover, conversion of usufruct systems to private property has rarely occurred historically without considerable social and economic displacement.

Though tenure recognition improves productivity in Latin America and Asia, where title is the dominant means for securing land rights, **productivity gains may take time to become apparent, the effects vary substantially across cases, and they likely depend on other supportive conditions, such as the performance of credit, input supply, and product markets.** Most studies provide little information about *why* certain households or land

parcels received tenure recognition while others did not, posing a problem of selection bias – better-off households may have been better able to secure their tenure, making their productivity, levels of investment and other class-related indicators a cause rather than an outcome of the tenure recognition. While we find clear positive evidence on productivity in seven of the 20 cases that met our selection criteria (five in Latin America, one in Asia and one in Africa), we also find that land rental markets and credit access are unaffected or only marginally affected. The evidence suggests, then, that arguments that tenure conversion will unleash rental and credit markets merit greater scrutiny, taking account of local contextual factors.

Policy makers should consider and assess a variety of models, appropriate to regional and national contexts, when framing tenure interventions. More evidence is needed to help policy makers choose what types of reforms are most appropriate in a given context. This includes the need for more evidence on both titling and, given the major blind spot in the current evidence base, statutory recognition of customary tenure. Such studies should provide evidence on diverse social outcomes, including displacement, women's access, and other data on both winners and losers of any given policy reform. What is clear is that there are important regional variations, and the literature we reviewed strongly suggests that titling works better in Latin America and Asia than in sub-Saharan Africa. This stands to reason. Title is the dominant means for securing land rights in Latin America and Asia and land reform beneficiaries would be unlikely to consider an tenure arrangement other than title satisfactory. In sub-Saharan Africa customary tenure systems remain relatively functional and the overlapping character of family and collective resource rights–to residential, cropping, grazing and common property resources– complicate the creation of exclusive property rights, potentially resulting in significant levels of displacement. Importantly, a greater challenge to customary rights in Africa is not tenure conversion per se, but the fact that customary arrangements lack adequate constitutional and legal recognition in many countries. Customary arrangements often operate on land held by the state, and as such customary rights are vulnerable to arbitrary taking by state agencies, in some cases in land deals with large-scale outside investors. This vulnerability is being addressed in several African countries (including Mozambique, Kenya, South Sudan) by new policies and legislation that give full statutory recognition to customary tenure, on a par with state land and land held under freehold title. Specific aspects of customary arrangements that are considered regressive socially or not responsive to transparent administration or accountability are also subject to legislative remedy, without diminishing their underlying value in providing access to land as a social and economic right. For instance, traditional authorities, who typically administer land rights, can be made accountable to public oversight or, as in the case of Botswana, replaced in their land administration function by civil land boards. Women can be enabled, by statutory reforms, to hold customary rights jointly with spouses. Customary rights can be registered as lease rights, and in turn sub-leased to outside investors.

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1. Background

1.1. Identification of the problem

Secure and predictable access to land as a productive resource is key to the livelihoods of millions of farmers around the world. Secure land rights enable farmers to invest in long-term improvements to their farms and soils in the expectation that they will reap the benefits of those investments without fear that their land may be confiscated arbitrarily. Investments in improvements to soil fertility, and capital improvements such as irrigation equipment and fences, pay for themselves over multiple cropping seasons. Recent research on the use and management of common pool resources, such as forests and grazing lands, shows that ecological and livelihood outcomes are greater where local user groups have clear and secure rights to the resource; the right to exclude ineligible users often emerges as decisive to local communities' ability to manage their natural resources sustainably (see especially Persha, et al. [2010] and Porter-Bolland, et al. [2011]). Formal and informal land rights are therefore seen as key to improving the conditions of the poor in developing countries in terms of economic growth, agricultural production, food security, natural resource management, gender-related inequalities, conflict management and local governance processes more generally.

Many farmers in developing countries hold customary rights that are considered highly secure in the context of local social arrangements, but which are not accorded legal status in the country's statutory property regimes. In such situations, land assigned under customary arrangements is most often statutorily categorized as public land, and subject to the stewardship and administration of public agencies. In some instances where commercial investments have taken place, the customary tenure arrangements that delivered secure tenure rights to generations of farming families have been over-ridden and farming families have faced displacement. An appropriate policy remedy may be to accord extant customary arrangements statutory status equal to that accorded to land held under public land and freehold tenures (Knight, 2010; United Nations, 2012). The tenure insecurity evident in such situations underscores the value to landholders of clear statutory recognition of their land rights, whether that recognition is based on customary rights or freehold rights.

Leading multilateral and bilateral development agencies accord high priority to policy reforms that strengthen tenure security, especially as elements of strategies to reduce poverty among women and other traditionally disadvantaged members of society. According to a 2003 World Bank study,

> "Providing secure tenure to land can improve the welfare of the poor, in particular, by enhancing the asset base of those, such as women, whose land rights are often neglected. At the same time, it creates the incentive needed for investment, a key element underlying sustainable growth." (Deininger, 2003, ix).

Other agencies, including USAID and FAO, have placed support for reforms promoting tenure security close to the centre of their funding strategies (see especially USAID and MCC [undated] and FAO [2011]). The historical and contextual understanding and success of land tenure interventions is discussed further in section 1.4.

1.2. Description of the intervention

Land rights may include a wide range of rights to use, own and/or transfer land, as well as enforce rules and exclude outsiders. Strengthening of land rights can take a variety of forms that range from documenting customary uses to formalizing legal rights. Some forms may engage directly with the rights holder, for example through farm-by-farm land titling. Other forms of strengthening rights may be enacted at the national level, for example constitutional reforms in Mozambique that recognize customary rights to land (van den Brink et al. 2006). National scale or even community level interventions that seek to strengthen rights may have differing impacts within populations, for example many interventions seeking to improve rights may lead to elite capture of benefits and subsequent loss of rights for poor and vulnerable sub- populations, particularly in the absence of safeguards (Besteman (1990). The socially embedded nature of customary rights means the land rights of many women depend on social entitlements that can be eroded due to reforms that make land rights marketable, resulting in a de facto transfer of a greater share of rights to (typically) male title holders. Therefore observed impacts depend on the type and scale of the assessment, across individuals, communities, regions and countries (Place and Swallow 2000).

Conversion of communal or non-demarcated rural land to freehold title and registration of such rights in an official registry has become a standard approach, under the presumption that communal land tenure rights are inherently insecure. Such conversion typically consists of adjudicating and assigning land rights, physically surveying boundaries, and registering rights and boundary demarcations in an official land registry. Once systematic conversion to a tenure system based on registered rights is completed, all subsequent transactions of land rights must be recorded in the official registry if right holders are to be able to defend their rights against the claims of others. Conversion of customary tenure systems to a system based on registration of individual parcels has in practice resulted in concerns about the high costs of title adjudication and registration, and the failure in many settings of right holders to register transactions. (Arguably, tenure insecurity may increase for many customary right holders after conversion to systems based on securing rights through mandatory rights registration because of chronic weaknesses in the civil administrative capacity; while the customary land administrative systems delivered adequate levels of tenure security reliably and at low cost.) This has led to a focus in several African countries on recognition and codification of customary or communal rural land rights, an approach that recognizes that communal systems need not be inherently insecure and that the greater source of the vulnerability of customary rights lies in the fact that the customary regimes themselves do not enjoy statutory recognition. Botswana's Tribal Land Act of 1968 extended statutory recognition to the traditional customary tenure system while replacing chiefs as land administrators with civil land boards. More recently, the Kenya National Land Policy of 2009 placed customary land rights on equal legal par with freehold tenure and public land.

1.3. How the intervention might work

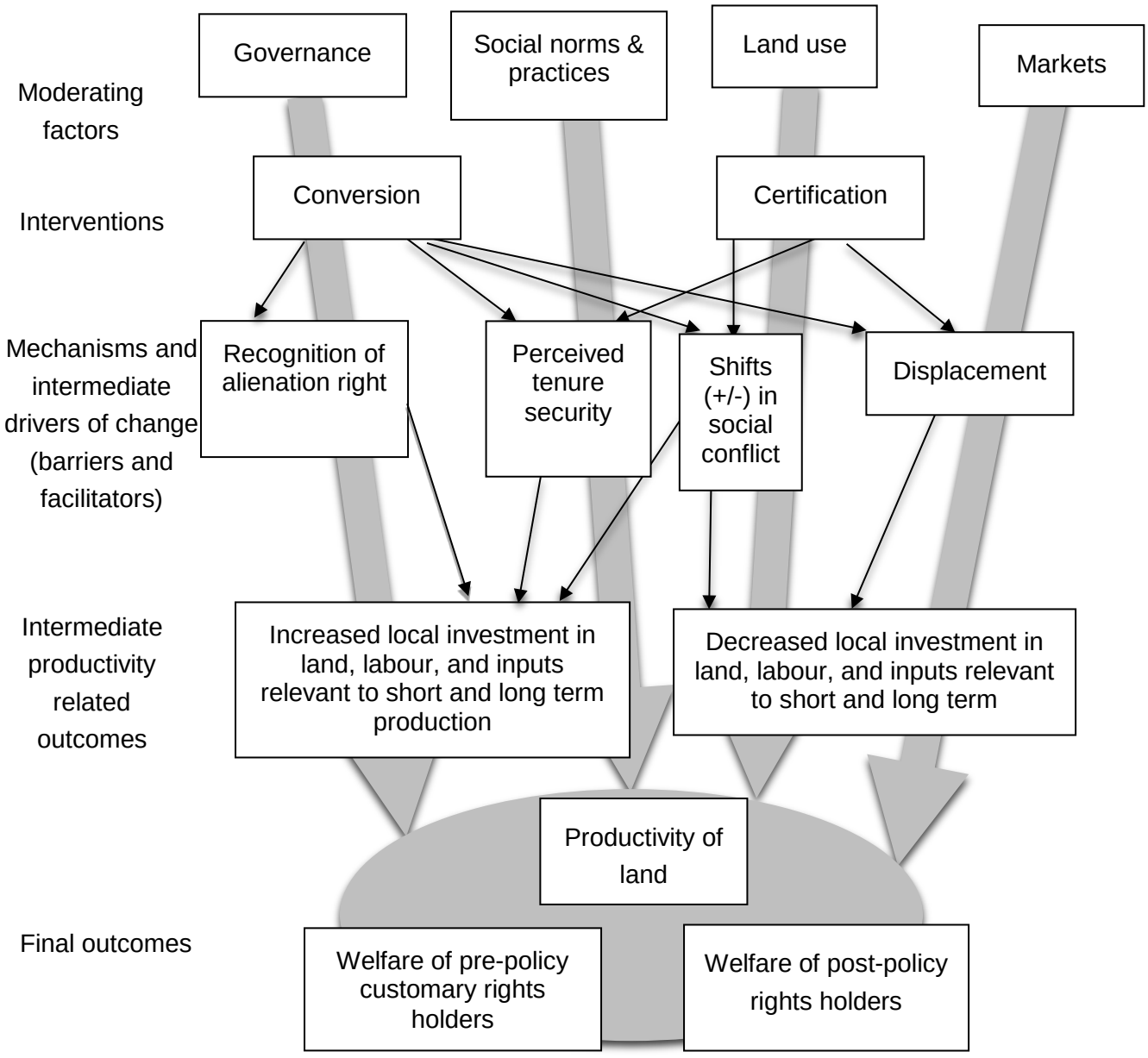
A variety of factors are likely to influence the effectiveness of land property rights interventions on productivity. Figure 1 presents the basic elements of a causal chain that draws on the research teams' own work in this area as well as the available literature (summarized below). The figure sketches out moderating factors, mechanisms of change and intermediate outcomes, and final outcomes that, prior to carrying out our review, we saw

as being important in understanding the effects of land property rights on productivity. The final outcomes of interest include:

- Productivity of land use
- Welfare of pre-policy landholders, measured in terms of income and consumption
- Domestic violence and gender equity
- Welfare of post-policy landholders, measured as noted above

In theory, it is important to distinguish between the welfare of pre-policy and post-policy landholders in evaluating the welfare impacts of these interventions. To the extent that these groups differ, our analysis aimed to incorporate the potential for adverse consequences for pre-policy landholders, but this was largely not possible, as all studies which compared landholders with and without title / tenure recognition did so ex-post, and did not address pre-policy landholders.

Figure 1: Causal chain



Our causal chain proposes the following moderating factors as being important in determining the nature of the effects that are likely to follow land property rights interventions:

- Governance, including the nature of interests represented by those controlling policy
- Social norms and practices, specifically ways in which gender, age, community standing, and other characteristics influence the other three moderating factors and individuals' ability interact with interventions in a particular social context
- Land use, including population pressure on land, whether land is subject to mixed use (pastures and forests), and whether cash crops are grown
- Markets, including the presence of credit markets and market demand for crops as well as demand for agricultural land, resulting from both local and international factors

The causal chain further proposes that interventions and moderating factors operate through a number of intermediate drivers of change, including the following:

- Recognition of alienation right by those holding registered rights. This is presumed by conventional economic theory to provide collateral and, therefore, enable access to credit.
- Perceptions of tenure security, which is presumed by conventional economic theory to motivate investment of personal resources into production.
- Social conflict, including reducing amounts of land held in dispute and therefore not being used productively due to inheritance disputes, boundary demarcation disputes, or land use conflicts between, for instance, pastoralists and agriculturalists. At the same time, to the extent that such registration changes who has access to land, these interventions may indeed trigger violence or other forms of contention over these changes.
- Displacement of tenants whose rights to land are denied as a result of the intervention.

We presumed that intermediate outcomes of an intervention include shifts in land, labour and agricultural inputs relevant to both short and longer-term production. More specifically, these would include changes in:

- Investments of resources into short-term production and land (fertilizer, pesticides, and so on)
- Investment of resources into longer-term production and land (for example, soil conservation, tree crops, and so on),
- Fuller employment of land through leasing-out or sharecropping.

1.4. Why it is important to do this review

Existing evidence on the effects of land property rights interventions is mixed and to a considerable degree dependent upon the initial land rights conditions. In many cases where existing rights are already secure through stable informal and customary systems, the formalization of rights through land titling, one form of strengthening rights, may have little impact (Pickney and Kimuyu 1994, Atwood 1990). In other cases, as in the Brazilian Amazonian frontier in the early 1990s, mechanisms for formalizing property rights where no formal institutions had previously existed are argued to have increased productivity and slowed forest loss (Alston et al. 1996). Alternatively, if strengthening land rights simply results in formalizing a bundle of overlapping rights customarily distributed through a community into private property, this "strengthening" could lead to the exclusion and marginalization of large sections of the community, including the poor, as is argued to have

occurred alongside Kenyan tenure reform (Meinzen-Dick and Mwangi 2005). Thus it is important to understand to what extent the strengthening of rights in any context leads to new institutional realities and who bears the costs and benefits of changes in how land rights are assigned (Fort 2008, Bellemare 2010).With this systematic review, we seek to offer policy makers and other stakeholders insights into the specific contexts and factors that allow for the likely success of a variety of potential land tenure interventions, with positive outcomes for both women and men. Alas, given the limitations of the current evidence base, our ability to do so is quite limited.

The inconsistent conclusions from studies on the relationship between strengthening land rights and productivity have led scholars and policy makers in recent years to try to understand how differing theoretical assumptions and different approaches to the empirical study of tenure may explain these differences (Brasselle et al. 2002). A literature review published by Dickerman et al. (1989) on efforts to formalize and register customary land rights in Africa found that formalization had significant positive effects on investment and agricultural productivity in only a small number of particularistic contexts where customary systems had broken down or were absent. Rarely did the benefits associated with surveying land parcels, adjudicating and assigning rights and maintaining official registers outweigh the costs. The authors suggested that registration in many settings had deleterious effects on the poor and on women farmers, particularly where women were not listed as joint title-holders.

Much of the literature underscores the complexity of attribution and the importance of context (Place 2009) to understanding relationships between security, registration and productivity, and to understanding gender dimensions. They also suggest that tenure security alone is not the single factor ‘silver bullet’ leading directly to higher farmer incomes attributed to tenure reforms by writers such as Hernando de Soto (2000). Context matters, including whether markets and credit institutions are in place and input and other costs are at levels conducive to competitive pricing of agricultural products (Bruce 2012). Relevant questions have recently been raised about the extent to which much of the available empirical research on the effects of tenure security has a handle on tenure security as a concept (Arnot, et. al, 2011).

The team is unaware of any systematic review or meta-analyses on the relationships between land property rights and productivity or welfare. In addition, Fenske (2010) highlights study design limitations in many of the studies that have not found significant impacts of tenure security. The concerns about inconsistent effects and design limitations provided a strong motivation for this systematic review, which serves as an independent review of the quality and reliability of findings offered in the available literature. In addition, our methods, which include both quantitative impact assessments as well as qualitative research, have been shown in the field of medicine to be useful for a variety of purposes, including ensuring decision-makers have the most accurate evidence; assessing key population traits relating to a given intervention; establishing whether further primary research is required; and gaining new insights into relevant population or institutional traits (Ring et al 2011).

Finally, this review has allowed us to highlight areas in need of further assessment through rigorous impact evaluation and offers guidance on how to make the most of evaluation opportunities.

2. Objectives

The objectives of the review are as follows:

1. To understand impacts of two types of interventions to strengthen land property rights on agricultural and livelihood outcomes in rural areas in low and middle income countries:
    - Conversion of communal or non-demarcated rural land to freehold title and registration of such rights in an official registry; and
    - Statutory recognition and codification of customary or communal rural land rights, and registration of these rights in an official registry;
2. To assess whether these effects are different for men and women, and under what circumstances;
3. To assess specific mechanisms that enable or limit productivity improvement (barriers and facilitators).

3. Methods

3.1. Criteria for considering studies for this review

Although the literature on the relationship between property rights and productivity in developing countries is large, with theoretical and applied research dating to the 1960s, the rigorous impact evaluations required for the quantitative section of our study are not the norm. We used the PICOS (Participants, Intervention, Comparison, Outcomes, Study types) tool to assist us in framing the criteria to be used in sifting through the literature to determine those studies eligible for inclusion.

3.1.1. Participants

We included studies investigating smallholders and communities in rural farming systems in low- and middle-income developing countries, that had data disaggregated at least to the household level. Although it was planned to disaggregate studies by gender where possible, we found a gaping lacuna of gender-relevant evidence and were unable to quantitatively examine differential impacts for women and men, as is discussed in our section on opportunities for further research.

3.1.2. Intervention

This review sought to examine the specific impacts of two types of land rights interventions:

- Conversion of communal or non-demarcated rural land to freehold title and registration of such rights in an official registry
- Statutory recognition and codification of customary or communal rural land rights, and registration of these rights in an official registry

However, as we discuss below, we only found studies on the first type of intervention to include in the synthesis. We excluded other types of reform from the review, including those relating to justice, capacity-building, outreach, and inheritance.

Further, informal processes may resemble the interventions described above but without statutory backing. Despite the value of informal processes of tenure recognition, this review focuses on the effects of the added value of formal registration of land rights. This decision was taken for the practical reason that effects of informal practices are less likely to be robustly and rigorously measurable and comparable, and because formal interventions are more relevant for development projects aiming to introduce and replicate effective interventions transparently and accountably.

We also excluded related justice interventions from the review (for example, paralegal, outreach, alternative dispute resolution interventions, and so on) as well as enforcement capacity interventions (for example, training of justice sector actors, digital boundary marking, and so on). Land inheritance reforms were also excluded.[1] Relevant moderating factors and mechanisms/intermediate outcomes for these interventions are likely to be

[1] Research has shown the adaptability of customary tenure to changing demographic patterns, including large-scale rural to urban migration by men, by accommodating new rules permitting the inheritance of customary land rights by widows (Lawry 1992). The availability of evidence on inheritance reforms suggests that this topic should be devoted to a systematic review in itself.

different, and analyzing them would require separate theories of change and literature searches. We had expected to find that some interventions relevant to this study would have constituted one part of a bundle of mutually supportive interventions affecting tenure, undertaken simultaneously in a given context, but in the end did not come across such bundled interventions, and therefore did not have the associated expected challenge of extracting specific effect sizes of tenure interventions.

3.1.3. Comparisons

We included studies comparing farmers and communities where formal and informal activities to strengthen land rights have been implemented to control or comparison groups where these efforts have not been undertaken. Thus, the comparison conditions are the 'status quo' property rights situation prevailing in the absence of the intervention. As is always the case with evaluation of interventions in natural field settings, our comparisons are between intervention settings and prevailing non-intervention conditions in terms of land tenure security. This implies a range of counterfactuals across studies, but nonetheless provides a suitable benchmark against which to measure impacts within a given setting. In addition, we address sources of baseline and effect heterogeneity in our analysis of effect moderation, due to characteristics related to governance, social norms and practices, land use, and market conditions.

3.1.4. Outcomes

Based on the causal chain outlined above, we examine outcomes that we classify as "final" outcomes and "intermediate" outcomes. While final outcomes form the basis of our analysis, intermediate outcomes also play an important role in our discussion, as does an analysis of causal mechanisms linking the interventions to the final outcomes. Fostering or inhibiting these changes are a number of drivers of change that impact the outcome of tenure interventions.

