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Pareto Efficient Intrahousehold Allocations and Land Rights: evidence from South Africa

Nicholas Fitzhenry and Malcolm Keswell*

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Abstract

We study whether South African farm households participating in a land reform program make Pareto efficient intrahousehold consumption decisions. Using evaluation survey data of beneficiary households participating in South Africa's Land Redistribution for Agricultural Development (LRAD) program, we estimate and test the unitary and collective models of intrahousehold resource allocation. By estimating the households' demand function's responses to the size of land grant transfers going to resident men and women, we find evidence contradicting the income pooling hypothesis of the unitary model. On the other hand, we cannot reject the hypothesis allocations are Pareto efficient. A test based on a linearisation of the demand system also favours Pareto efficiency.

JEL Keywords: Household Economics, Expenditure, Land Reform

JEL Codes: D130, D120, O12

1 Introduction

Understanding household decision making is a key issue for economists and policymakers seeking to empower women within the developing world. This is particularly the case when designing cash or asset transfer programs that aim to improve the status of women by making them direct program recipients. Without a clear understanding of power dynamics within the home, the impact of these polices might be mitigated or produce unintended consequences for other family members.

Traditionally, economists ignored these issues by assuming households behaved as if they are monolithic entities, with individual preferences set aside and all resources pooled to then channeled towards a common goal. In this characterisation (known as the unitary model) household spending decisions are not swayed by the identity of a resource contributor: any benefit from controlling a resource is relinquished when the resource is added to the family's common pool. However, an overwhelming body of research has shown that households often violate this prediction, with household consumption patterns being sensitive to changes in who contributes what to the family (Thomas, 1990; Shultz, 1990; Duflo, 2003; Bobonis, 2009).

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This has motivated the development of intrahousehold allocation theories which emphasise the role of individual bargaining power within the decision making process. One such class of models - known as the collective approach[1] - do not explicitly characterise mechanisms of the decision making process besides assuming that the final allocation of resources is Pareto efficient, in that a reallocation would not improve the welfare of one member without making another worse off (Chiappori, 1992). Another class of models - known as non-cooperative models - predict that allocations might not be inefficient when household environments are unstable, or when information asymmetries exist between household members (Lundberg & Pollack, 1993, 2003; Bloch & Rao, 2002).

Whether household resource allocations are Pareto efficient is an empirical question. On the one hand, a number of studies from both developed and developing countries have failed to reject the hypothesis that household resources are allocated efficiently (Browning et al., 1994; Browning and Chiappori, 1998; Bobonis, 2009). On the other hand, studies focusing on the efficiency of agricultural productivity of rural West African farm households have shown that households are not efficient in their production (Udry, 1996; Duflo & Udry, 2004). This is a striking result, as it indicates that in a highly resource constrained context, husbands and wives are systematically unable to to achieve efficient resource outcomes.

In this paper, we propose and then implement a quasi-experiment to determine whether the predictions of the unitary and collective models hold for South African farm households who participated in the Land Redistribution for Agricultural Development (LRAD) program. This land reform program, which was active from 2001 until being phased out by 2012, provided land grants to landless black farmers and farm tenants for the purpose of purchasing agricultural land. Rather than mandating the redistribution of farmland, the program worked through state assisted market transfers on a willing-buyer, willing-seller basis. A key feature of the program was that it permitted multiple members of the same household to apply individually for land grants, which resulted in a large share of female household members receiving transfers. Because of maximum limits on individual grants, LRAD applicants would typically pool grants with others in order to purchase larger farms to be owned in common. This produced co-ownership schemes involving both men and women within the same household. However, it is unclear whether the acquisition of rights in land by female household members resulted in a substantive change in their capacity to affect household expenditure decisions (thus violating the unitary model) and whether efficient spending patterns were maintained as rights in land were reallocated across men and women within households (as the collective model would predict).

The theoretical framework developed by Chiappori (1988, 1992), Bourguignon et al. (2009), and Cheryche et al. (2011), among others, offers a series of useful tests of the unitary and collective models. The advantage of these tests is that they do not require the observation of individual demand behaviour. Instead, they are based on the responses of household level demand to changes in what are termed *distribution factors*: variables that only alter consumption patterns by shifting the relative bargaining power between decision makers. We will argue that LRAD's grant transfers to men and women are appropriate candidates for distribution factors.

Assuming that consumption preferences are heterogeneous between men and women, both models place different restrictions on the way household consumption can respond to separate variation in distribution factors. A key prediction of the unitary model is what is known as the income pooling hypothesis, requiring that household expenditure decisions are equally responsive to changes in male and female distribution factors. Where the income pooling hypothesis is rejected, the unitary model cannot hold. With regards to the collective model, the efficiency requirement gives rise to what is known as the proportionality condition, where the ratio of the responses of household demand to changes in each genders' distribution factor should be equal across all goods. A test for the proportionality condition is a necessary and sufficient condition for the collective model (Chiappori, 1998).

The identifying assumptions required by the proportionality condition are hard to satisfy. An ideal research design would randomly assign land grants to men and women within households. Following this ideal design,

[1] Alternatively described as *cooperative models* (Alderman et al., 1995).

we instead use quasi-experimental data on LRAD grant applicants and recipients to construct plausible distribution factors. The data comes from a cross-sectional evaluation survey conducted by the Department of Land Affairs (DLA) between 2005 and 2007, which collected demographic, consumption and program relevant information on LRAD participating households. A key feature of the data is the fact that the survey sample included households who had received grant transfer, as well as those still in the application pipeline. For both groups, the survey collected information on each grant applicant within the household, including their gender and the size of the applied for grant. Using this data, it is possible to determine the total value of the grants applied for by men and by women within each household.