Final outcomes of interest include:

1. Productivity of land use, measured in terms of prevailing market monetary value (or its natural logarithm) of agricultural output, which is typically computed by multiplying farms' or households' output portfolios with prevailing market prices, or market value of the property, which is assumed to be a straightforward (that is, linear) function of the value of output that the land will sustain

2. Welfare of pre- and post-policy rights holders in terms of income/consumption or poverty, measured via prevailing market monetary value of consumption (or its natural logarithm for example, monetary value of foodstuffs and nondurables consumed in the past month, tallied using a consumption roster such as that which appears in the World Bank Living Standard Measurement household survey instrument) or regular household monetary income (or its natural logarithm)

3. Gender-based welfare outcome measures, measured in terms of variability in income/consumption or poverty, as defined above, by gender.

Intermediate outcomes of interest include:

1. Recognition of alienation rights in terms of accessing credit, which is typically measured using either an indicator for borrowing from formal institutions or the monetary value of credit received from formal lenders
2. Perceptions of tenure security, typically measured using survey questions asked to farmers about whether they fear expropriation of their land
3. Shifts in social conflict, typically measured in terms of those claiming rights to perceive the existence of conflict over rights designations or overt manifestations such as unlawful occupations or demonstrations
4. Displacement, typically measured in terms of the rate of coerced out migration from areas potentially subject to a change in tenure institutions
5. Changes in investments of personal resources into immediate production, typically measured in terms of prevailing market monetary value, based on prevailing market prices, of seasonal inputs into agricultural production such as seeds, fertilizers, and pesticides
6. Investment in longer term production (for example, large equipment, embankments or fencing, irrigation, and planting trees for growing tree crops, typically measured using either an indicator for such investments or the prevailing market monetary value of such investments), and fuller employment of land through leasing-out or sharecropping.

3.1.5. Study Types

Study designs eligible for quantitative synthesis of effects

We used quantitative studies to assess impacts on intermediate and final outcomes, focusing on counterfactual studies that compare outcomes observed at the point of intervention to those in an appropriate second context. Specifically, the review synthesizes quantitative evidence only from studies characterized by all of the following (See Appendix I):

1. (a.) Randomized experiments or (b.) quasi-experimental studies that employ strategies for causal identification with clearly delineated treated and control groups and use some method for removing biases due to non-random assignment of treatment, including regression adjustment, difference-in- differences estimation, instrumental variables regression, fixed effects regression, regression discontinuity, matching, or inverse-propensity-weighted estimation. While application of such a method is sufficient for inclusion in our study, we appreciate that not all studies apply methods for causal identification with equal rigor. Therefore, each of the included studies was also assessed in terms of “risk of bias,” as discussed below.
2. Studies that estimate the impact of either of the two interventions described above.
3. Studies that obtain measurement on at least one of the final or intermediate outcomes described above.
4. Studies that estimate impacts with outcome data measured at the individual or household level.

5. Studies undertaken in developing countries (as defined by the World Bank) and that measure outcomes at some point between 1980 and 2012.

Study designs eligible for qualitative synthesis

While this review uses evidence gathered solely from experimental and quasi-experimental research to evaluate how interventions impact final and intermediate outcomes, it also includes results from qualitative research in order to, *inter alia*, assess factors contributing to the success or failure of interventions; identify how and why intended or unintended outcomes occur; understand the context in which un/successful interventions are carried out; elucidate the views beneficiaries have of the interventions; as well as more generally broaden the evidence base and understanding of the evidence on intervention effectiveness and address effectiveness questions more specifically than might be otherwise possible (Spencer et al 2003 and Ring et al. 2011). In short, while the quantitative analysis presented below offers many yes and no answers, the qualitative section aims to move away from this narrow and rigid analysis to provide context and address possible answers to how and why interventions may or may not have been successful overall or for certain groups in particular.

Eligibility of non-impact evaluation studies was determined via a two-stage screening process to facilitate review of the most relevant studies while quickly filtering out inappropriate research based on the Critical Skills Appraisal Programme (CASP) tool (Hannes 2010; Waddington et al. 2010). The first stage screened out studies based on intervention, location, population, relevance to review questions, and study type (See Appendix IIa). The second round of screening focused on study quality based on frameworks outlined in Kuper et al. 2008, Spencer et al. 2003, and Waddington et al. 2010. Specifically this second round filter included studies with clearly defined: research objectives; links to relevant literature; context and sample selection; data collection; methods; as well as quality and relevance of analysis (see Appendix IIb).

3.2. Search methods for identification of studies

Our search included studies, and as far as is feasible, in all languages, although all studies included in our analysis were published in English. We undertook searches of the following online electronic databases from 1980:

- Agricola database
- ASSIA
- British Library for Development Studies
- CAB Abstracts (this section of the search was conducted by IDCG TSC)
- EconLit (this section of the search was conducted by IDCG TSC)
- Econpapers
- ELDIS
- FAO Gender & Land Rights Database
- Google Scholar (for both subject searches and citation searches of included studies)
- HeinOnline
- International Bibliography of Social Science (this section of the search was conducted by IDCG TSC)
- JOLIS
- Networked Digital Library of Theses and Dissertations
- OpenGrey

- PAIS
- Web of Science (for both subject searches and citation searches of included studies – this section of the search was conducted by IDCG TSC)

Our searches were based on key terms in the titles and abstracts, and were supplemented by thesaurus terms used by individual databases, where appropriate.

1. land.ti,ab.
2. (tenure or right* or property right* or conversion or freehold* or titl* or codification or recognition or customary or certification).ti,ab.
3. (impact* or evaluat* or effect* or experiment* or trial or random* or quasi* or natural experiment* or discontinuity or fixed effect* or regression or difference in differences or instrumental variable* or matching or inverse propensity weight*).ti,ab.
4. (alienat* or collateral or credit* or secur* or conflict* or dispute* or violen* or displac*).ti,ab.
5. (qualitative or findings or interview* or themes or experience).ti,ab.
6. 1 AND 2 AND 3
7. 1 AND 2 AND 4 AND 5

In addition to the electronic database searches, we searched for grey literature from leading institutions working on land tenure, published from 1980, including the following, :

- University of Wisconsin Land Tenure Center
- International Land Coalition
- Think tanks such as PLAAS, AIAS, TEGEMEO Institute, ASARECA.
- Reports from key national donors such as USAID, DFID, GTZ/GIZ, and AFD.
- USAID Land Tenure & Property Rights portal.
- Reports from international development organizations such as the CGIAR group,
- FAO, IIED, IFAD, and the World Bank.

These searches were supplemented by bibliographic snowballing and hand searches of the following key journals back to 1980:

- African Development Review
- Agricultural Economics
- American Economic Journal: Applied Economics
- American Economic Review
- American Economic Review: Papers and Proceedings
- American Journal of Agricultural Economics
- Development in Practice
- Economic Development and Cultural Change
- Econometrica
- Economics and Politics
- Journal of African Economies
- Journal of Agrarian Change
- Journal of Development Effectiveness
- Journal of Development Studies
- Journal of Development Economics
- Journal of International Development

- Journal of Political Economy
- Journal of Public Economics
- Land Economics
- NBER Working Papers
- Proceedings of the National Academy of Sciences
- Oxford Economic Papers
- Quarterly Journal of Economics
- Review of Economics and Statistics
- World Bank Research Observer
- World Bank Economic Review
- World Development

3.3. Data collection and analysis

3.3.1. Data extraction and management

Each article returned from the database searches was screened for eligibility by Mtero and Hornby, with disagreements resolved by another project investigator– either Hall, Lawry, Leopold, or Samii. For studies meeting the inclusion criteria laid out in section 3.1 of this review, data were extracted on the studies and their findings. (The set of items were adapted from Waddington, et al 2010). The extraction was done by two trained research assistants with Samii and Leopold providing guidance in cases that were ambiguous or difficult to code.[2] The following table lists data that were extracted from each of the included studies:

Table 1:

General Information:	Authors, author affiliations, publication date, publication type
Quantitative inclusion criteria	Indicators for whether each of the five quantitative inclusion criteria are met (cf. Appendix II for coding)
Intervention:	Indicator for whether the study looks at conversion interventions, certification interventions, both, or as part of a larger bundle of interventions. Date of intervention. (cf. Appendix II for coding)
Study design:	Experimental, quasi-experimental, or qualitative. For quasi-experimental, the method used to address bias from non- random assignment. For quantitative studies, dates of data collection, unit of data collection (individual, household, community), numbers of treated and control units included in the analysis, numbers of treated and control units subject to the intervention. (cf. Appendix II for coding)
Context:	Year, country, region/province/area within country. (cf. Appendix II for coding)

[2] Given the volume of studies, resources and time available did not permit double-coding of data. Rather, the quality of coding was assured by Samii and Leopold's review of coding results.

Effects on intermediate outcomes	For quantitative studies, estimated effects on any of the intermediate outcomes listed above. Metrics that we used are discussed below. For all studies, quotes from the study on how the intervention seems to have affected any of the intermediate outcomes listed above were extracted.
Effects on final outcomes	For quantitative studies, estimated effects on any of the final outcomes listed above. Metrics that we used are discussed below. For all studies, quotes from the study on how the intervention seems to have affected any of the final outcomes listed above were extracted.
Moderators	The causal chain outlined above also suggested we collect data on the following moderators: 1. Governance environment, particularly concerning whether pre-policy tenant communities are well represented in institutions that control land rights policies. We proxied this quantitatively using the Polity IV score for the year of the study (Marshall et al., 2011). 2. Land use environment, and specifically whether the land is mixed-use (e.g., pastoral/agricultural or forested land, and whether cash crop and subsistence farming co-reside) and the types of cash crops produced on the land. We coded studies according to whether land was subject to mixed use (pastures and forests), and whether cash crops were grown in the period and location of the study. We also collected data on population density in the study area, or where not available, approximated this using the relevant country-period population density using the World Bank's World Development Indicators. 3. Market context, including access to credit markets and access to buyers' markets for cash crops. Market conditions were proxied quantitatively using GDP per capita.[3] 4. Social norms and practices, specifically ways in which gender, age, community standing, and other characteristics influence the other three moderating factors and individuals' ability to interact with interventions in a particular social context. We proxied social norms and practices by geographical region. Quantitative measures of these moderators, as discussed above, were obtained from auxiliary data sources and included in the meta-analysis dataset alongside the respective effect estimates.

[3] We initially sought to use the World Bank's "Findex" indicators for credit access (Demirguc-Kunt & Klapper, 2012). However, the Findex indicators were only available for years starting in 2011, which meant they would provide a highly distorted picture if used to characterize country cases that were included in the synthesis, given that the interventions typically took place many years or even decades before 2011.

3.3.2. Assessment of risk of bias in quantitative effectiveness studies

Quantitative effectiveness studies that met our inclusion criteria were coded in terms of risk of bias in estimating impacts. Risk of bias was assessed using the IDCG Risk of Bias Tool (March 2012 version). These methods are based on guidance from Higgins and Green (2011), Campbell Collaboration (2011), and Cochrane Effective Practice and Organization of Care Group (2009), suitably adapted to development interventions (for example, accounting for the fact that blinding is nonsensical for interventions such as changes in land property rights). The quality ratings reflect the following domains:

1. Potential for selection bias due to non-random assignment, non-exogenous source of quasi-experimental variation in assignment, no adjustment for differences in baseline measurements
2. Potential for spill-over, non-intervention based differences in treatment, or other types of interference across intervention and non-intervention units
3. Selective outcome and analysis reporting based on systematic differences between reported and unreported findings
4. Potential bias due to non-compliance, attrition, or otherwise missing data
5. Other sources of bias

For each study, and following the detailed protocol in the IDCG Risk of Bias Tool, we coded "yes", "no", or "unclear" as to whether the design or analysis was susceptible to biases in each of these domains.

3.3.3. Measurement of treatment effect

For outcomes measured in terms of monetary value (for example, productivity, value of credit received, and consumption), studies usually report treatment effects on the scale of the natural logarithm. When this is the case, we carry out our quantitative analysis in monetary terms as well. One may convert such treated effect estimates into percentage changes by exponentiating, which we do in our discussion for ease of interpretation. When natural logarithms were not used (for example, for value of credit received), we use a standardized difference that standardizes the outcome relative to the control group standard deviation– "Glass's delta," which is a commonly used standardized effect size in economics because it specifies the treatment effect in terms of the no-treatment regime "counterfactual" outcome distribution (Kling et al., 2007). In cases where such standardization is applied, treatment effects are reported on the scale of control group standard deviations.

Another type of outcome typically reported is binary (for example, indicators for long term investment, perception that land is vulnerable to expropriation, and formal borrowing). For binary outcome measures, the standard in economics is to estimate and report treatment effects in terms of absolute changes in probability or percentage point changes (or, in the language of health sciences, "risk differences").[4] Such estimates are either from linear probability models on a treatment indicator or so-called "marginal effect" estimates computed as a difference in predicted probabilities when the treatment indicator is switched from zero to one in a logit or probit regression model, typically holding all other regressors at

[4] We understand that in other disciplines, the convention is to report effects on binary outcomes in terms of risk ratios or odds ratios. Such quantities are not typical of studies in economics (cf. Angrist and Pischke, 2009, chap. 3), and because the reference discipline for this review is economics, we prefer to communicate findings in a way that will be readily interpretable to our target audience.

their mean values (or modes, for binary regressors). We abide by this convention in the analysis that appears in the main text, although an appendix contains additional analyses using the natural logarithm of the risk ratio, a measure of treatment effect on binary outcomes that tends to be preferred on mathematical grounds in the meta-analysis literature.

When a study included multiple estimates of the same treatment effect, we used the one judged to have minimal risk of bias. Making such judgments cannot necessarily abide by simple rules and requires expert judgment on a case-by-case basis. In our case, such judgments had to be applied to a set of studies that relied on the conditional independence assumption ("CIA", Angrist and Pischke, 2009,. 52-59). CIA-reliant studies include most regression or matching studies. In CIA-reliant studies, the minimal risk of bias estimate can typically be considered to be one that includes the most covariates, and for matching studies the one that achieves acceptable "balance" on the largest number of covariates, although even this rule is complicated by the possibility of "bias inflation" that arises when one (i) controls for variables that do not predict the outcome well under (ii) unobservable CIA violations (Bhattacharya and Vogt, 2007). For such CIA-based studies, without the ability to assess the potential for bias inflation due to hidden CIA violations, we elected to choose the estimate based on either the regression fit with the largest pre-treatment covariate set with no post-treatment variables included or the matching fit that achieved the best balance on the largest set of pre-treatment covariates and excluded post-treatment covariates. Conditioning on post-treatment covariates was deemed to increase risk of bias (Rosenbaum, 1984).

Some of our cases cannot be considered as independent insofar as they estimate effects for the same intervention over the same time period (within one year) in the same location, albeit with different analysis samples. This applies to studies that we include from Ethiopia 1998-2006, Ethiopia 2003-2006/7, Nicaragua 1981-1998, Peru 1992/3-2004, and Vietnam 1993-2004/6. We use a hierarchical approach where, in the first step, we aggregate the estimates from such sets of overlapping studies into single inverse-variance weighted random effects mean. Then, in the second step, we perform the meta-analysis across cases using these synthesized estimates along with the estimates from the non-overlapping cases in the quantitative analysis.[5]

Another point worth emphasizing is the fact that in all of the studies considered, treatment effect estimates are "conditional" insofar as they are derived from regression or matching models that include control variables that vary from study to study. Under the assumption that the requisite conditional independence assumptions for causal identification are met, the problem that covariate control presents is one of vagueness in the nature of the "effective sample" that gives rise to the effect estimate (Angrist and Krueger, 1999; Aronow and Samii, 2013), although when one cannot reasonably consider the identifying assumptions to be met, then such points are moot, and the study clearly ought not to be included in the synthesis. The mechanics of covariate control in regression are such that units are weighted in a differential manner depending on the relationship between the covariates and the treatment variable. As such, the resulting effect estimate is not constructed from equal contributions from each sample unit. Given that effects are likely heterogeneous from unit to

[5] This is an approximation to a fully hierarchical analysis that would attempt to fit the within-case and between-case distributions simultaneously (Gelman et al., 2012; Lunn et al., 2013). The consequence of fitting separately is that we are unable to "borrow strength" across cases, resulting in higher variance though with no cost in terms of bias.

unit, this implies that such effect estimates are consistent for the average effect of some distorted version of the sample or population under consideration.[6]

3.3.4. Unit of analysis issues

While many of the studies reported results from individual-level data but cluster-level treatments, all were judged to have applied appropriate adjustments to account for clustering– namely, the use of cluster-robust covariance estimators when treatment was at the cluster level (Angrist and Pischke, 1999, Ch. 8) and so no additional adjustments were applied.

3.4. Data synthesis

3.4.1. Quantitative synthesis

We found considerable heterogeneity in the manner in which intermediate and final outcomes were measured. Nonetheless, we were able to find comparable measures for impact estimates on a number of intermediate and final outcomes and were therefore able to carry out a quantitative synthesis (Campbell Collaboration, 2011, 8-10; Rothman et al., 2008, 675-677). By "comparable measures" we mean that studies were reporting treatment effects on outcomes measured by an identical or nearly identical operationalisation of one of the final or intermediate outcomes of interest, as described in section 3.1.4, on a scale that was either common or allowed for straightforward conversion to a common scale.[7]

Because of high inter-study heterogeneity in effect sizes, we used random effects synthesis and random effects meta-regression on moderator variables.[8] In our causal chain, we proposed that the following contextual variables would likely moderate the effectiveness of tenure recognition:

- Governance conditions, proxied here by Polity IV democratic governance scores[9], an index ranging from 0 to 10 (least to most democratic, respectively)

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[6] For this reason, it is not generally valid to use summary statistics from the nominal sample as the basis of moderator analysis when working with conditional effects computed via multiple regression.

[7] For measures that get at arguably comparable concepts but measure effects using very different operationalisations, one may be tempted to use a scale-free "standardized effect size." However, in cases when mappings across different operationalisations of a concept are unclear, likely to be non-linear, and may even result in different effect directions altogether, such an exercise has little face validity and the results are very difficult to interpret. This is in addition to the problems of using standardized effect sizes more generally, including possibly pathological reversals of effect magnitude rankings for reasons that have only a mathematical and no substantive justification (Greenland, 1987).

[8] Random effects estimators weight each effect estimate by the inverse of the sum of the estimated effect size variance and residual between study variance. We produced our random effects estimates using the random effects and mixed effects meta-regression functions in the "metafor" package in R (Viechtbauer, 2010). Various methods are available for fitting random effects and mixed effects models; the results presented are based on fits via the empirical Bayes method programmed into metafor. Results were nearly identical using other then available methods. In the random effects estimation, the metafor estimates take the estimate of the residual between study variance (tau) to be the true value with no sampling variability. To account for uncertainty in these effect estimates, we apply the Knapp and Hartung (2003) post-hoc adjustment to the reference distribution used to compute *p*-values and construct confidence intervals. For predictive intervals, we follow Higgins et al. (2009) and use a *t*-distribution (with degrees of freedom equal to the number of studies minus 1) as a post-hoc adjustment to the normal approximation to account for uncertainty in tau.

[9] Available from http://www.systemicpeace.org/polity/polity4.htm.

- Social norms, proxied by indicator variables for the region of the world (Latin America, Middle East/North Africa, South Asia, Southeast Asia/Oceania, or sub-Saharan Africa)
- Market conditions, proxied here by general income levels, measured in terms of GDP per capita, from the World Bank Development Indicators dataset[10]
- Land use, proxied by rural population density, measured as the number of agricultural households per square kilometre of agricultural land, from the World Bank Development Indicators dataset; an indicator variable for cash crop farming determined on the basis of information given in each study; and an indicator variable for mixed land use determined on the basis of information given in the study.

Because of the heterogeneity in the times between intervention and assessment, we also include years since intervention in the moderator analysis as a control variable. We were able to code these moderator variables for all of our studies (and so there was no missing data).

Given the low number of studies, we only performed bivariate meta-regressions of effect estimates on moderators. Moderators were deemed to be significantly associated with effect heterogeneity if the bivariate meta-regression yielded statistically significant coefficients at the 95% level or above. We assess the extent of spuriousness in the bivariate random effects meta-regressions, operating within our set of moderators, by evaluating correlations between moderator variables. The random effects meta-regressions weigh each study by the inverse of the sum of the within-study effect variance and the between study residual variance, with the latter estimated via empirical Bayes (Viechtbauer, 2010). If the bivariate results show significant associations for two variables, but those two variables are significantly correlated, then we cannot distinguish whether the results for one or the other moderate are spurious. Finally, we assessed publication bias via funnel plots and funnel plot regression (Egger et al., 1997).

3.4.2. Qualitative synthesis

Once appropriate studies had been identified using the two stage CASP style criteria outlined in 3.1.5.2 and found in Appendixes IIa and IIb, we used the qualitative metasummary methodology pioneered by Sandelowski and Barroso (cf. Sandelowski et al. 2007; Voils 2008) to analyze our results. This methodology has been termed an "aggregative" approach in that it focuses broadly on quantitatively identifying the frequency of qualitative results found in the research, and is not used to synthesize concepts or create lines of argumentation (Voils et al. 2008).

Metasummaries involve a five stage process to process and evaluate findings: extraction of findings from the research; grouping them into categories; abstracting diverse findings into 'themes' with a comparable and coherent format; establishing the frequency and intensity of findings; and presenting and interpreting results. During extraction of findings, care was given to ensure that these were separated from: data presented as evidence in the research; conclusions of other work used to support findings; methods used to arrive at findings; and elaborations on the relevance of findings. Creating a matrix of findings grouped by topic and similarity to one another enabled us to better compare results among disparate studies and elucidate possible trends or relationships. Carefully abstracting findings improved

[10] Available from http://data.worldbank.org/data-catalog/world-development-indicators.

comparability by removing unnecessary context and detail while preserving their complexity and helped to reveal overarching trends and other important insights, while calculating frequency and intensity of findings helped to respectively understand the relative magnitude of findings and which studies contributed most or least to our overall sample of findings (Sandelowski et al. 2007; Voils et al 2008). While the findings are presented below in section 6, their discussion and analysis in the context of the larger set of quantitative findings is found in section 7.

4. Search Results

The searches were carried out in October 2012 and the non-impact evaluation, or qualitative, results were revisited again in July of 2013 after feedback on an initial draft of the report. Searches yielded 27,632 results for the quantitative component of the review which were screened using our search criteria (see previous chapter and Appendix I), and narrowed down to 90 for full-text screening. Of these, 70 were then excluded based on our eligibility criteria (see table 1 and figure 2), with 20 remaining for inclusion in our study.

Table 2: Reasons for study exclusion after full text analysis

Experimental and quasi-experimental studies: reasons for rejection (not exclusive)	Number	Percent
Did not study a clearly defined and relevant tenure intervention or policy change	43	81%
Did not assess an outcome of interest	5	6%
Did not assess outcomes at appropriate level of analysis	2	2%
Did not examine a developing country	0	0%
Did not provide adequate methodological information	4	6%
Did not use acceptable experimental or quasi-experimental method	11	9%

Non-experimental and qualitative studies: reasons for rejection (not exclusive)	Number	Percent
Did not study a clearly defined and relevant tenure intervention or policy change	52	22%
Did not assess an outcome of interest	53	22%
Did not offer qualitative analysis	72	30%
Did not examine a developing country	0	0%
Did not provide post-intervention analysis	5	2%
Was not based on primary research	35	15%
Did not assess outcomes at appropriate level of analysis	21	9%

The qualitative side of the search proved more challenging as titles and abstracts garnered from the various search results only rarely indicated directly whether a report or article would contain qualitative information relevant to our study. Hence the search team was faced with a decision to either screen the full texts of potentially thousands of studies or to approach the search more strictly, using only information in titles and abstracts to discern initial relevance based on the inclusion criteria in appendices IIa and IIb. It was decided to use the latter method for reasons of practicality and also because the non-experimental portion of this study was never meant to be a full systematic review in and of itself, but rather aims to provide context for the experimental intervention analysis. This approach resulted in a corpus of 262 studies for full text screening out of an initial 7,198 search results. A further challenge was the lack of explicit methodologies used by researchers in the vast majority of studies (often including nothing more than brief discussions on sampling techniques), forcing us to broaden our inclusion criteria to include studies with implicitly, rather than explicitly, sound methods. While every effort was made to include all relevant studies, a final concern was that many tenure interventions outcomes do not have to do with the economic

outcomes on which this study focused, and on which our search criteria were based. Therefore, some important social outcomes are likely incompletely represented in our review. Nine studies made it through this process into the analysis (see table 1 and figure 3).

Figure 2: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram for Quantitative Search and Screening

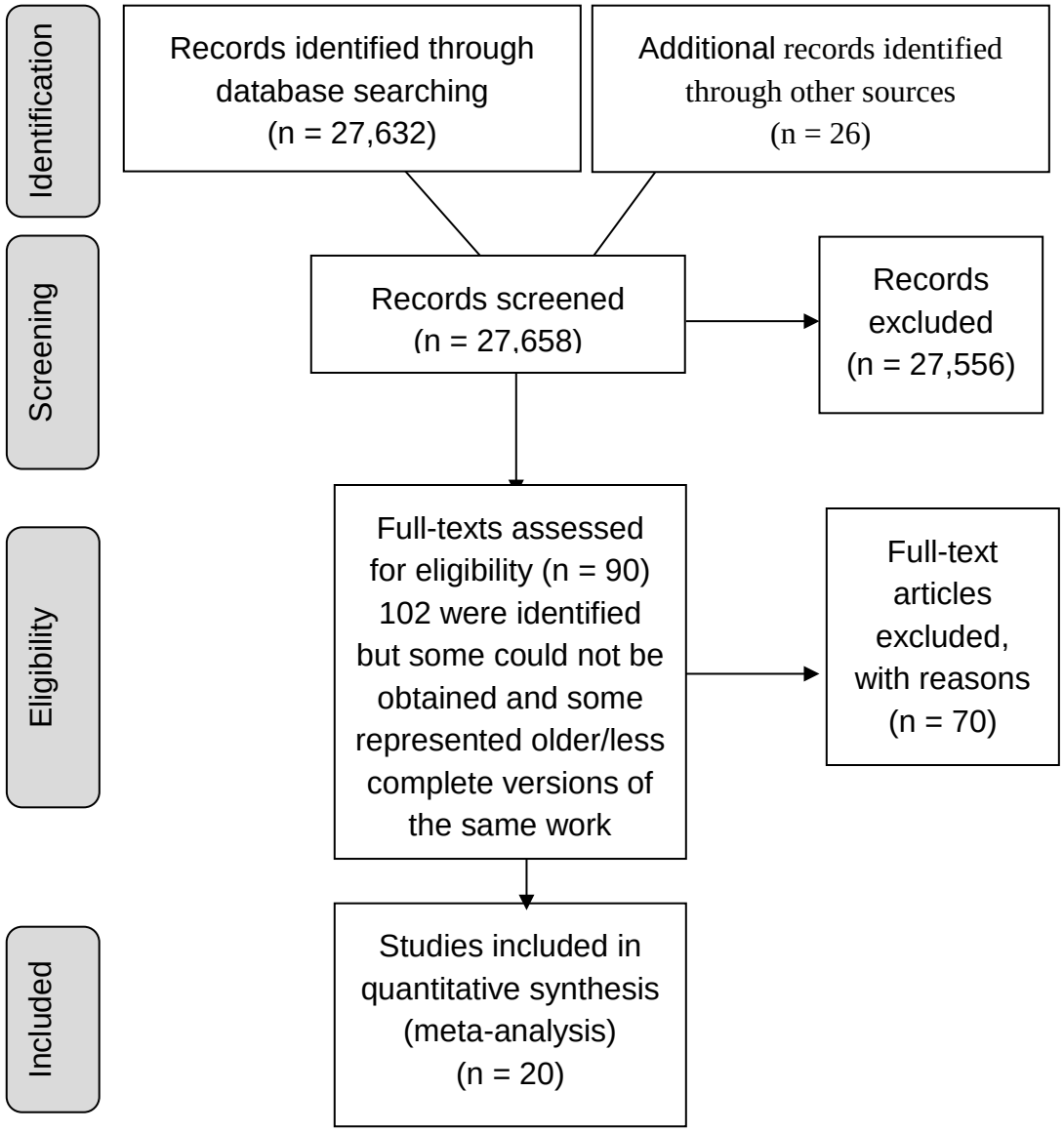
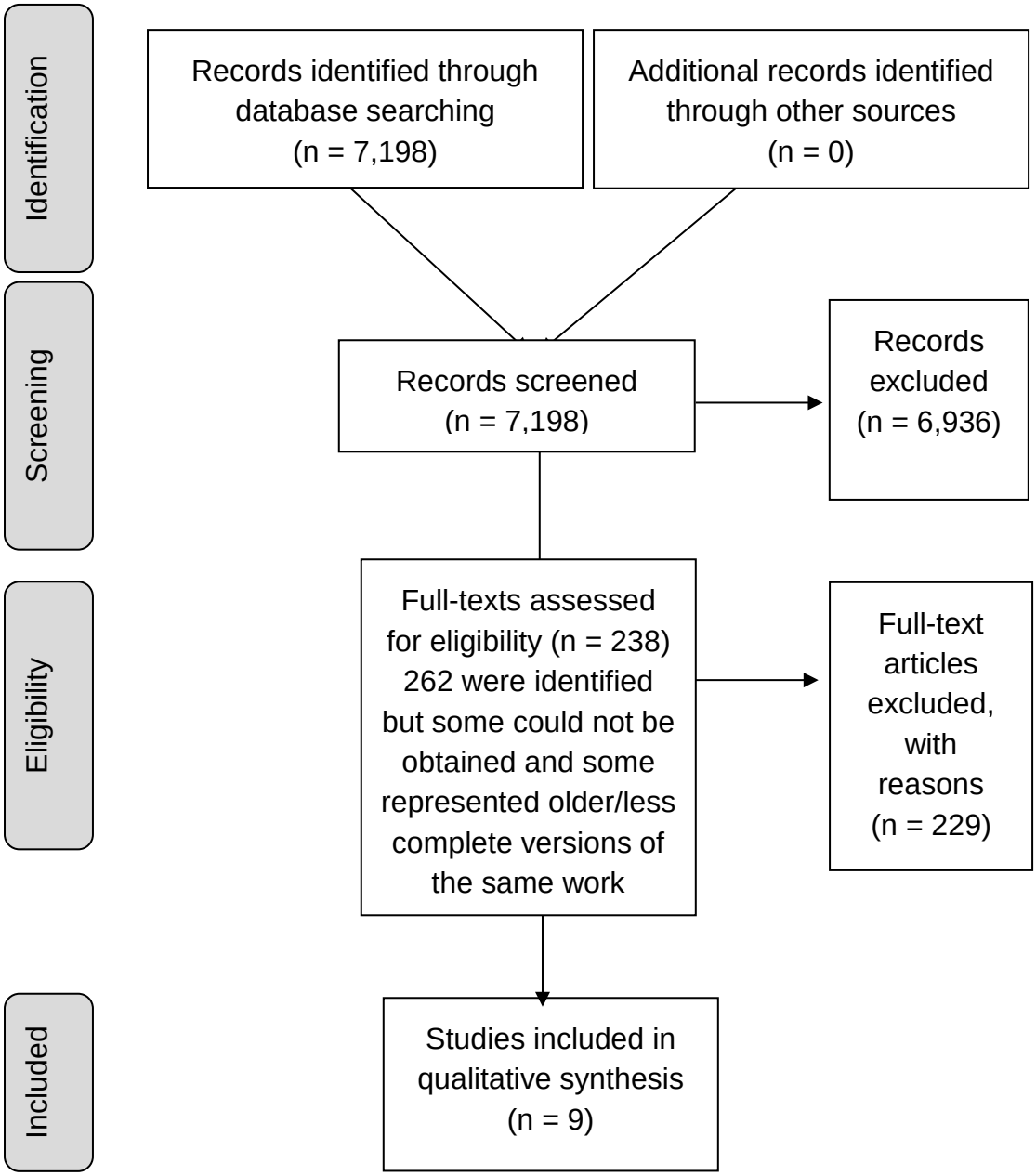


Figure 3: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram for Qualitative Search and Screening



5. What does the quantitative evidence say?

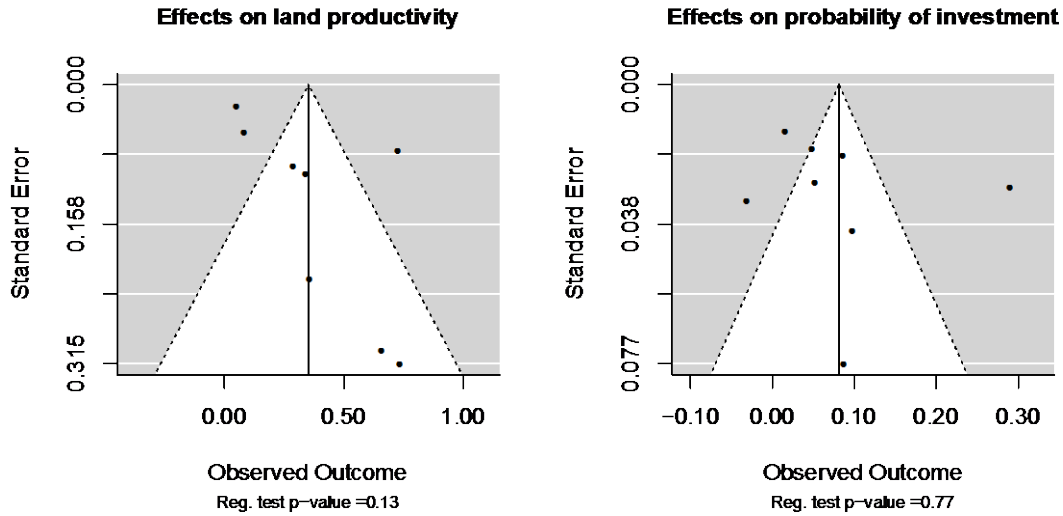
In this section, we assess the quality of the quantitative evidence base and synthesize findings on the effects of land tenure interventions. We were only able to find quantitative studies of adequate quality on the effects of freehold titling. We did not identify any eligible quantitative studies on the effects of statutory recognition of customary tenure arrangements on farm level productivity, investment, or income. In addition, we did not find any eligible studies assessing effects of land tenure interventions on displacement, conflict, or other outcomes associated with both "winners" and "losers" in such reforms. The first section below evaluates the methodological quality of the evidence base, while the second section synthesizes the quantitative evidence.

5.1. Assessing the quantitative evidence base

We demonstrate that there are some reasons for concern about the methodological quality of the quantitative evidence base. This includes reason for concern about how well selection and spill-over biases were controlled. These potential biases are not so severe as to have us discard the evidence, but they do make us think that the evidence base may overstate the beneficial effects of tenure recognition. With respect to publication bias, Figure 6 displays funnel plots of the productivity and long-term investment effect estimates. The regression test fails to reject the null of no publication bias, however the presence of the two, large, positive effects with large standard errors (bottom right of the productivity graph) is quite typical for situations where low powered tests are screened for statistically significant positive effects (Gelman and Weakliem, 2009). The fact that so many estimates reside outside the confidence region on each plot is indicative of the high degree of heterogeneity.

Figure 4

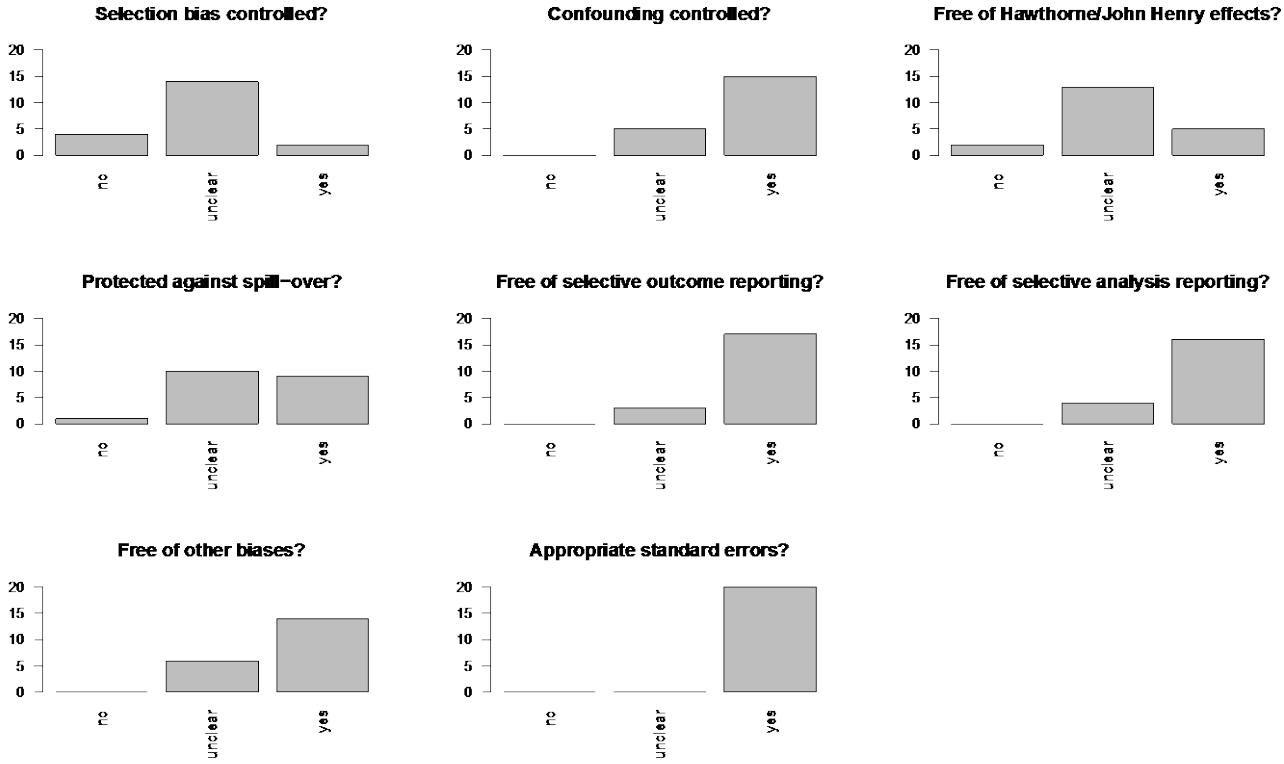
Figure 5: Reasons for study exclusion after full text analysis



Another way to assess the reliability of the quantitative evidence is to evaluate each study's research design in terms of "risk of bias." To do so, we coded studies using the Campbell Collaboration IDCG Risk of Bias Tool. The results of this coding are shown in Figure 8. As the coding indicates, a weakness of these studies is that they tended to provide little clarity on why certain households or land parcels received tenure recognition while others did not

and therefore leave as unclear the extent of selection bias that may be present (the top left histogram in Figure 7). Indeed, out of the twenty studies, only a handful attempted to provide clarity on this point. For example, Ali et al. (2011) discussed how the programme that they were evaluating was a geographically-limited pilot by the Rwandan government. As such, they were able to use a geographic discontinuity design to minimize the threat from potential selection biases. As another example, Do & Iyer (2007) explained that the variation in access to tenure recognition was due to phased province-level implementation of tenure recognition policies in Vietnam. This allowed them to use a difference-in-differences design that reduced possible taint due to selection biases. The modal research design among these studies was to take a random sample of parcels or households, and then use a regression analysis or perhaps matching method to control for potential confounders. (Nearly all studies clearly tried to address confounders, as shown in the second histogram on top of Figure 7.)

Figure 6: Distribution of studies according to IDCG Risk of Bias criteria.



Such confounder control is crucial. But without marrying such control to a clear explanation for how tenure recognition status might differ even if two households or land parcels resemble each other in terms of confounder variables, concern about selection biases remain. In particular, one is left to wonder whether factors that determine households' or producers' expected gains from tenure recognition continue to confound the analysis even after controlling for a variety of background factors. If that were the case, then the positive effects suggested by the studies would overstate the real impact. Finally, the studies did little to dispel concerns about spillover effects. Spillovers may be a problem if, for example, households with de jure tenure rights increase production and then crowd out neighbours without recognized tenure. Such spillover effects would result in estimates that, again, overstate the gains from extending tenure recognition to more households.

5.2. Synthesis of quantitative evidence

The quantitative evidence on the effects of freehold titling on farm level investment, productivity, and incomes is mostly consistent with conventional economic theories of property rights. The evidence indicates clear benefits measured in terms of productivity and consumption expenditure or income, and suggests that long-term investment and increases in perceived tenure security are plausible channels through which tenure recognition may contribute to welfare. The credit channel finds no support, although the evidence base is very thin. When looking at contextual factors that moderate the effects of tenure recognition, we find that gains in productivity are significantly greater outside Africa and in wealthier settings, although strong correlation between the two makes it impossible for us to determine whether this is a "wealth effect" or "Africa effect" per se. By "Africa effect," we refer to the fact that most farms in sub-Saharan Africa are held under customary tenure arrangements, which generally provide long-term tenure security to qualified members of land-holding families, groups or communities. As such, customary tenure may provide a level of pre-existing tenure security without formalization, something that is not typical in Latin America or elsewhere. As a result, gains to formalization in Africa may be more limited because tenure insecurity, which formalization seeks to remedy, is often not present to the degree that the designers of reform programs assume. The evidence base is too thin to say how productivity and investment effects are moderated by our other contextual factors of interest, including length transpired since the intervention, levels of democratic governance, population density, agricultural systems, or cash crops. The quantitative evidence base has very little to say about consequences of such policies for social outcomes like displacement, conflict, or gender equality. While we were unable to report on quantitative effects of these outcomes due to a lack of useable data, these issues are considered in the qualitative section below. Thus, while tenure recognition appears to improve land productivity and the material welfare of those who have access to registered land, we do not have a clear sense of the dynamics that follow from such policies in terms of overall access to land.

Twenty studies were included in the quantitative synthesis after applying the inclusion criteria specified in section 3.1. Appendix III and Figure 4 show the basic characteristics of the cases that these studies covered. The studies examine outcomes in rural areas in a variety of lower and lower-middle income countries across Latin America, South Asia, East Asia, and Africa. The studies vary markedly in the time between the intervention or reform and assessment of outcomes: the shortest such period is two years while the longest is 44. All of the cases included examination of various forms of certification or de jure recognition of individual land tenure. In some cases, different modalities of tenure recognition were examined. However, the manner of presentation in the papers limited how much use we could make of these different comparisons. For example, Foltz et al. (2000) studied the effects of various forms of titling, but the manner of presentation of their results was such that we could only use the "no title" versus "full-title" comparison. The precise comparisons that we use in the synthesis are described in the eighth column of Appendix III. Even though we were interested in de jure recognition of communal tenure, we failed to locate any rigorous quantitative studies on the subject.

Figure 4 shows how the cases are distributed over three key contextual variables: rural population density, levels of democratic governance as assessed by the "Polity IV" index (Marshall et al., 2011), and income level. The values on these variables are set with respect to the date that the programme or intervention under study began. For reference, the gray histograms show the current global distribution on these indicators. Population density is an

indicator of stresses on land; the cases included in the quantitative synthesis are diverse on this score. Representative institutions are presumed, in our causal chain, to help ensure that rural landholders benefit from transformative policies such as tenure reform; again, the cases included in the synthesis are diverse with respect to this measure of democratic governance. Income is an indicator for the size of markets as well as the quality of institutions. By construction, the study is limited to lower and lower-middle income countries. But taking this into consideration, the cases are still quite diverse in their income levels.

Appendix III also provides a very basic summary of the nature of the estimated effects on the outcomes of interest, including both the intermediate outcomes in our causal chain as well as final outcomes (see section 3.1.4). For some of these outcomes, the available quantitative evidence is substantially lacking; this is true for perceived tenure insecurity, social conflict, gender based variations in welfare effects, short term investments, and displacement, for which no evidence at all is reported across these cases.

Figures 5a through to 5e provide a more rigorous assessment of the evidence on the effects of de jure recognition of tenure. They show forest plots of effect estimates for six outcomes that were measured in ways that allowed for inter-study comparisons. (See section 3.4.1 on how we establish comparability.) The plots are ordered as per our discussion of variable operationalisations in section 3.1.4. The forest plots show the point estimates (black squares) and 95% confidence intervals for each study (horizontal line segments crossing through the black squares). These effects are grouped from top to bottom by region. At the bottom of each plot is a black diamond showing the random effects mean of the estimated distribution of treatment effects and its 95% confidence interval. The hollow diamond shows the 95% predictive interval for the distribution of treatment effects. The random effects mean can be interpreted as the estimated centre of the distribution of treatment effects for a population of study contexts that resemble those included in our analysis. The predictive distribution is our estimate of where 95% of treatment effects estimates are expected to reside from this population (Higgins et al., 2009). (See section 3.4.1 for details on the models and methods used to produce these estimates.) A vertical black line references a null effect. The I^2 statistic displayed at the bottom left is a measure of heterogeneity across effects, with current convention being to interpret the statistic as follows (Higgins and Green, 2011, section 9.5.2),

- 0% to 40%: heterogeneity might not be important;
- 30% to 60%: may represent moderate heterogeneity;
- 50% to 90%: may represent substantial heterogeneity;
- 75% to 100%: may represent considerable heterogeneity.

In cases where there were only two effect estimates available from our set of studies (that is, for the effects on formal credit obtained, and perceptions of land expropriation), we simply plot the effect estimates, as these cases provide too little information to reliably characterize a treatment effect distribution.

For final outcomes, the available evidence suggests substantially beneficial effects on average from de jure recognition of tenure. The available evidence suggests that de jure recognition of tenure boosts productivity (Figure 5a), as measured in terms of the monetary value of land productivity, by around 40 per cent on average (*random effects mean=0.35, s.e.=0.10, exp(mean)=1.42*). This is a substantively huge effect, although this estimate masks substantial heterogeneity, and the predictive 95% interval crosses zero. Figure 5b shows that the average effect on welfare, as measured by consumption or income, is about

a 15 per cent increase (*random effects mean=0.14, s.e.=0.04, exp(mean)=1.15*). In this case the 95% predictive interval is squarely in the positive domain, and the level of heterogeneity is deemed quite low.

As far as mechanisms go, the available evidence provides little to indicate an operative causal pathway via the credit access effects, although there is some evidence to suggest an active pathway through tenure security and investment effects. Figure 5c shows that there exists no consistent evidence to indicate either a positive or negative effect of de jure recognition of tenure on either the probability of formal borrowing or the amount of formal credit obtained. On the other hand, the two studies that did assess perceptions of tenure security each found the de jure recognition reduced the probability that a farmer respondent believed that his/her land would be subject to expropriation in the near future (in this case, the negative estimates are indicative of a beneficial effect). We have more evidence to evaluate the long-term investment channel, and this evidence is displayed in Figure 5e. On average we find that de jure recognition of tenure increases the probability of long-term investment by about 5 per cent (*random effects mean=0.05, s.e.=0.02*), although the 95% predictive interval crosses zer

Figure 7: Distribution of the cases over key background characteristics. The gray distributions in the background show distributions of current rural population density, governance, and income levels (sources: World Bank Development Indicators, Polity IV data, and Maddison Project income data).

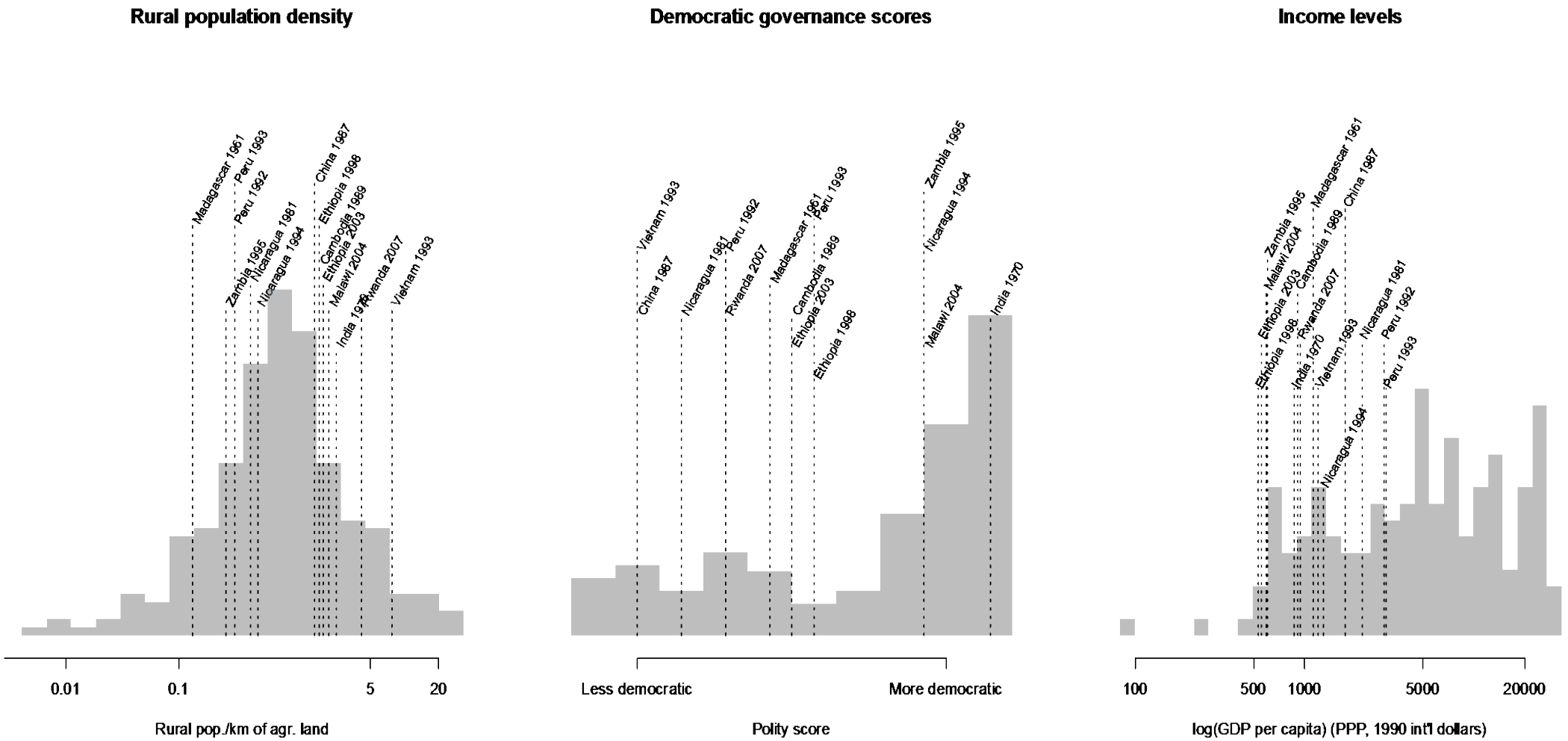


Figure 5a: The forest plot shows estimates of the effect of de jure recognition of tenure on the monetary value of land productivity (log scale). See section 3.1.4 for operational definitions of the outcomes. Moves to the right on the x-axis indicate beneficial effects. See section 3.4.1 for details on the random effects model used to produce the random effects mean, predictive interval, and I2 measure of heterogeneity.

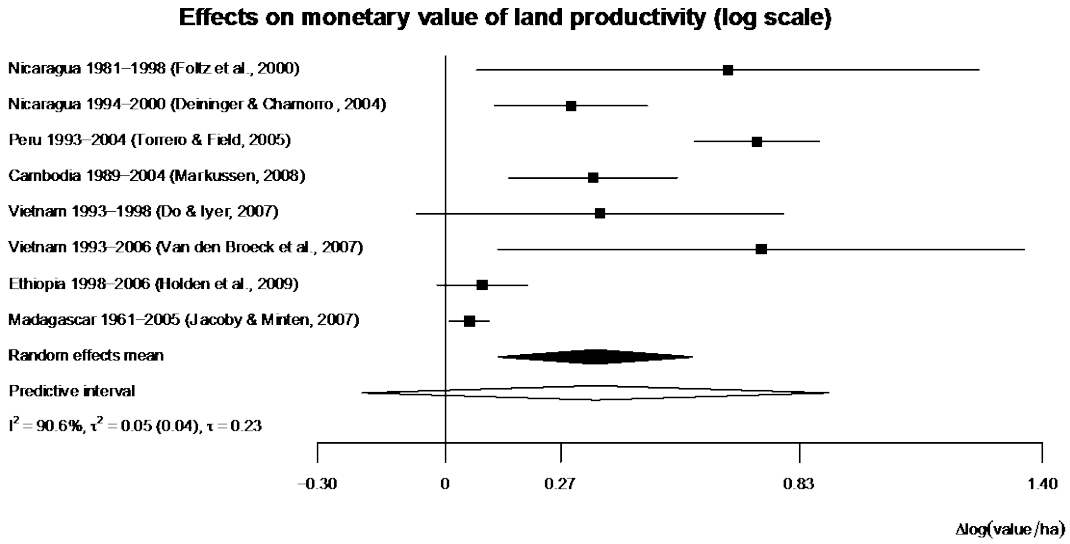


Figure 5 b: The forest plot shows estimates of the effect of de jure recognition of tenure on the monetary value of consumption or income (log scale). See section 3.1.4 for operational definitions of the outcomes. Moves to the right on the x-axis indicate beneficial effects. See section 3.4.1 for details on the random effects model used to produce the random effects mean, predictive interval, and I2 measure of heterogeneity.

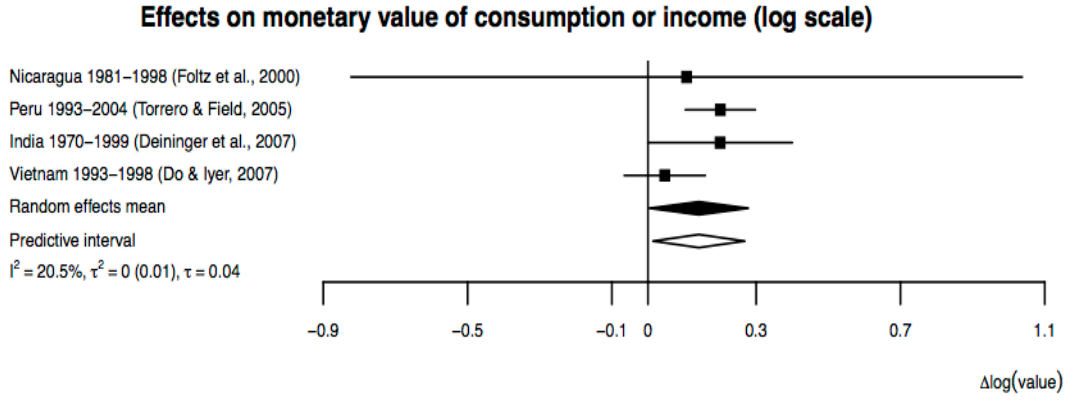


Figure 5 c: The two forest plots above show estimates of the effect of de jure recognition of tenure on the probability of formal borrowing (top, risk difference scale) and the amount of credit received (bottom, measured in terms of control group standard deviations). See section 3.1.4 for operational definitions of the outcomes. Moves to the right on the x-axis indicate beneficial effects. See section 3.4.1 for details on the random effects model used to produce the random effects mean, predictive interval, and I2 measure of heterogeneity. An analysis of the probability of formal borrowing using the log risk ratio appears in the appendix.

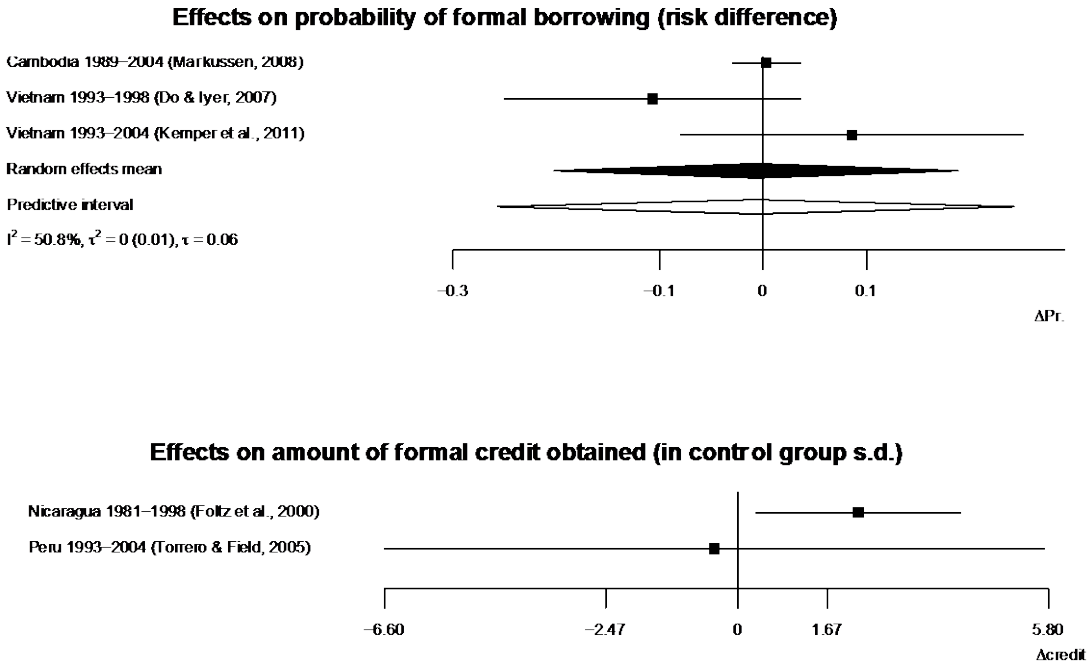


Figure 5 d: The forest plot above shows estimates of the effect of de jure recognition of tenure on the farmers' perceptions that their land may be expropriated in the near future. See section 3.1.4 for operational definitions of the outcomes. Moves to the left on the x-axis indicate beneficial effects (a reduction in the perceived risk of expropriation). See section 3.4.1 for details on the random effects model used to produce the random effects mean, predictive interval, and I2 measure of heterogeneity. An analysis using the log risk ratio appears in the appendix.

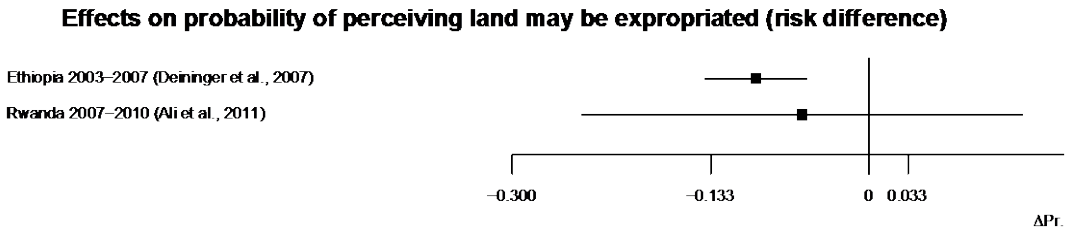
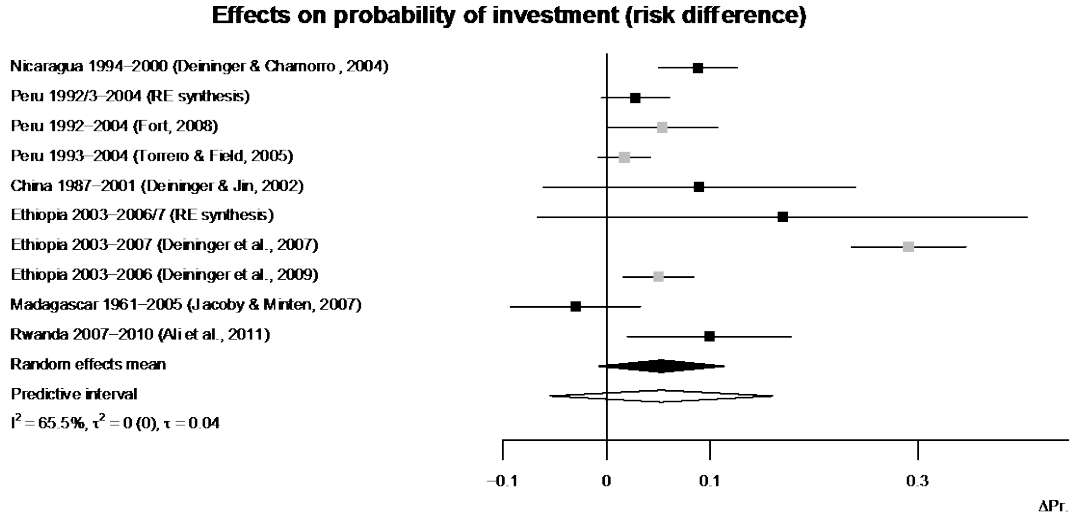


Figure 5 e: The forest plot shows estimates of the effect of de jure recognition of tenure on the probability of long-term investment (risk difference scale). See section 3.1.4 for operational definitions of the outcomes. Moves to the right on the x-axis indicate beneficial effects. See section 3.4.1 for details on the random effects model used to produce the random effects mean, predictive interval, and I2 measure of heterogeneity. An analysis using the log risk ratio appears in the appendix. The effect estimates that appear as gray squares are for sets of overlapping cases (for Peru 1992/3-2004 and Ethiopia 2003-2006/7) where the same intervention is evaluated in the same context but with different samples. The effects were first synthesized into a single, random-effects case-specific effect estimate (denoted as "RE synthesis" in the labels to the left), and then these synthesized estimates were used to produce the random effects mean, predictive interval, and I2 heterogeneity measurement. (See section 3.3.3 on this hierarchical approach.)



Some of the outcomes listed in Appendix III are not plotted in Figure 5a-e. This is because those effects were defined or measured in ways that do not allow for direct comparisons. (see section 3.4.1 on how we establish comparability.) For example, as part of investment behaviour, three studies estimated effects on tree crop planting, an indicator of long-term productive investments, but they used very different measures. These papers were Bandiera (2007, Nicaragua), Do & Iyer (2007, Vietnam), and Holden et al. (2009, Ethiopia). All three studies found significant increases in such investment, corroborating the positive investment effects shown in Figure 5e. Two studies evaluate leasing out of land, another way that tenure recognition may boost land productivity. Deininger et al. (2011, Ethiopia) find that households with land use certificates are significantly more likely (ca. 11 per cent) to lease out land. Kung (2006, China) finds a modestly positive association between a measure of land entitlement and likelihood of leasing out, although the effect is statistically insignificant. With respect to social conflict, only Markussen (2008, Cambodia) attempts to assess it, but in his case in Cambodia, reported incidence of conflict is too rare (ca. 1% of cases) to allow for reliable estimation of tenure security effects. With respect to effects on gender equality, Ali et al. (2011, Rwanda) find no clear indication that recognition of ownership by women or share of land owned by women is increased, although for married women with a marriage certificate, there is a significant (ca. 9 per cent) boost in recognition of land ownership. Holden et al. (2011, Ethiopia) find that the generally positive effects of certification on leasing out are significantly higher for women. None of the studies look at displacement outcomes.

Presumably context matters for tenure recognition programmes, but the synthesized estimates (the black diamonds) in Figures 5a through 5e do not explore such context specificity. In our causal chain, we proposed that the following contextual variables would likely moderate the effectiveness of tenure recognition (see section 3.4.1 for further details),

- governance conditions, proxied here by Polity IV democratic governance scores;
- social norms, proxied by indicator variables for the region of the world;
- market conditions, proxied here in terms of GDP per capita;
- land use, proxied by rural population density and an indicator variable for cash crop farming; and
- years between intervention and assessment.

We were able to conduct a formal moderator analysis for effects on productivity and long-term investment only; the other outcomes were too sparse for such an analysis. We could not assess region-specific effects for all of the regions, as the number of observations per region was too small. Inspection of Figures 5a through 5e shows that within each region (the cases are grouped from top to bottom by region) there is substantial heterogeneity, although productivity and investment gains appear to be lower for cases in sub-Saharan Africa. Therefore, we include an Africa indicator in the analysis.

Table 2 shows the results of an analysis of how these contextual moderating variables relate to the effects of tenure recognition on productivity and long-term investment. The table displays estimates from bivariate random effects meta-regressions of the productivity and long-term investment effects on each of the moderators. Statistical significance (relative to the null) at 95% is indicated by an asterisk next to a coefficient. From this analysis, we find that productivity effects in Africa are significantly lower, and that magnitude of productivity effects rises with income (log GDP per capita). Interpreting these coefficients is difficult, however, because of the high correlation between log GDP per capita and the Africa indicator (Pearson's rho = -0.58, $p < .001$). Therefore, we cannot say whether the coefficients that we see are appropriately interpreted as an "income effect" or "Africa effect" per se (or, whether there is some third variable inducing a spurious relationship all around). None of the moderators provide traction in explaining heterogeneity in the long-term investment effects, and the residual heterogeneity tests indicate that substantial unexplained heterogeneity exists after taking each of these moderators into account.

Table 3: Estimates from bivariate random-effects meta-regressions on each of the moderator variables. See section 3.4.1 for details on the random effects model used.

Effects on:	Moderator:	Years trans-pired	Dem. gov. scores	Africa	Log (GDP/ capita)	Rural pop. density	Mixed agri-culture	Cash crops
Land product-ivity	Moderator coef.	-0.01	-0.02	-0.42*	0.37*	0.02	0.20	0.19
	(s.e.)	(0.01)	(0.03)	(0.12)	(0.11)	(0.04)	-0.19	(0.28)
	tau-sq.	0.05	0.06	0.02	0.02	0.06	0.05	0.06
	Residual het. test *p*	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	N	8	8	8	8	8	8	8

Prob. of invest-ment	Moderator						
	coef.	0.00	0.00	-0.06	0.04	0.02	0.01
	(s.e.)	(0.00)	-0.01	(0.10)	(0.26)	(0.03)	(0.09)
	tau-sq.	0.01	0.01	0.01	0.01	0.01	0.01
	Residual het. test *p*	0.00	0.00	0.00	0.00	0.00	0.00
	N	8	8	8	8	8	8

Bivariate random effects meta-regression estimates. Between study variance (tau-sq.) estimated via empirical Bayes. Regressions all include intercepts (omitted from display). Prob. of investment regressions include indicator variables that account for overlapping cases in Peru and Ethiopia (estimates omitted from display). Standard errors apply the Knapp and Hartung (2003) post-hoc correction to account for uncertainty in the tau-sq. estimates.

6. What does the qualitative evidence say?

This section synthesizes evidence from non-experimental and qualitative sources and aims to provide context for interpreting the quantitative results presented previously. We begin with a statement on the methodological quality of the evidence base, and follow with a synthesis of the results provided in the qualitative studies.

6.1. Assessing the qualitative evidence base

In all of the qualitative studies accepted for synthesis, respondents for individual interviews were randomly selected, although in some instances communities or groups within communities were selected specifically on the basis of their status as members of a vulnerable group (c.f Chilundo et al. 2006). Our intention with the qualitative synthesis is to provide context for the quantitative results, point out social and economic consequences that the quantitative studies overlooked, and indicate possible factors contributing to the success or failure of property rights intervention efforts.

6.2. Synthesizing the qualitative evidence

The importance of context and perspective is one of the key insights offered by the evidence presented in the nine studies that qualified for qualitative synthesis based on the inclusion criteria outlined in the protocol. These nine studies indicated a broad spectrum of both positive and negative experiences with land tenure interventions that make it difficult to draw out conclusive trends, but instead offer an impression of the wide variety of social impacts that can result from tenure interventions.

Seven of the studies meeting the inclusion criteria for non-experimental inclusion were carried out in rural areas of Sub-Saharan Africa, one study focused on Peru, and one on Vietnam. As was the case with the quantitative studies included in this review, all case studies were forms of recognition of individual land tenure and there was significant variation in the time-span between the intervention itself and the research being undertaken to assess it, with the shortest period being one year and the longest 20 years. There were two cases of registration as part of land redistribution programmes (Chirwa, 2008 and Lesorogol, 2005), six resulting from more standard land registration policies (Besteman, 1990; Burgi, 2007; Chilundo, et al, 2006; Kerekes and Williamson, 2010; and Teklu, 2005; World Bank, 2008) and one unique case from Côte d'Ivoire where although its formal passage and implementation was prevented by the 2002 rebellion, the initial effects of the nonetheless informally implemented 1998 Rural Land Law were measured in advance of the actual intervention (Bassett 2009).

The metasummary methodology used here and elaborated by Sandelowski and Barroso is an "aggregative" approach in that it focuses broadly on quantitatively identifying the frequency of qualitative results found in the research, and is not used to synthesize concepts or create lines of argumentation (Voils et al. 2008). That said, although frequency matters for a metasummary, the aim of the approach is to weigh data equally regardless of sample size. Hence the fact that most studies discussed here incorporated mixed methods approaches of individual and group interviews, the sample sizes used in the studies themselves, and indeed of the number of respondents noting a particular outcome, becomes moot.

During the data extraction process, which was in line with that outlined in the protocol for this review, extreme care was taken to separate qualitative findings from researchers' interpretation of their results or their discussion of these results, as well as to separate them from references to findings of other studies. Table 4 at the end of this section provides a snapshot synthesis of the 23 key findings extracted from the studies included in this review,

organized in nine groups identified during the extraction process, as well as an indicator of whether the finding represents a social boon, bane or sends mixed signals. These 23 findings are the result of a process of abstracting and combining the mostly heterogeneous results from the initial pool of 27 total experiences recounted in the literature. The studies provided a very mixed picture of the perceived benefits of tenure regularization. We found five studies that positively evaluated the land tenure intervention at hand (Besteman, 1990; Chilundo, et al 2006; Chirwa, 2008; and Lesorogol 2005; and World Bank 2008); four that presented mixed messages (Burgi 2007; Chilundo et al, 2006; Kerekes and Williamson 2010; Teklu, 2005), and three that presented negative views on the intervention (Bassett 2009; Besteman 1990; Kerekes and Williamson 2010). Appendix IV provides a more detailed look at the characteristics of cases included in qualitative synthesis, as well as summaries of their relevant findings.

Only five of the 23 qualitative findings we extracted were mentioned in two or more studies, and had frequency effect sizes of 20 per cent, with the remaining 18 findings being unique to the study in which it was identified and having frequency effect sizes of merely 11 per cent. Three of the findings with frequency effects sizes above 20% reflected favourably on the intervention,[11] and two reflected negatively.[12] The outcome with the highest frequency effect size of 33 per cent, being mentioned in three studies, was the negative perceived outcome of increased concerns over displacement or land unavailability after titling. The studies with the highest number of findings and findings with frequency effect size above 20 per cent were Besteman (1990) and Lesorogol (1990) with intensity effect sizes of 60 per cent. Each of these studies contributed five individual findings of the 23 identified by this review.

Due to the small corpus of studies on which this analysis is based, and the importance of context for understanding qualitative results, the remainder of this section will present the findings more descriptively.

While our quantitative evidence base says little about consequences of such policies for social outcomes like displacement, perceived insecurity, social conflict, or gender equality, these issues were all taken up in the qualitative discussions of many of the studies considered here. Teklu (2005) (Ethiopia) focused entirely on the effects of land registration on women in Amhara regional state of Ethiopia, with findings that crosscut nearly all of the social outcomes mentioned above. Teklu found that while land policy gives equal access to land for men and women, access does not equal control, and land registration efforts were unable to address important cultural norms prohibiting women from ploughing land, forcing them to pay men for this or enter into share-cropping arrangements with men. Respondents noted increased tenure insecurity for women where no working men were available and land lay fallow in a social context where tenure is traditionally retained through use. In such cases, Teklu reported anecdotal evidence of forced cultivation by others (without the respondent reaping benefits), as well as of forced evictions of women, although the population overall saw reduced fear of displacement. The World Bank (2008) (Vietnam), in investigating whether supporting the replacement of land titles and only naming the household head with titles or naming both husband and wife was worthwhile, found there

[11] These being: credit and investment money from outside community made available (Besteman 1990; Chilundo et al 2006); feelings of improved security and control over land. (Lesorogol 2005; Chilundo et al 2006); and a reduction of conflicts over land use, domestic decisions, inheritance (Lesorogol 2005; World Bank 2008).
[12] These two being: new land disputes and land grabs seen (Bassett 2009) (Besteman 1990); and concerns over displacement and land unavailability (Besteman 1990; Bassett 2009; Kerekes and Williamson 2010).

was an increase in feelings of empowerment amongst female respondents who held joint husband-wife titles.

Besteman (1990) (Somalia) and Bassett (2009) (Côte d'Ivoire) also recorded concerns over displacement, with Bestemen finding increased concern due to examples within the village of land-grabbing by outsiders. Kerekes and Williamson consider effects of the creation of Peru's two land registration bodies (Comisión de Formalización de la Propiedad Informal [COFOPRI] and Proyecto Especial de Titulacion de Tierras y Catastro Rural [PETT]) and the commencement of their work on registered landowners' ability to access credit and defend their right via official channels. They found respondents lacked faith in government enforcement of the law, and in fact, feared displacement or eviction by the government, but not from individuals. Bassett, who followed the effects of the incoming Rural Land Law on migratory pastoralists, found that the rising number of fields and others' herds on their traditional pastoral grazing lands was increasing over time, limiting the areas on which the FulBe pastoralists could graze their cattle. As international concerns over land grabbing have risen in prominence over recent years, the fact that displacement had the highest frequency effect size of our results is an important finding, indicating tenure interventions meant to prevent such negative outcomes can sometimes instead create conditions that enable them.

Outcomes on displacement were not all negative however, with positive results on pastoralism and displacement reported in the case study of Lesorogol (2005) (Kenya), where a group of traditional pastoralists had participated in a land redistribution and registration programme as an effort to end a decades old communal land dispute. Respondents saw land registration as a way to protect their land from outsiders, in a context where strong taboos against selling land existed.

On the associated issue of perceived tenure insecurity, Lesorogol found positive views of increased security, as did Chilundo et al. (2006) (Mozambique), who examined household and community effects of land registration in two Mozambican provinces and found that increased security was perceived against attempts by outsiders to acquire local land. In contrast however, Besteman found that farmers in Somalia felt that the threat of losing land to outsiders would increase over time due to corruption associated with, and inaccessibility of, very non-transparent land registration processes. Burgi (2007) (Ghana) found that while some respondents indicated titling alleviates the possibility of others claiming rights over one's land, most preferred the lack of "restrictions" on where one farms in customary tenure systems. As noted above, Teklu found cultural norms led to increasing feelings of tenure insecurity in women in Ethiopia.

On social conflict, Lesorogol observed satisfaction in Kenya that the intervention had improved social cohesion in the area due to the registration process acting as the solution to previous social conflicts. . Likewise, the World Bank found female respondents in Vietnam overwhelmingly agreed that joint husband-wife titles offered them advantages in domestic disputes and decision-making. This was contrasted however by accounts recorded by Bassett in Côte d'Ivoire of numerous land disputes based on new attempts to legally demarcate traditional lands that negatively affected pastoralists, and of Besteman's accounts that in Somalia numerous disputes over land-grabs by outsiders had occurred and respondents felt they would likely increase in the future.

Moving away from the social outcomes and onto the perceptions of material changes brought about by the interventions, we were only able to identify negative views on

productivity changes, which was not in line with our expectations, although both examples are of a perverse nature. The lack of positive qualitative perceptive data on productivity may be a result of productivity being more of an ostensibly objective, quantitative data collection and analysis topic rather than of qualitative interest. Bestemen found that productivity of individuals, not of parcels, increased in Somalia's Jubba valley for perverse reasons. Due to increased anxiety over growing tenure insecurity, villagers were clearing forested parts of their parcels to produce more while they could before presumed land grabs could take place. Bassett found that FulBe pastoralists faced lowering quality and availability of rangelands as farmer tenure claims increased, decreasing productivity of some respondents' herds. While non-pastoralists may perceive the situation differently, a major concern of the author was that once fully implemented the law may bring an end to the pastoralist way of life and the important cultural values it embodies.

On all remaining material outcomes, including investment, long-term production, leasing out land, and consumption, almost exclusively positive experiences were reflected in the qualitative literature. On investment, although non-agricultural, Chilundo et al found registration in Mozambique led to credit being given to a new carpenters association and to outside investments to build a local school. In the World Bank case of Vietnam, respondents felt joint husband-wife titles had a positive impact on their, and especially her, credit access. In the case of a Malawian redistribution programme for landless workers, respondents indicated they had more money for farm investments after the intervention (Chirwa, 2008). One unclear result came from Besteman, who found that government officials (the only group who had been able to register land in the area) lamented the need for, but lack of, agricultural wage labourers for their registered farmlands. Another ambiguous result came from Peru, where Kerekes and Williamson heard from respondents that they have not seen improvements in their ability to access affordable credit.

On long-term production and consumption, Lesorogol found that in Kenya, respondents largely viewed farming opportunities brought about by land redistribution as positively impacting income and food availability, whereas Chirwa's respondents indicated they had more money for household needs. An unclear result came from Chilundo et al, whose interviewees perceived no improvement in income or living standards, which the authors' attributed to lack of infrastructure to bring goods to market. On leasing out land, Lesorogol found widely held views that leasing land was an advantage of land ownership and a good opportunity for those with few livestock to improve their livelihoods (Lesorogol 2005).

Table 4: Qualitative findings organized by category of impact

Perceived Impact: negative/ unclear or mixed/ positive (– /. / +)		Freq-uency Effect size %
	Productivity	
–	Productivity increased perversely due to tenure security anxiety (Besteman 1990)	11
–	Lowering quality and availability of pastoralist rangelands has decreased productivity (Bassett 2009)	11
	Investment	
+	External credit and investment money from made available (Besteman 1990) (Chilundo et al 2006)	22
+	Increased income led to more money for farm investments. (Chirwa 2008)	11
+	Joint husband-wife titles had a positive impact on credit access (World Bank 2008)	11
.	Registration did not improve access affordable credit (Kerekes and Williamson 2010)	11
	Long-term Production	
+	Viewed land redistribution as positively impacting income and food availability. (Lesorogol 2005)	11
	Leasing out land	
+	It was widely held that leasing was an advantage of land ownership (Lesorogol 2005)	11
	Consumption	
+	Respondents indicated they have more money for household needs. (Chirwa 2008)	11
.	No perceived improvement in income or living standards (Chilundo et al, 2006)	11
	Gender equality	
+	Joint husband-wife land titles led to increased feelings of female empowerment (World Bank 2008)	11
.	Some improvement but not as much as policy would require (Teklu 2005)	11
	Perceived insecurity	
+	Feelings of improved security and control over land. (Lesorogol 2005) (Chilundo et al 2006)	22
./+	Overall improved except for female-headed households (Teklu 2005)	11
./+	Titling may alleviate others claiming rights over one's land, however many preferred the lack of "restrictions" on where one farms in customary tenure systems. (Burgi 2008)	11

.	No faith in government titling as security, fear eviction by government. Private tenure security mechanisms resolve disputes more effectively (Kerekes and Williamson 2010)	11
–	Corruption within, and inaccessibility of, the registration process leads to insecurity. (Besteman 1990)	11
	Social conflict	
+	Many indicated a reduction of conflicts over land use (Lesorogol 2005) (World Bank)	22
–	New land disputes and land grabs seen (Bassett 2009) (Besteman 1990)	22
	Displacement	
+	Owning land ensures one always has a home. (Lesorogol 2005)	11
./+	Overall improved but anecdotal evidence of eviction of vulnerable females. (Teklu 2005)	11
–	Concerns over displacement and land unavailability (Besteman 1990) (Bassett 2009) (Kerekes and Williamson 2010)	33
–	Fear eviction from government, but not from individuals. (Kerekes and Williamson 2010)	11

7. Discussion of applicability of findings for different contexts

The aim of this section is to provide context and nuance to the quantitative and qualitative findings. We stress that the quantitative evidence covers only beneficiaries of freehold titling, and therefore excludes consideration of displacement or other costs borne by those who do not receive title. In addition, we did not find any eligible studies on the effects of statutory recognition of customary tenure on farm level productivity, investment, or income.

A key finding of the quantitative analysis is that freehold titling was followed by positive gains in productivity and investment for the title recipients (40 per cent productivity gains across the studies, though gains were on average more modest in the Africa cases). These are important and promising results from the studies considered and may be relevant to settings where similar circumstances prevail. There is a danger however, that the results will be used to justify a widespread and uncritical embrace of freehold titling as the principal intervention for productivity and investment promotion. While titling may play an important role for doing so in some settings, it is important that applying titling as the remedy for low levels of productivity and investment be approached on the basis of a clear understanding of the larger contextual factors that explain a strong response to the programmes studied. As such, it is essential to put factors on the table that might predict stronger or weaker responses to different forms of tenure recognition in any given setting. We draw on the literature on customary tenure, freehold tenure, tenure reform, land policy and land administration, including national and regional comparative literature, to help shed further light on broader contextual issues in implementing tenure recognition programs intended to increase investment in agricultural land and boost agricultural productivity in Latin America, sub-Saharan Africa and Asia.

7.1. Explaining stronger gains in productivity and investment in Latin America and Asia, and weaker gains in Africa

Studies from Nicaragua, Peru, Cambodia and Vietnam found statistically significant productivity effects of tenure interventions, compared to much weaker effects recorded for African cases in Ethiopia and Madagascar. Adjusting for other factors, region emerges as a predictor of productivity effects. As a generalization, ownership of land based on titled and registered private rights is the dominant form of rural agricultural tenure across Latin America, and to a significant degree in Asia. This is not the case in sub-Saharan Africa, where access to land is secured principally through customary tenure arrangements. Customary rights are typically secure, held for life, inheritable, and granted as a social right to bona fide members of larger landholding communities. Because title is “the name of the game” for securing rights in Latin America (and a number of countries in Asia) it is not surprising that the productivity effects of titling in these regions would be positive. To the extent that customary tenure provides adequate levels of security to land holders in sub-Saharan Africa, it is similarly not surprising that the productivity gains resulting from titling would be neutral or only modestly positive in that region.

To explain the more modest increases in investment and productivity in Africa following tenure formalization compared to those found in Latin America and Asia, we propose the term “Africa effect,” referring to the fact that most farms in sub-Saharan Africa are held under customary tenure arrangements, which generally provide long-term tenure security to qualified members of land-holding families, groups or communities. Accordingly, customary

tenure may provide a level of pre-existing tenure security without formalization, something not typical in Latin America or elsewhere. As a result, gains to formalization in Africa may be more limited because tenure insecurity, which formalization seeks to remedy, is often not present to the degree that designers of reform programs assume. We hasten to point out that the African farmers studied were considerably poorer than farmers studied in Latin America and Asia, and lower levels of investment and productivity following tenure formalization may also be attributable to wealth and income effects. Understanding the relevance and the relative weight of either effect— the wealth/income effect and the "Africa effect"— in explaining lower levels of investment and productivity following formalization in Africa merits further research.

There is limited experience with conversion of customary land to freehold title in Africa, and somewhat more experience with documenting and registering the customary rights of existing holders, including where insecurity of customary land rights may be growing. The most significant historical case is that of Kenya, where individual titling that was implemented from the Swynnerton Plan of 1954 onwards created an indigenous landed class. However, as Okoth-Ogendo (1991) observed, it also created the corollary: a landless class. This, he shows, formed the basis for long-term conflicts in Kenya over land claims, taking the form of litigation and violent ethnic clashes. The title system created a chronic disjuncture between the deeds registry and rights in practice. Problems with the model included that wealthy, influential individuals gained most from the new system (Sorrenson 1967). Individualised rights undermined the claims of secondary rights holders, particularly women. Some of the lessons from the Kenyan experience are that rights in customary systems are often non-exclusive, overlap and perform the function of a social safety net – aspects which are lost with the individualisation of titling (Okoth-Ogendo 2002). Specific problems in Kenya and elsewhere where titling has been attempted include the effects of titling (or tenure clarification and adjudication) in extinguishing claims by secondary rights holders, specifically women, junior male relatives, pastoralists and recent incomers versus autochthons.

The Ethiopian rights certification programme examined in five of our studies might be better characterized as a rights clarification and adjudication programme than a tenure recognition programme based on conversion to a new form of tenure. The tenure certification programme in Ethiopia did not create an alienable form of private tenure based on title, as the Ethiopian constitution strictly prohibits land sales. The Ethiopian programme was to a significant degree a political response to widely held concern that the systematic land removals that characterized the Derg period (1978-1989) not be repeated, and was promulgated on the belief that certification of existing rights could inhibit emergence of similar social and economic catastrophes. The programme also gives considerable emphasis to adjudication of disputes that had become chronic in parts of upland, intensively cultivated regions, especially Amhara and Tigray regional states, with boundary disputes being especially prevalent. Once again, in Africa, because farmer tenure is, as a generalization, already secure under customary systems, it is not surprising that productivity and investments gains to conversion to title or even to registration of existing customary rights are modest. We explore other issues surrounding customary tenure in the following section.

7.2. Other factors relevant to African cases

Levels of rural agricultural productivity in Africa remain low, but are influenced by many factors other than tenure insecurity. These may include small farm size, the importance of off-farm income to rural households, and the associated deployment of working-age family members to urban centres for work, among others (Bruce and Migot-Adholla 1994, Toulmin and Quan 2000). Remittance income is an important source of income for rural households and many households invest a portion of remittance income in their agricultural enterprises, buying seed and other inputs and purchasing livestock. But the role of the farm enterprise as a source of income and target of investment stands in contrast with household choices that direct labour toward off-farm employment, and invest cash income in education and non-farm enterprises. Low gains in agricultural productivity in Africa, including where customary tenure security is high, may be explained best by the high opportunity costs of agricultural labour and decisions to invest in non-agricultural endeavours, while retaining the household's still important, socially-protected rights to land. Moreover, low average productivity farming in Africa may be more a function of the absence of farming enterprises of sufficient scale managed by farmers for whom agriculture is the principal and not secondary source of income.

For many rural African families, customary tenure rights may be viewed in essence as social and economic rights essential to household social and economic security, and as such customary tenure arrangements retain popular support across Africa. That said, security of tenure under customary arrangements is in doubt in many parts of Africa (particularly where there is rising investor interest), meriting attention as a policy problem in its own right. Colonial and post-colonial administrations have tended not to extend statutory recognition of customary tenure systems on a par with the legal recognition and protection extended to private and state land. Rather, customary arrangements have continued to operate informally from a statutory point of view, with the state claiming underlying land ownership. This has made customary holdings vulnerable to arbitrary state taking, often for sale or leasing to large-scale commercial enterprises. There are some exceptions to the constitutional and statutory vulnerabilities faced by customary systems constitutionally and statutorily, most notably represented by Botswana's 1968 Tribal Land Act.

Another consideration setting Africa apart is the prevalence of 'multi-tenure systems' in which different land uses are predicated on different types of tenure (Platteau 1996). Typically, the multi-tenure systems across much of sub-Saharan Africa involve, at the least, a distinction between strong household-based rights to residential and cropping land, and community-based rights to grazing and natural resource harvesting land. The prospects for registering formal private property rights in such contexts inevitably confront the problem of disentangling the 'nested' character of different entitlements that flow from membership of a community, many of which reside with the group and group-based systems of natural resource, rather than with individuals. Privatising communal rangeland has proven particularly problematic in the limited cases where it has been attempted, given the need for extensive grazing patterns that are adaptable to highly variable, seasonal rainfall and ecological problems that arise from carving rangelands into small individual parcels.

7.3. The need for studies on statutory recognition of customary land rights

None of the included studies addressed the effects of statutory recognition of customary land rights, which remains a nascent intervention type that has not yet been broadly implemented (apart from Botswana). Correspondingly, the number of available studies investigating it is very small, and those that do investigate it, principally address questions of policy reform and not policy impact. That said, statutory recognition of customary tenure may in time prove effective in addressing one of the principal vulnerabilities of customary right holders— that their rights are not legally defensible in the face of attempts by government agencies and private interests to convert customary use rights to state-owned tenure or private, freehold tenure. Efforts are underway in several countries to extend statutory recognition to customary tenure. An important FAO study on customary tenure reform in Botswana, Mozambique and Tanzania assessed efforts to recognize and secure customary rights to land statutorily, instead of through formalization measures such as titling (Knight 2010). While a spectrum of methods of recognition and registration exist, the study found that the required starting point is to secure customary rights through statutory means, that is, by passing laws recognizing such rights as constituting property rights with legal standing equivalent to public and privately-owned land. Three countries stand out as pioneering the statutory recognition of community-based customary land rights recently: Mozambique (often considered to have the best land law in Africa), Kenya (currently translating constitutional recognition of community land into a Community Land Bill) and South Sudan (which recognizes community land as a legal category of ownership).

7.4. The experience of tenure recognition in Rwanda and Ethiopia suggests clear national commitment and investment are essential to the success of systematic rights registration programmes

Western donors have been the principal proponents of systematic rights registration in sub-Saharan Africa, usually borne of the view that customary tenure arrangements are inherently insecure, that this presumed insecurity impedes investment in productivity enhancing practices and technologies, and that the inalienability of customary land rights hinders the flow of credit to farming enterprises. The evidence on the first two of these propositions has proven weak. Inalienability of customary rights very likely constrains the supply of credit (micro-finance programmes that eschew collateral requirements notwithstanding) but research has demonstrated that supply of credit to smallholders is hindered by a host of factors unrelated to tenure. Donor-driven programmes have failed in part because they have been proffered on the basis of these and other unfounded assumptions. In effect, donor-driven tenure conversion programmes have tended to over-estimate the demand for tenure replacement by African farmers, assuming it was strong when in fact it was weak. A clear policy lesson is that tenure conversion and rights certification initiatives should be responsive to authentic demand for tenure-based remedies to agricultural investment and other problems.

Ethiopia and Rwanda's rights recognition programmes distinguish themselves from donor-initiated programmes by the fact that they were promulgated by national leadership and largely funded by the national treasuries in pursuit of ambitious national policy goals. While programmes in both countries have received donor funding, this has only been a fraction of the total costs of those programmes. Rwanda's programme of rights registration is one aspect of an ambitious national agricultural development strategy that aims to commercialize

the agricultural sector by, among other things, creating larger farm units. The policy is candid in its effects on loss of land rights of smallholders, and assumes that those dispossessed will find remunerative employment as farm workers and in cities.

Tenure conversion programmes carry a heavy political overhead and cannot be effectively implemented unless led and fully embraced by national governments, cognizant of the political costs and benefits to implementation, and prepared to bear the high fiscal costs of implementation.

7.5. Credit and tenure recognition: why is de Soto's hope for land to be used as collateral not borne out by the evidence?

Among all the included studies, only one study in Nicaragua found consistent evidence of a credit effect (Foltz, Larson and Lopez 2000). Here, comparison of households with full title and those with no title showed that the former were more likely to access and take up credit. A further study in Peru found mixed and statistically insignificant evidence (Torero and Field 2005). None of the other studies, across all regions, found any significant effect on credit uptake. This is in stark contrast to the predictions of many neo-classical economists, and the advice of Peruvian economist Hernando de Soto (2000) that formalization can convert 'dead capital' into capital that can be used as collateral. Why might this be?

First, the character of the properties in question – smallholdings of the rural poor – may be unattractive to financial institutions as collateral, regardless of their tenure status. The types of credit institutions, such as microfinance institutions, that could meet some of their needs are not widespread, and local informal savings and lending institutions draw on social capital and do not use fixed assets as collateral.

Second, the bankability of the landholders themselves, and the transaction costs in extending credit through formal channels may be unaffected by a change in tenure status. For instance, Philips (2003), in an assessment of poor uptake of credit by land reform beneficiaries in South Africa (but which did not address the effects of tenure recognition and therefore was not included in our study) notes that the primary constraint in terms of access to finance is not actually access to loan capital. Rather, "the real issue is the lack of capital or equity with which such loan capital could be leveraged, and that is a problem rooted in the asset poverty of the targeted constituency." Other constraints to credit flowing to poor farmers were poor access to information, the length of time for processing loan applications, and the quality of business plans.

7.6. Titling versus lower-cost local solutions

One review of evidence from several countries concludes that "most of the beneficial effects usually ascribed to such a reform are grossly over-estimated and that, given its high cost, it is generally advisable to look for more appropriate solutions that rely on existing informal mechanisms at community level" (Platteau 1996: 29).

The Madagascan case, as depicted in the study by Jacoby and Minten (2007), shows no significant difference between investments and land values on titled and untitled plots, and therefore does not recommend that formal titling be extended country-wide. Following the titling initiative studied by Jacoby and Minten (2007), a new initiative involving decentralized, low-cost registration of land rights at municipal level instead of formal titling has reportedly been both rapid, affordable for the state and for farmers, and extensive in its reach (Teyssier

2010). The Madagascan experience shows that, where customary land tenure systems are functional, stable and enjoy a reasonable level of legitimacy and efficiency, formal titling may be unnecessary and not cost-effective (Jacoby and Minten 2007).

7.7. A continuum of tenure recognition: finding the appropriate degree of individualization/ community recognition and in/formal recognition

The studies reported in this review document a wide range of different types of tenure interventions, across vastly divergent socio-economic, political and ecological contexts. At the most formalized and individualized end of the spectrum is the allocation of formal titles to individual landholders, through registration on a national cadastre (Foltz et al 2000 on Nicaragua, Ali et al 2011 on Rwanda, Do & Iyer on Vietnam 2007). The studies also depict varying systems of recording, registering and mapping individual and household claims to land (Fort 2008 on Peru, Deininger et al 2007 on India). At the more informal end of the spectrum, they address mechanisms for recording household claims through local institutions (Holden et al 1998 and both Deininger et al 2003 papers on Ethiopia).

The studies demonstrate a wide range of approaches, informed in part by the context-specific political and economic objectives of the tenure intervention, and available institutional capacity to implement it. This suggests the possibility of tailoring the type of tenure intervention, and the degree of formality and individualization, to the context, rather than aiming merely to transpose successful experiments in one context into programming in another. Situations characterised by external pressures, internal divisions and rapid change – that is, where social capital for effective customary land governance is often most depleted – may warrant the security and external validation of more formalized and individual tenure, but the converse may also be true (Bruce and Migot-Adholla 1994).

Conditions that might correlate with demands for more formalized and more individualized types of tenure recognition, including rights clarification and adjudication include:

- High levels of land scarcity
- Contexts of major population movement (for example, post-conflict resettlement)
- Low legitimacy and accountability in land governance, including traditional and elected authorities
- Rapid urban expansion and dense peri-urban areas
- Limited use of common pool resources managed by communities (that is, predominance of household-based resource management) (Bruce and Migot-Adholla 1994, Deininger 2003).

The central problem with the above, of course, is that the process of clarification and adjudication, in such a pressured context, may itself exacerbate land conflicts.

Variations that might correlate with demands for more community-based types of tenure recognition include:

- Relatively stable population and settlement
- High levels of legitimacy and accountability in land governance (for example, traditional or elected authorities)
- No, or limited, growth of new internal pressures on land access
- High dependence on common pool resources managed by communities (Knight 2010).

7.8. Policy messages

The results of the study point to a number of key messages for policy-makers to consider:

Tenure security is important. The evidence from the eligible studies suggest that provision of title to smallholders in Latin America and Asia can result in significant increases in investment, agricultural productivity, and farmer incomes. The gains to formalization in Africa appear also to be positive, though much weaker, and the database for Africa is very limited. The greater gains in Latin America and Asia are likely explained by the fact that in these regions titling is the dominant pathway for securing land rights. This is not the case in Africa, where customary tenure arrangements have proven to provide high levels of tenure security, in many settings likely reducing the demand for formalization among land holders. Moreover, levels of wealth and income are lower among African farmers, constraining their ability to invest in farm inputs and infrastructure upon securing title.

Any tenure reform may have negative social effects, including on women's access to land and on displacement of the poor or others facing social and financial barriers to participating in the reformed regime for assigning rights. African customary land rights are a form of usufruct right once common in regions around the world before the systematic introduction of individual systems of private land ownership in Europe beginning in the 18th century. African customary, or usufruct, systems provide access to land as a *social* right, to qualified members of land holding communities. Conversion to title extinguishes the social basis for claiming land rights, a right particularly important to poor households who may lack the financial resources necessary to secure land through the market. An important policy message is that great care should be taken when considering land reform programs in Africa that would convert customary tenure arrangements to arrangements based on freehold title. The economic gains to conversion may be significantly more modest than anticipated, and the social consequences, in terms of the ability of the poor to gain access to land, may be considerable. Moreover, conversion of usufruct systems to private property has rarely occurred historically without considerable social and economic displacement.

Though tenure recognition improves productivity in Latin America and Asia, where title is the dominant means for securing land rights, **productivity gains may take time to become apparent, the effects vary substantially across cases, and they likely depend on other supportive conditions, such as the performance of credit, input supply, and product markets.** Most studies provide little information about *why* certain households or land parcels received tenure recognition while others did not, posing a problem of selection bias – better-off households may have been better able to secure their tenure, making their productivity, levels of investment and other class-related indicators a cause rather than an outcome of the tenure recognition. While we find clear positive evidence on productivity in seven of the 20 cases that met our selection criteria (five in Latin America, one in Asia and one in Africa), we also find that land rental markets and credit access are unaffected or only marginally affected. The evidence suggests, then, that arguments that tenure conversion will unleash rental and credit markets merit greater scrutiny, taking account of local contextual factors.

Policy makers should consider and assess a variety of models, appropriate to regional and national contexts, when framing tenure interventions. More evidence is needed to help policy makers choose what types of reforms are most appropriate in a given context. This includes the need for more evidence on both titling and, given the major blind

spot in the current evidence base, statutory recognition of customary tenure. Such studies should provide evidence on diverse social outcomes, including displacement, women's access, and other data on both winners and losers of any given policy reform. What is clear is that there are important regional variations, and the literature we reviewed strongly suggests that titling works better in Latin America and Asia than in sub-Saharan Africa. This stands to reason. Title is the dominant means for securing land rights in Latin America and Asia and land reform beneficiaries would be unlikely to consider an tenure arrangement other than title satisfactory. In sub-Saharan Africa customary tenure systems remain relatively functional and the overlapping character of family and collective resource rights–to residential, cropping, grazing and common property resources– complicate the creation of exclusive property rights, potentially resulting in significant levels of displacement. Importantly, a greater challenge to customary rights in Africa is not tenure conversion per se, but the fact that customary arrangements lack adequate constitutional and legal recognition in many countries. Customary arrangements often operate on land held by the state, and as such customary rights are vulnerable to arbitrary taking by state agencies, in some cases in land deals with large-scale outside investors. This vulnerability is being addressed in several African countries (including Mozambique, Kenya, South Sudan) by new policies and legislation that give full statutory recognition to customary tenure, on a par with state land and land held under freehold title. Specific aspects of customary arrangements that are considered regressive socially or not responsive to transparent administration or accountability are also subject to legislative remedy, without diminishing their underlying value in providing access to land as a social and economic right. For instance, traditional authorities, who typically administer land rights, can be made accountable to public oversight or, as in the case of Botswana, replaced in their land administration function by civil land boards. Women can be enabled, by statutory reforms, to hold customary rights jointly with spouses. Customary rights can be registered as lease rights, and in turn sub-leased to outside investors.

8. Author's Conclusions

8.1. Main findings

The findings of this systematic review underscore the importance of tenure security. In addition to being a pre-condition to farm investments that foster productivity and increase farm incomes, growing investor interest in farmland as well as contextual changes– population growth, changing settlement patterns, political conflict, environmental degradation and climate change– are among the factors underscoring the need to better secure tenure rights in developing countries. In principle, tenure security can be delivered through tenure conversion, from informal tenure to freehold title, but also by extending greater legal recognition to informal or customary tenure arrangements, the latter approach being especially relevant to sub-Saharan Africa. Either approach has potentially different measurable effects on productivity and investment, though the effects in both cases may be positive. Any tenure reform may have negative social effects, including on women's access to land and on displacement of the poor or others facing social and financial barriers to participating in the reformed regime for assigning rights.

Though tenure recognition improves productivity in settings where title is the dominant means for securing land rights, as is the case in much of Latin America and Asia, productivity gains may take time to become apparent, the effects may vary substantially across cases, and they likely depend on other supportive conditions, such as the performance of credit, input supply, and product markets.

The study results draw attention particularly to the significant gains in productivity and investment in agriculture in the Latin American and Asian cases due to tenure formalization, and the comparatively weak effects attributable to formalization in Africa. To explain these regional differences we propose the idea of the "Africa effect," based on the fact that most farms in sub-Saharan Africa are held under customary tenure arrangements, which generally provide long-term tenure security to qualified members of land-holding families, groups or communities. As such, customary tenure may provide a level of pre-existing tenure security without formalization, something that is not typical in Latin America or elsewhere. As a result, gains to formalization in Africa may be more limited because tenure insecurity, which formalization seeks to remedy, is often not present to the degree that designers of reform programs assume.

Low gains to investment and productivity in Africa following tenure formalization may also be explained by the low levels of wealth and income of African farming families in comparison to those studied in Latin America or Asia. Understanding the relevance and the relative weight of either effect— the wealth/income effect and the "Africa effect" noted above— in explaining lower levels of investment and productivity following formalization in Africa merits further research.

Our review of qualitative studies and literature on African agriculture suggests levels of rural agricultural productivity in Africa may remain weak due to factors other than tenure insecurity. These factors may include small farm size, the importance of off-farm income to rural households, and the associated deployment of working-age family members to urban centres for work, among others. In sum, low gains to agricultural productivity in many parts of Africa, and especially where customary tenure security is high, may be explained best by

the high opportunity costs of agricultural labour and the choice to invest in non-agricultural endeavours, while retaining the household's still important, socially-protected rights to land.

We propose an agenda of needed future research. We believe further research is needed, *inter alia*, on:

- the relationships between household wealth and income, customary tenure, and investment in agriculture in Africa
- the positive and negative effects of tenure recognition on women's tenure security in Latin America, Africa and Asia, and the gains or losses in women's tenure security in comparison to the customary tenure arrangements replaced by tenure formulation in Africa
- the effects on farm-level investments and productivity and the management and productivity of natural resources used in common resulting from tenure reforms extending statutory recognition to customary tenure arrangements.

8.2. Quality of the Evidence

The available quantitative evidence provides a weak basis for establishing the general effectiveness of land tenure programs. This is due to reasons of quality and completeness. With respect to quality of the evidence base, none of the included studies were randomized control trials, and for only two out of the twenty studies reviewed (namely, Ali et al., 2011, and Torero & Field, 2005; cf. Appendix V) was there a concerted effort to address selection biases by explicitly accounting for the processes through which households or plots were assigned to receive or not receive de jure recognition of tenure rights. This leaves the studies vulnerable to biases associated with deliberate selection into de jure recognition, biases that we conjecture would tend to result in overestimating the benefits of de jure recognition. With respect to completeness, none of the studies considered gave systematic consideration as to whether the alternative to de jure recognition of freehold tenure was either customary or some other form of tenure. As our discussion of the "Africa effect" suggests, such differences in the nature of the non-de jure recognition condition may matter in determining whether de jure recognition of freehold tenure rights are likely to make a difference. We failed to identify any studies that examined the effects of statutory recognition of customary tenure, in which case it is unclear how recognition of freehold tenure might compare with an increasingly important alternative mode of property rights management. Finally, none of the studies made a distinction between the effects of tenure reform on pre-recognition versus post-recognition inhabitants, with all studies estimating effects for post-recognition inhabitants only. To the extent that recognition occurs as part of displacement processes (as the current literature on "land grabs" suggests), the generally positive benefits that we see in these studies may conceal social costs. Such possibilities ought to be taken up in further research.

8.3. Methodological limitations and reflections

This review and its findings are constrained by the literature that could be admitted into the synthesis on the basis of the systematic review inclusion criteria. Many contextualized insights in the land reform literature emerge from qualitative studies in anthropology, sociology, and human geography that do not focus on estimating or characterizing the impact of policies. This includes studies on social relations, political economy, intra-

household gender relations, and potential "losers" of reforms that tend to be ignored by the impact studies. Impact studies, on the other hand, tend to focus on productivity of post-reform rights holders and are dominated by studies in economics. Moreover, among the 20 quantitative studies, four (20%) are World Bank evaluations that address Ethiopia's certification programme, supported by the Bank, and come to some similar findings. World Bank economist Klaus Deininger was an author in nine of the 20 included studies. A combination of methodological limitations of the broader literature, disciplinary biases, and institutional priorities (for example, concerned with productivity) means that the studies included in this review over-represent the work and research priorities of the World Bank over the past 10 years. The impact studies tend to gloss over mechanisms, and so the literature reviewed provides some insights on whether– but cannot explain how and why– there is a link between tenure recognition and productivity (and other variables). In future research, the transmission mechanisms need to be tested in order to explain why there might be a strong positive correlation under certain circumstances and not (or even a negative correlation) under other circumstances. Besides processes of tenure formalization, there are different pathways to tenure security that have been tested and have shown results, and much is also known about the negative effects of titling, yet these literatures are not well represented in our study.

Our review attempted to address these issues explicitly by including a component examining evidence from qualitative studies. While articles were screened by two researchers with resolution by a third, there were inevitably judgment calls regarding in/exclusion of borderline cases, which might bias the findings.

8.4. Research gaps

This review has exposed several research gaps that weaken the evidence basis for policy making. These include:

Understanding the interplay between wealth and income, customary tenure, and investment in agriculture in Africa: The factors affecting the agricultural investment decisions of African farmers, particularly smallholders farming land held under customary tenure, are particularly complex and not well comprehended by conventional models of economic decision-making. Studies are needed that, for instance, take into account the effects of the relatively high opportunity costs of labour in non-farm sectors of the economy on the supply of agricultural labour, the low cost of access to land faced by bona fide customary right holders, and the low rates of return to investment in agriculture compared to other investment opportunities, such as trading and transportation and other services.

Gender equality: The qualitative evidence quite consistently shows that tenure interventions that aim at individual titling or registration can be detrimental to women's land rights and tenure security. While the more anthropological and sociological evidence draws attention to the different situations of older and younger women, widows, married women and unmarried women, senior and junior wives, and women of these various statuses and matrilineal, matrilocal, patrilineal and patrilocal contexts, the quantitative evidence has little, if anything, to say about gendered effects. One World Bank study found that certification improved women's position in northern Ethiopia, notably by giving them the security to lease out land they could not cultivate with confidence – but overall there is a dearth of evidence on the important question of which types of tenure interventions have improved gender equality in land management decisions and in controlling land-based livelihoods, and how

benefits and losses are distributed not only between women and men, but among women differently placed in relation to land use and control. This seems an obvious gap to address in future research, including quantitative research.

Statutory recognition of customary tenure: While there has been growing policy and legal innovation in the past 10-15 years, especially in Africa, in statutory recognition of informal land rights – an alternative to rights formalization and titling – due to a lack of rigorous community-cluster studies examining agricultural productivity, we could find no study that met our inclusion criteria that assessed the impacts of such policy and legal strategies on productivity. New opportunities for studying the effects of statutory recognition on investment and productivity, and on the ability of customary rights holders to resist arbitrary taking of land through state-brokered large-scale land acquisitions, will present themselves in coming years as more African countries extend statutory recognition to customary tenure arrangements.

Community titling: While there is now a growing literature on community-based titling initiatives, there is a need for rigorous longitudinal studies which can demonstrate their impacts on land uses and productivity, on investment, on gender equality, on community-investor negotiations, and on land-related conflicts. Such research necessarily involves a different level of analysis from the types of studies included in this review, which only addressed individual / household titling. The effects of interventions such as community titling, as well as statutory recognition of customary tenure arrangements (above), on investment and productivity at the farm level and on the management of outcomes of forests and pasturelands, merits attention going forward.

8.5. Agreements and disagreements with other studies and reviews

This is the first systematic review or meta-analysis we are aware of to consider the effects of land tenure interventions on investment and agricultural productivity. Our findings are largely consistent with conventional economic work on property rights.

9. Differences between the protocol and the review

For certain outcomes planned for our analysis, that is, perceived tenure insecurity, social conflict, gender based variations in welfare effects, short term investments, and for displacement, no quantitative evidence at all was reported across our included studies, and as such analysis of these issues was not included in our systematic review. Furthermore, none of the included studies addressed the effects of statutory recognition of customary land rights, the second intervention which we had planned to investigate. Other than these data-related omissions, no deviations from the plans outlined in the protocol were necessary.

10. Contribution of Authors

Ruth Hall	Study design, write-up
Donna Hornby	Study design, literature search
Steven Lawry	Study design, lead author
Aaron Leopold	Study design, project coordination, qualitative analysis and write-up
Farai Mtero	Literature search
Cyrus Samii	Study design, statistical analysis, quantitative write-up

Data were coded by Hannah Carmichael, Mothusi Turner and Veronika Wesselowsky.

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12. Declarations of Interest

The authors have no vested interest in the outcomes of this review, nor any incentive to represent findings in a biased manner.

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Appendix I: Screening for Experimental and Quasi-Experimental Studies

Inclusion Form: Level 1 Screening – Initial Inclusion

1. Is the paper related to primary research done on free-hold land titling or statutory codification and certification of land rights?
   YES free-hold land titling: ☐
   YES statutory codification and certification: ☐
   NO: ☐
2. Context:
   a. Year:
   b. Country:
   c. Region/locale:
3. Does the study examine a developing country?
   YES: ☐ NO: ☐
4. Does the study assess facilitators of, or barriers to:
   a. changes in investments of personal resources into production,
   b. increasing employment through leasing-out or sharecropping,
   c. improving productivity of land use,
   d. increasing income/consumption,
   e. poverty reduction, or
   f. gender-based welfare improvements?

   YES: _____ NO: ☐ UNCLEAR: ☐
5. Is data reported at the household or sub-household level?
   YES: ☐ NO: ☐ UNCLEAR: ☐
6. Was random assignment used to assign groups?
   YES: ☐ NO: ☐ UNCLEAR: ☐
7. What randomized experimental or quasi-experimental methodology was applied?
   a. regression adjustment,
   b. difference-in-differences estimation,
   c. instrumental variables regression,
   d. fixed effects regression,
   e. regression discontinuity, or
   f. matching and inverse-propensity-weighted estimation?
   g. none

   _____ UNCLEAR: ☐

Inclusion Form: Level 2 Screening – Methodological Quality

If yes was answered to questions 1-5 of the level 1 screening questions, please answer the following questions to determine the inclusion of the study.

1. How was randomization or the quasi-experiment carried out specifically?

_____

_____

_____

_____

2. Were any specific randomization problems noted?
   YES: ☐ NO: ☐
   If yes, what were they?

3. Where did the comparison group originate?

4. Were any significant differences between groups treatment and comparison groups noted?
   YES: ☐ NO: ☐
   If yes, what were they?

5. How were attrition problems dealt with?

Appendix IIa: Screening for non-Experimental Studies

Inclusion Form: Level 1 – Initial Screening

1. Is the paper related to primary research done on free-hold land titling or statutory codification and certification of land rights?
   YES: ☐ NO: ☐
2. Is the research undertaken in a developing country?
   YES: ☐ NO: ☐
3. Is data reported at the household or sub-household level?
   YES: ☐ NO: ☐ UNCLEAR: ☐
4. Does the study assess facilitators of, or barriers to:
   a. changes in investments of personal resources into production,
   b. increasing employment through leasing-out or sharecropping,
   c. improving productivity of land use,
   d. increasing income/consumption,
   e. poverty reduction, or
   f. gender-based welfare outcome measures?

   YES: _____ NO: ☐ UNCLEAR: ☐
5. Does the study provide information on all of the following:
   a. research questions;
   b. data collection procedures;
   c. sampling and recruitment;
   d. and a minimum of two sample characteristics?

   YES: ☐ NO: ☐

Appendix IIb: Screening for non-Experimental Studies

Inclusion Form: Level 2 – Quality Screening

1. Is the aim of the study clear?
   YES: ☐ NO: ☐
2. Does the study clearly utilize a relevant theoretical framework?
   YES: ☐ NO: ☐
3. Does the study clearly describe all of the following:
   a. the context?
   b. the sample?
   c. data collection methods?
   d. analysis methods?

   YES: ☐ NO: ☐ SOME: ☐
4. If based upon quantitative survey data, are multivariate tools used to control for confounding variables?
   YES: ☐ NO: ☐
5. Does the data clearly support the papers conclusions?
   YES: ☐ NO: ☐
6. Are conclusions based on the findings from the research?
   YES: ☐ NO: ☐
7. Are any ethical considerations of the research elaborated?
   YES: ☐ NO: ☐

Appendix III: Characteristics of cases included in quantitative synthesis and basic findings.

								Nature of Estimated Effects on Outcomes of Interest*									
Region	**Country**	**Setting**	**Study**	**Year Policy or Program Initiated**	**Year of Outcome Assessment**	**Years Between Initation & Assessment**	**Comparisons Used in the Meta-analysis**	*Productivity*	*Investment*	*Leasing out land*	*Access credit*	*Credit amount*	*Consumption*	*Gender equality*	*Perceived insecurity*	*Social conflict*	*Displacement*
Latin America	Nicaragua	Rural	Foltz, Larson & Lopez (2000)	1981	1998	17	Households with full title versus no title.	+				+	-				
	Nicaragua	Rural	Bandiera (2007)	1981	1998	17	Households who received land through land reform versus those who did not.		+								
	Nicaragua	Rural	Deininger & Chamorro (2004)	1994	2000	6	Land parcels registered versus parcels informally occupied.	+	+								
	Peru	Rural	Fort (2008)	1992	2004	12	Land parcels covered by either medium or low tenure security and then either with or without title registration.		+								
	Peru	Rural	Torero & Field (2005)	1993	2004	11	Households with PETT title versus no title.	+	.			.	+				
South Asia	India	Rural	Deininger, Jin & Nagarajan (2007)	1970	1999	29	Households that were either subject to tenancy reform or not.						+				
East Asia	Cambodia	Rural	Markussen (2008)	1989	2004	15	Land parcels either with or without paper.	+			-					.	
	China	Rural	Deininger & Jin (2001)	1987	2001	14	Household in Guizhou province where land reform was carried out vs. those outside Guizhou province.		+								
	China	Rural	Kung (2006)	1987	1999	12	Households either before, during, or after the freezing of land allocations.			-							
	Vietnam	Rural	Do & Iyer (2007)	1993	1998	5	Households covered by new land-use rights laws vs. those not covered.	.	+		-		-				
	Vietnam	Rural	Van den Broeck, Newman & Tarp (2007)	1993	2006	13	Household members are listed in government documents as having title for plots or not.	+									
	Vietnam	Rural	Kemper, Klump & Schumacher (2011)	1993	2004	11	Households either with or without land certificate.				-						
Africa	Ethiopia	Rural	Holden, Deininger & Ghebru (2009)	1998	2006	8	Land parcels either with or without certificate.	-	+								
	Ethiopia	Rural	Holden, Deininger & Ghebru (2011)	1998	2006	8	Households either with or without land certificate.							+			
	Ethiopia	Rural	Deininger, Ali & Alemu (2009)	2003	2007	4	Household issued a land certificate vs. those with no certificate.		+	+					-		
	Ethiopia	Rural	Deininger, Ali & Holden (2007)	2003	2006	3	Communities (kebeles) in which certificates were issued versus communities without certificates.		+								
	Madagascar	Rural	Jacoby & Minten (2007)	1961	2005	44	Land parcels that are either titled or not.	+	.								
	Malawi	Rural	Chiwra (2008)	2004	2006	2	Households that acquired land under the Community-based Rural Land Development Project pilot project versus those whose holdings remained under customary tenure.		+								
	Rwanda	Rural	Ali, Deininger & Goldstein (2011)	2007	2010	3	Households receiving pilot land tenure regularization program versus those outside the program area.		+					+	.		
	Zambia	Rural	Smith (2004)	1995	2001	6	Household head holds title versus on customary land.		+								

*For the outcomes evaluated, "+" indicates clear (i.e., consistent, statistically significant at with 90% confidence in a two-sided test) evidence that such outcomes were increased, "-" indicates clear evidence that such outcomes were decreased, "." indicates outcome was assessed but results do not yield consistent, statistically significant evidence of either positive or negative effects, and blank spaces mean the outcome was not assessed in the study. The last three columns are shaded in gray because they refer to adverse outcomes for which, e.g., "-" indicates potential harms were reduced.

Appendix IV: Characteristics of cases included in qualitative synthesis

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
Teklu (2005)	Côte d'Ivoire	How has the anticipated implementation of the 1998 Rural Land Law affected the mobile pastoralist livestock system of the immigrant FulBe population?	Written from an anthropological/ geographers perspective, arguing herd mobility and productivity are negatively impacted by "tenure building" of farmers and communities in anticipation of the Rural Land Law.	Individual interviews	Randomly selected.	Herd owners or workers were interviewed	Structured questionnaire-based interviews every 10-14 days over a series of years.	Not indicated	Found that increasing population, adoption of ox-driven ploughs, and informal tenure claims are pushing pastoral herders from their traditional rangelands, especially affecting owners of larger herds.	The author concludes the new law is bias against pastoralists and that FulBe mobile pastoralism will be negatively affected by land privatization, which "erects barriers to herd mobility and thus threatens herd productivity." (p765) He recommends reforming the policy to encourage

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
										"multi-terroir land use planning," including travel corridors and flexible land rights systems to ensure farmers, herders, hunters, fishers, and gatherers can all retain access to resources associated with their livelihoods.
Chilundo et al (2006)	Somalia	Paper aims to determine how government land policies are dealing	The paper examines the land tenure ethnographically to test "the hypotheses,	In-situ longitudinal ethnographic research was undertaken	Randomly selected.	40 households randomly selected for two-stage interviews (formal	Structured interviews followed up by	Not indicated	High (corruption-related) registration costs and unfamiliarity with the process prevented most	The author found that land registration as it was prescribed was inappropriate

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
		with and influencing changes in the Jubba Valley and in particular to 1) describe conflicts between customary and state leasehold systems; 2) understand the impact of the 1975 Land Law on tenure security; 3) evaluate the impact of the land law	first, that land registration increases tenure security and, second, that land registration (through enhanced security) encourages agricultural investment and greater productivity."	via 10 month continuous residence in a representative middle Jubba village.		structured + informal follow-ups) in a village made up of mostly unregistered parcels. 37 were male-headed and three female headed, plus five further female-headed households were sought out for further data on female tenure and socioeconomic status. In male-headed households, if wives were	unstructured informal interviews		villagers from registering, leading to local titles being owned disproportionately by outsiders, leaving unregistered villagers with feelings of a loss of tenure security. Those with titles (all government officials) acquired them for prestige, as speculative investments, or to provide for their families. Those with registered parcels did not work the land themselves and	for the region, especially in that its goals were unclear and in that "it does not offer an appropriate alternative to the system it is replacing" (p51). She finds land grabbing speculation to be the most significant areas of concern for smallholders in the case study, and that the traditional multiple-parcel land use

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
		on agricultural practices and production on newly registered plots; and 4) evaluate the socioeconomic impact of the law, particularly in terms of credit, investment and land distribution.				present they were separately interviewed as well. Group interviews on land tenure and registration were also carried out in eight surrounding villages. Fifteen owners/managers of registered parcels from surrounding villages were selected randomly to			faced constant labor shortages. More registered parcel owners planned not to increase investment in the property than those who did.	practices are threatened by the registration law. Furthermore, the land registration process itself is problematic in that it is underfunded and underequipped, making bribery a requirement to get things done.

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
						compare experiences.				
Lesorogol (2005)	Mozambique	Assess land registration impacts on the livelihoods of low-income groups	No explicit framework outlined but implicitly political-economic in nature, with the following hypotheses: 1) "Land registration is not inherently anti-poor;" 2) "The distributional consequences of land registration will depend on the design of the	Both group interviews as well as 117 semi-structured individual interviews with government, NGOs, community leaders and farmers were carried out in four communities. Direct observatio	Two districts within two different provinces were chosen (no explanation how). Two communities within these were then selected as case studies (again no explanation). Sampling focused on low-income groups identified by	"27 individual interviews were conducted in Murrua (11 women and 16 men) and 24 individual interviews in Nhafuba (10 women and 14 men). Two group interviews were held in Murrua and three in Nhafuba. In Koma Koma and Nipuro	semi-structured interviews and group discussions	Not indicated	Findings broadly support the hypotheses that land registration is not anti-poor in the rural Mozambican context. But disadvantaged groups lack ability to use land as productively as others, which increases vulnerability. Others perceived increase in tenure security, especially in ability to resist	Despite some positive impacts, implementation of the land registration process is seen as problematic, with community consultations often focusing on only the security-related benefits of registration. This was also reflected in the perceptions and experiences of respondents,

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
			process and governance of the institutions responsible for its management;" and 3) "Land registration procedures can be elaborated to address systematically the risk of bias against poorer, more marginal groups by considering issues including location, registration fees, language used, and recognition of	n was also undertaken to intimate the dynamics of the registration process and its implications for individual livelihoods.	mapping exercises 3 months prior to interview process. Groups identified for special attention were: women, immigrants, young people, single mothers, older men and women, widows and widowers. No details were given on the	communities, 66 interviews were carried out; 36 with men and remainder with women. Different categories of women were included, such as widows, single, elderly and divorced. Two group interviews were held; one in Koma Koma and the other in Nipuro." (footnote 30, p15)			outside investors. Also, increase in community organization and credit availability for local carpentry association (nothing was mentioned for farmers). Finally, new shops and schools being developed are associated with new property rights.	who had not yet reaped many economic or productive benefits from the process.

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
			secondary rights." (p1)		specific selection process however.					
Bassett (2009)	Malawi	The paper investigates the impact of a land reform trial program in Malawi on investments, food production and	Statistical and econometric analyses using both quantitative and qualitative data. No explicit theoretical framework is outlined.	Qualitative interviews of individuals and groups. No indication	As the community was made up partially of resettled farmers, some beneficiaries were purposively selected to	146 farming households were interviewed for a quantitative analysis, of which 49 percent were beneficiaries and 51 percent were non-	structured interviews and socioeconomic data collection together with	Not indicated	Interviewees noted increased maize production and more money for both investments and household needs as a result. They also indicated overall feelings of well-being had	However, given the design of the CBRLDP, the observed impacts may be due to both land relocation and land tenure combined with greater access to agricultural

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
		agricultural productivity.			ensure they had at least a year of farming experience. The non-beneficiaries were randomly selected from surrounding villages.	beneficiaries. 4 beneficiary households were also qualitatively interviewed, as were eight focus groups and six key informants.	semi-structured group discussions.		increased after the intervention.	inputs acquired through the resettlement package that beneficiaries receive in the first year of benefiting from the CBRLDP.
Bestemman (1990)	Kenya	What economic outcomes has privatization of pastoral lands had on pastoralists? How has it	Political-economic approach with a focus on "micro politics" and bargaining power in land decisions. No explicit hypotheses or	Survey of 100 households in Siambu, randomly selected. No number for Mbaringon was given,	Within the Samburu district, the Siambu community was chosen due to its history with land redistribution	For each household, the head and or spouse was interviewed.	Survey and semi-structured interviews	Not indicated	Found that privatization created feelings of security in a previously land conflict-rife community, and expanded cultivation of crops which	The author concludes that gains from land privatization in Siambu stemmed not as theory might predict, from abandoning livestock to

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
		affected household welfare? How has it affected norms surrounding land ownership and use?	theoretical assumptions outlined.	although the author notes that the survey covered approximately 40% of households in both communities. Quantitative data was provided on many issues relevant to our study, but as the study did not qualify for inclusion in	and registration. Mbaringon, located 40km away was chosen for its similar culture, environment, and land use but continued use of traditional communal land tenure systems. No detail was given on the specific selection technique for interviews.				provided economic diversification for pastoralists.	farm exclusively or from boosting investments in agriculture or livestock, but from the ability of land owners to diversify income and provide supplemental livestock inputs when foraging is difficult. Diversification was also attempted in Mbaringon, but without more secure property rights,

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
				the quantitative synthesis, only its qualitative components are presented here.						opportunities were limited.
Chirwa (2008)	Ethiopia	Investigate how women's interests have been dealt with via land registration.	No explicit framework outlined but implicitly political-economic in nature, with the following hypotheses: 1) "Land registration is not inherently anti-poor;" 2)	Mostly female focus group-based interviews with women's organizations, but also individual interviews with heads	Participants in focus groups were selected randomly by the researcher after announcing the meetings in advance to give women from	No details other than "women's groups," "Land Use Administration Committees (LUAC) at Goat level" (Goat level is the lowest local administrative	semi-structured interviews and group discussions	Not indicated	While findings broadly support the hypotheses that land registration is not anti-poor in the rural Ethiopian context, the report also concludes that, while land policy gives equal access to men	The authors conclude that women's access to and control over land have improved, discrepancies between gender equality on paper in policy and the on the ground reality

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
			"The distributional consequences of land registration will depend on the design of the process and governance of the institutions responsible for its management;" and 3) "Land registration procedures can be elaborated to address systematically the risk of bias against poorer, more marginal groups by	of female-headed households to discuss sensitive issues.	elsewhere a chance to participate as well.	level in Ethiopia) and heads of female-headed households.			and women, access does not equal control. Intervention was unable to address the important cultural norms prohibiting women from ploughing land, forcing them to pay men for this or enter into share-cropping arrangements with men. This can increase tenure insecurity for women where no men are available and land lay fallow in a culture where	stems from the lack of "gender implementation guidelines" in the law, which has led to a female participation in local decision-making, a lack of attention to female issues at the local level and a corresponding low instance of participation in land registration and adjudication processes by women.

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
			considering issues including location, registration fees, language used, and recognition of secondary rights." (p1)						tenure is retained through use. In such cases anecdotal evidence of cultivation by force by others was observed as was forced eviction.	
Kerekes and Williamson (2010)	Peru	Do titles provide access to credit in Peru? Has land titling created secure property rights institutions?	Sociological study building off of the work of De Soto on tenure rights and access to capital, but authors state explicitly that while they feel tenure increases investment, it	Qualitative interviews of individuals.	Respondents were chosen based on potential to provide insights into the credit and security research questions.	20 interviews were carried out with a mix male and female respondents, some of whom were registered individual landowners and some who were	semi-structured interviews	Not indicated	Found no evidence that titling improved access to affordable credit– in many cases government and private loans still required other forms of collateral. Found that security of tenure is	Although the government is defining and codifying property rights, it is not enforcing them. Hence, authors argue that land titling should not be assumed to be the best

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
			does not necessarily increase access to credit.			registered as parts of communal landholding groups.			determined locally through private enforcement mechanisms, as government enforcement is expensive, corrupt and often non-existent.	course of action in all contexts.
Bugri (2008)	Ghana	The paper considers the implications of different forms of formal and informal tenure arrangements in northeast Ghana for	Implicitly sociological/economic in nature but no theoretical framework is outlined.	Dual qualitative and very basic quantitative methodology, with qualitative data used to support and explain quantitative results.	Authors collected qualitative data from 35 communities using snowballing, individual, group and focus group interviews/discussions.	70 qualitative interviews were undertaken and a sample of 419 were surveyed quantitatively. Of the qualitative interviews, 19% women and 81% men.	Snowballing, individual, group and focus group interviews/discussions were used	Not indicated	The author found that although respondents felt high degrees of tenure security using the customary tenure system, severe environmental degradation was observed, as were falling yields, hence the	While this study is very illuminating in its analysis of stakeholder views of why customary/formalized tenure systems are preferable in north-eastern Ghana, it only offers clear

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
		agricultural production and environmental sustainability.					for the qualitative data collection. The qualitative data was selectively presented to support quantitative results by offering "typical" responses.		author concludes that: "Tenure security is a necessary but not a sufficient condition for improvement in agricultural production and environmental management" (Bugri, p271) The author suggests other circumstances have led to this scenario, including: "poor access to credit, inadequate and erratic rainfall regime, poor soils, inadequate	before/after comparisons on security perceptions. The other conclusions are based on assumptions of customary tenure-holders about possibly consequences of titling, and as such many of the results are of limited use for this systematic review.

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
									farmland and the effects of demographic changes on the environment." (p282)	
World Bank (2008)	Vietnam	Is there a justification for committing World Bank / Viet nam government funding to replace land titles only naming the household head with titles naming both husband and wife?	No explicit framework outlined but implicitly sociological/economic in nature as it hypothesizes that naming both husband and wife on land titles will increase feeling of security and ownership for women, improve	Both quantitative surveys and qualitative interviews of focus groups were carried out, all addressing the impacts of titling on women.	Teams made announcements via local authorities and those who arrived at the focus group meetings were allowed to participate. However, as the number of households with joint	For surveys, 100 in each of three of the four regions investigated. In each of these three regions, 50 households were chosen with individually titles, and 50 with joint husband/wife titles. A focus group was also carried out in	Qualitative methods included semi structured interviews and guiding questions/topics for in-depth interviews and	Not indicated	The study investigates a range of agricultural and non-agricultural title-holders (findings presented in this table represent only those relevant to agricultural title-holders) and finds that universally, even when not clearly evidenced in the quantitative	The study uses its finding that re-registering single spouse-held titles to joint-titles are generally positively viewed by both husbands and wives to argue, that communications campaigns should be undertaken to encourage

Study	Country	*Research purposes and questions*	*theoretical framework*	*method and design*	*sampling strategy*	*sample composition*	*data collection and analysis techniques*	*Bias reduction*	*general findings*	*discussion / conclusion*
			household decision-making practices, as well as increase opportunities to access credit for both individuals.		titles is very low, the team often selected the only people in the region who possessed such a title.	each region, one with only male, one with only female and one with local authorities.	focus group discussions.		analysis, women felt access to credit had improved with title acquisition, and the majority also felt improvements in tenure security and equality.	increased re-registration, and that the registration processes streamlined.

Appendix V: Design and risk of bias assessment for each quantitative study

Region	Country	Setting	Study	Design	Selection bias controlled?	Confounding controlled?	Free of Hawthorne/ J. Henry effects?	Protected against spillover?	Free of selective outcome reporting	Free of selective analysis reporting?	Free of other biases?	Appropriate standard errors?
Latin America	Nicaragua	Rural	Foltz, Larson & Lopez (2000)	Multiple regression on cross section	No	Unclear	No	Unclear	Yes	Yes	Yes	Yes
	Nicaragua	Rural	Bandiera (2007)	Fixed effects regression on panel and matching estimation on cross section	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
	Nicaragua	Rural	Deininger & Chamorro (2004)	Multiple regression on cross section	Unclear	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Yes
	Peru	Rural	Fort (2008)	Difference-in-differences	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
	Peru	Rural	Torero & Field (2005)	Matching and first differences	Yes	Yes	Yes	Unclear	Yes	Yes	Unclear	Yes

Region	Country	Setting	Study	Design	Selection bias controlled?	Confounding controlled?	Free of Hawthorne/ J. Henry effects?	Protected against spillover?	Free of selective outcome reporting	Free of selective analysis reporting?	Free of other biases?	Appropriate standard errors?
South Asia	India	Rural	Deininger, Jin & Nagarajan (2007)	Fixed effects regression and Heckman selection model on panel	Unclear	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes
East Asia	Cambodia	Rural	Markussen (2008)	Multiple regression and instrumental variables regression on cross section	Unclear	Yes	No	Yes	Yes	Yes	Yes	Yes
	China	Rural	Deininger & Jin (2001)	Multiple regression and instrumental variables regression on cross section	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes

Region	Country	Setting	Study	Design	Selection bias controlled?	Confounding controlled?	Free of Hawthorne/ J. Henry effects?	Protected against spillover?	Free of selective outcome reporting	Free of selective analysis reporting?	Free of other biases?	Appropriate standard errors?
	China	Rural	Kung (2006)	Multiple regression on cross section	Unclear	Unclear	Unclear	Yes	Unclear	Unclear	Unclear	Yes
	Vietnam	Rural	Do & Iyer (2007)	Difference-in-differences	No	Yes	Unclear	Unclear	Yes	Unclear	Unclear	Yes
	Vietnam	Rural	Van den Broeck, Newman & Tarp (2007)	Multiple regression on cross section	No	Unclear	Yes	Unclear	Yes	Yes	Unclear	Yes
	Vietnam	Rural	Kemper, Klump & Schumacher (2011)	Instrumental variables regression on cross section	Unclear	Yes	No	Yes	Yes	Yes	Yes	Yes
Africa	Ethiopia	Rural	Holden, Deininger & Ghebru (2009)	Fixed effects regression on panel	Unclear	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes
	Ethiopia	Rural	Holden, Deininger & Ghebru (2011)	Fixed effects regression on panel	Unclear	Yes	Unclear	Unclear	Yes	Yes	Unclear	Yes

Region	Country	Setting	Study	Design	Selection bias controlled?	Confounding controlled?	Free of Hawthorne/ J. Henry effects?	Protected against spillover?	Free of selective outcome reporting	Free of selective analysis reporting?	Free of other biases?	Appropriate standard errors?
	Ethiopia	Rural	Deininger, Ali & Alemu (2009)	Difference-in-differences	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
	Ethiopia	Rural	Deininger, Ali & Holden (2007)	Multiple regression on cross section	Unclear	Yes	Unclear	Unclear	Unclear	Unclear	Yes	Yes
	Madagascar	Rural	Jacoby & Minten (2007)	Multiple regression on cross section	Unclear	Yes	No	No	Yes	Yes	Yes	Yes
	Malawi	Rural	Chiwra (2008)	Multiple regression on cross section	No	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes
	Rwanda	Rural	Ali, Deininger & Goldstein (2011)	Regression discontinuity	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
	Zambia	Rural	Smith (2004)	Multiple regression on cross section	Unclear	Unclear	No	Yes	Yes	Yes	Yes	Yes

Appendix VI: Effects estimates

Region	Case	Study	Productivity			Investment			Leasing out land			Access credit			Credit amount			Consumption			Gender equality			Perceived insecurity			Social conflict			Displacement		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
Latin America	Nicaragua (1981-1998)	Foltz, Larson & Lopez (2000)	0.66	0.30	log(value of output/ha)										2.24	0.97	sd(amount of credit received by HH)	0.11	0.47	log(income)												
	Nicaragua (1981-1998)	Bandiera (2007)				0.19*	0.04	prob. tree crops																							

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Nicaragua (1994-2000)	Deininger & Chamorro (2004)	0.29	0.09	log(reported parcel selling price/ha)	0.09	0.02	prob. soil cons. invest.																							
	Peru (1992-2004)	Fort (2008)				0.05	0.03	prob. soil cons. invest.																							

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Peru (1993-2004)	Torero & Field (2005)	0.73	0.07	log(reported parcel selling price/ha)	0.02	0.01	prob. soil cons. invest.							-0.44	3.14	sd(amount of credit received by HH)	0.20	0.05	log(consumption)												
South Asia	India (1970-1999)	Deininger, Jin & Nagarajan (2007)																0.20	0.10	log(consumption)												

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Cambodia (1989-2004)	Markussen (2008)	0.35	0.10	log(value of output/ha)							0.00	0.02	prob. of formal borrowing												(not reported)		prob. reported land conflict			
	China (1987-2001)	Deininger & Jin (2001)				0.09	0.04	prob. soil cons. invest.																							

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	China (1987-1999)	Kung (2006)							0.08	0.17	measure of land rental activity (unclear)																					

Region	Case	Study	Productivity			Investment			Leasing out land			Access credit			Credit amount			Consumption			Gender equality			Perceived insecurity			Social conflict			Displacement		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Vietnam (1993-1998)	Do & Iyer (2007)	0.36	0.22	log(value of output/ha)	0.08*	0.03	prop. cult. area industrial or tree crops				-0.11	0.07	prob. of formal borrowing				0.05	0.06	log(consumption)												
	Vietnam (1993-2006)	Van den Broeck, Newman & Tarp (2007)	0.74	0.32	log(value of output/ha)																											

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Vietnam (1993-2004)	Kemper, Klump & Schumacher (2011)										0.09	0.08	prob. of formal borrowing																	

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
Africa	Ethiopia (1998-2006)	Holden, Deininger & Ghebru (2009)	0.09	0.05	log(value of output/ha)	2.15*	0.97	ordered logit coef. for level of soil cons. invest.																							

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Ethiopia (1998-2006)	Holden, Deininger & Ghebru (2011)																			1.69*	0.93	probit coef. on gender interaction for prob. leasing out land								

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Ethiopia (2003-2007)	Deininger, Ali & Alemu (2009)				0.29	0.03	prob. soil cons. invest.	0.11	0.06	prob. rent out land													-0.10	-0.02	subj probability of expropriation						
	Ethiopia (2003-2006)	Deininger, Ali & Holden (2007)				0.05	0.02	prob. soil cons. invest.																							

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Madagascar (1961-2005)	Jacoby & Minten (2007)	0.06	0.02	log(value of output/ha)	-0.03	0.03	prob. soil cons. invest.																							
	Malawi (2004-2006)	Chiwra (2008)				0.24*	0.11	ha. devoted to hybrid maize																							

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Rwanda (2007-2010)	Ali, Deininger & Goldstein (2011)				0.10	0.04	prob. investment													0.17*	0.06	prob. own land for women with marriage certif.	-0.06	0.09	subj probability of expropriation						

Region	Case	Study	***Productivity***			***Investment***			***Leasing out land***			***Access credit***			***Credit amount***			***Consumption***			***Gender equality***			***Perceived insecurity***			***Social conflict***			***Displacement***		
			b	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*	*b*	*s.e.*	*Effect scale*
	Zambia (1995-2001)	Smith (2004)				1.11*	0.45	value of soil cons. invest. in millions Kw.																								

"b" refers to the effect estimate and "s.e." is the estimated standard error.

*Excluded from meta-analysis because of non-comparable effect scales.

Appendix VII: Relative risk re-analysis for dichotomous outcomes

Higgins and Green (2011, Section 9.4.4.4) suggest using risk ratios, rather than risk differences, for dichotomous outcomes. Under the assumption that effects are multiplicative and constant, the risk ratio will also be constant even if control group event rates vary, while the risk difference will vary in an artificial manner and so a forest plot of risk differences may exhibit heterogeneity that is a confounded combination of such artificial measurement-induced variation and scientifically meaningful heterogeneity in how the intervention operates on different populations. If effects are additive and constant (requiring that even rates be sufficiently bounded away from zero and 1), the risk difference will also be constant while the risk ratio will vary as control group event rates vary in an artificial manner, producing similarly confounded heterogeneity. Each of these is an intuitively interpretable estimate (unlike, say, the odds ratio) and so Higgins and Green's recommendation is based on results due to Deeks (2002) showing that the constancy assumptions for the risk ratio seem more plausible in a larger set of past medical meta-analyses than is the case for the risk difference. Nonetheless, in economic studies, risk differences are the standard mode of computing treatment effects with binary outcomes. Such was the case with the studies reviewed here, and for this reason, the analysis that appears in the main text was based on these values. Here, we check the robustness of the results to working with the risk ratio, and in particular the natural log of the risk ratio, which is most amenable to meta-analysis because it has unbounded support.

Computing the risk ratio requires identifying a relevant control group event rate for each study, and this was not always straightforward. Control group event rates were not always reported in the studies with which we were working. In some cases, we had to refer to another study working with similar data to obtain an approximation for the control group event rate. For example, for the Deininger and Chamorro (2004) study, we obtained an appropriate approximation from de Laiglesia (2005) (a doctoral student's re-analysis of Deininger and Chamorro's data). In other cases, study authors did not present summary statistics on event rates broken down by treatment and control groups and the use of conditional estimation strategies (for example, multiple regression) did not allow for one to infer the control group event rate. In such cases, we approximated the control group event rate by subtracting from the overall sample event rate a quantity equal to the risk difference multiplied by the proportion of the sample in the control group, and if even this was not possible (for example, if control group sample size was unavailable), we simply took the overall event rate mean as the best available approximation. (In such cases, it so happened that the risk differences were small relative to underlying aggregate event rates, in which case the approximation was deemed acceptable.) For one case (Deininger et al., 2007), we were unable to obtain an appropriate measure of the control group event rate or any aggregate event rate for the matter. Note that in some cases, analyses were conducted on differences (for example, Deininger and Chamorro, 2004). However, the effect estimate for a properly causally-identified study should be consistent for the same target quantity whether one is using changes or levels. As such, risk ratios were computed as control group levels of events at the time of endline follow-up divided by the control group size rather than in terms of changes.

Calculations for the log risk ratio (log RR) and associated standard errors are as follows. For each study, the log RR is computed as

$$\log RR = \log [(RD + EC)/(EC)]$$

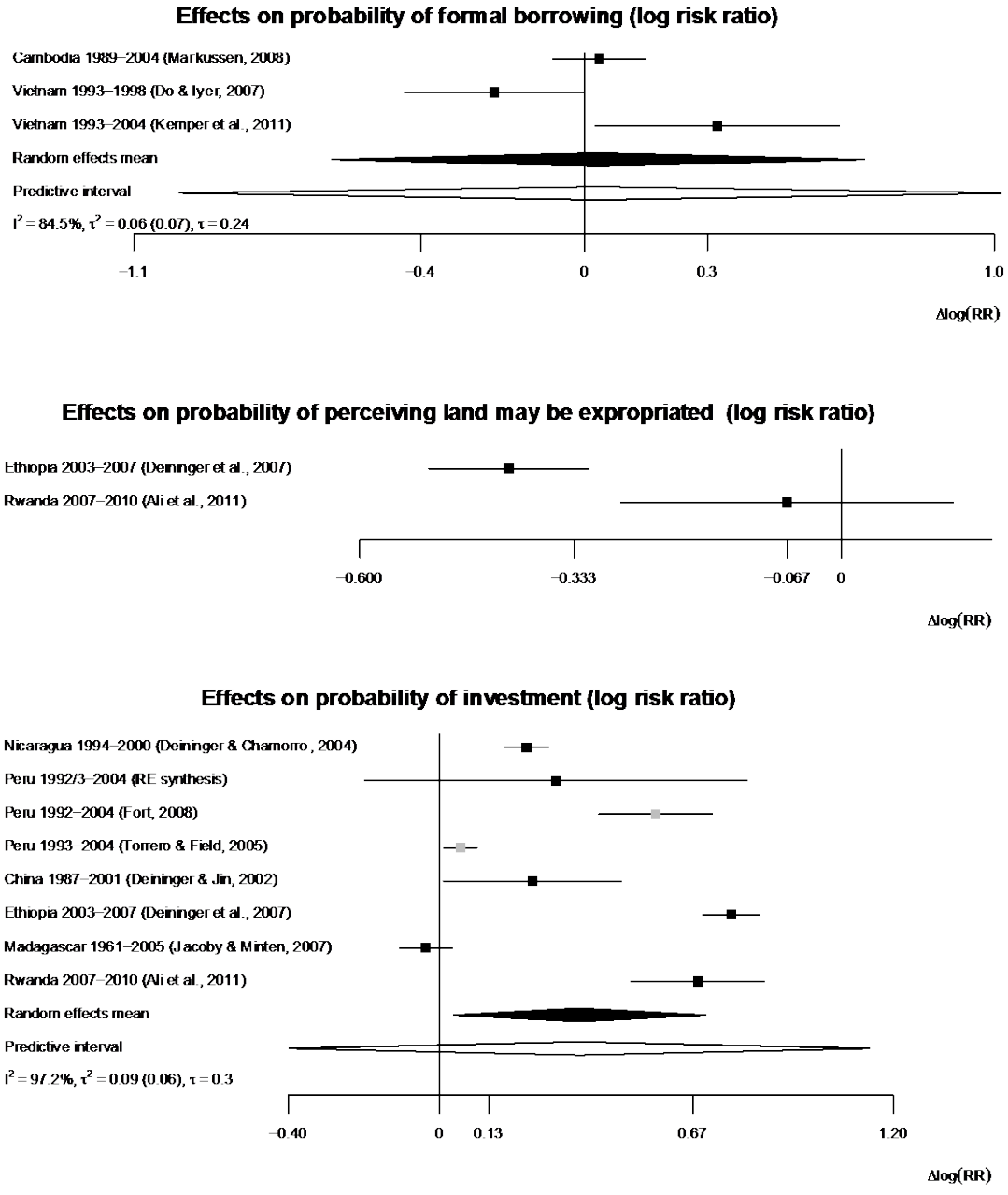
where RD is the reported risk difference (as appears in the analysis in the main text), and EC is the control group event rate. We also needed to compute standard error estimates for the log risk ratio. Because these studies involve clustering and stratification as part of the sampling designs, the standard approximate formulas, which are based on assumptions of simple random sampling or complete random assignment, are inappropriate. Rather, a better-justified approximation takes the appropriately cluster- and stratification-adjusted standard error reported for the risk difference and then uses it in a linearization approximation. In doing so, we take the control group event rate (EC) to be constant. The formula for the linearization standard error estimator is,

$$\text{se}(\log RR) = \text{se}(RD)/(RD + EC)^{0.5},$$

where se(RD) is the reported standard error for the risk difference.

Results are displayed in Figure VII.1. Relative to the analysis on risk differences presented in the main text, substantive conclusions are unaffected. The I^2 estimates for the log risk ratio plots for effects on borrowing and investment are substantially higher than for the risk difference plots. This may suggest that the assumption of constant multiplicative effects is no less, and perhaps considerably more, distorting than an assumption of constant risk differences.

Figure VII. 1: The forest plots show estimates of the effect of de jure recognition of tenure on log relative risks of formal borrowing, perception that land may be expropriated, and investment. See section 3.1.4 for operational definitions of the outcomes. Moves to the right on the x-axis indicate beneficial effects for the top and bottom plots, and moves to the left on the x-axis indicate beneficial effects for the middle plot. See section 3.4.1 for details on the random effects model used to produce the random effects mean, predictive interval, and I^2 measure of heterogeneity.



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