To deal with the potential endogeneity of these two variables, my identification strategy relies on features of the LRAD implementation process. Following Keswell & Carter (2014), we argue that, due to random delays in the application process, and a homogeneous application pool (generated by self-selection into the program and a stringent filtering-out of weaker applicants), whether a household had received grant transfer at the time of the survey interview was largely independent of household preferences. After controlling for observable differences in application date, as well as other application-relevant household characteristics, a household's 'post-transfer' status is sufficiently exogenous. Relying on this, we construct distribution factors by interacting an post-transfer indicator with the total value of land grants applied for by each gender in the household. We argue that, conditional on the total grant amount *applied* for by men and women, the estimated coefficients on these interaction terms capture the (exogenous) *transfer* effect of men and women's land grants.[2]

Using variation in these two factors, we test whether household members' resource allocation decisions support unitary rationality, and whether they are Pareto efficient. Including the above distribution factors in a demand system for food and non-food goods, we test the restrictions of the collective and unitary model. My results reject the income pooling hypothesis, thus providing evidence that South African farm households do not behave in accordance with the unitary model. On the other hand, my tests provide no evidence that households are inefficient: i.e., the tests fail to reject that the ratio of distribution factor effects is equivalent across all consumption goods considered. Therefore, this evidence favours the collective rationality approach. While separate variation in the land grant amount will alter consumption decisions differently depending on the recipient of the transfer, this does not prohibit the household from efficiently allocating resources amongst family members.

To ensure that our results are valid, we conduct an alternative test for collective rationally as developed by Bourguignon et al. (2009) termed the z-conditional demand system approach, that permits a linear test of the proportionality condition.[3] Accepting the additional assumption that at least one distribution factor has a monotonic influence on one of the consumption goods (I find evidence that this is the case for healthcare), it is possible invert the demand system on that distribution factor to develop a system of conditional demand functions that are a function of household expenditure, preferences, the good that is monotonic in one of the distribution factors, and the remaining distribution factor. Bourguignon et al. (2009) show that a linear test of the coefficient estimates on the remaining distribution factor being equal to zero for all goods is an equivalent test of the proportionality condition. The reasoning is that, if household allocation is Pareto efficient, the conditioned good should control for all information related to the movement of the household along the efficiency frontier (Bobonis, 2009). Therefore, the remaining distribution factor should be irrelevant. We conduct this test and demonstrate that the collective model's predictions still hold for the demand system using this more robust approach.

In addition to taking another step towards understanding intrahousehold bargaining between men and women in rural South Africa, this paper also contributes to the literature on the microeconomic impacts of property

[2]The following identification strategy is similar in spirit to studies such as Pitt and Khandker (1998), who a solve a similar identification issue while evaluating microcredit programs by surveying levels of borrowing for households both in eligible and ineligible villages. Here, eligibility is analogous to post transfer status.

[3]This is to address the concern that nonlinear Wald tests, upon which the proportionality test relies, are not invariant to restatements of the null hypothesis and thus tend to over reject the null (Bourguignon et al. (2009).

rights transfers in the developing world. Studies have shown that the transfer of land rights have an impact on a variety of household decisions, including labour supply (Field, 2007; Wang, 2012), investments (Goldstein and Udry, 2008), fertility (Field, 2004), and expenditure (Keswell & Carter, 2014). However, the majority of these studies focus on property transfers to the household as if it is a single entity. In reality, transfer effects might be dependant on who acquires ownership of the land asset. For example, in South Africa and other developing countries property is often held in the name of the household head (Deere and Leon, 2001; Quisumbing and Maluccio, 2003; Wang, 2014). As most household heads tend to be men, policy design that is not adequately cognisant of intrahoushold dynamics may produce unintended consequences to household gender inequality.

The rest of this paper is organised as follows. In section two, we present a review of the literature on intrahousehold models. In section three, we present a theoretical framework in which we formally set out the unitary and collective modes, and derive a series of tests for each. In section four, we present a summary of LRAD and the land reform evaluation data. In section five, we discuss the distribution factors. In section six, we discuss the methodological challenges that arise when attempting to estimate the demand system for low income farming households. In section seven, we present estimates of several specifications of the household demand system, along with my results for the tests of the income pooling hypothesis and the proportionality condition. Section eight concludes.

2 Models of Intrahousehold Allocation

2.1 The unitary model

For a long time, economists analysing household behaviour would treat the household as an individual agent, maximising a single utility function based on a single set of preferences and a single budget constraint defined by pooled household incomes (Chiappori, 1992). This unitary approach is convenient as it allowed any formal theory relating to individual decision making to be directly applied to the household (Chiappori 1992; Samuelson 1956). However, this came at the expense of ignoring the different preferences and behaviours of the individuals that made up the household, running against the methodological individualism at the heart of microeconomic theory (Donni & Ponthieux, 2012).

Several explanations have been used to justify the treatment of household behaviour as individual behaviour. One such justification is based on a Dictatorial model of the household, assuming that all household decisions are made by a single head. The dictator - presumably the *pater familiar* of the traditional household (Deaton, 1997) - has supreme power over other family members. Because other members have no say in the household's decision making, their individual preferences and utility functions are not relevant. Thus, the household's behaviour depends solely on maximising the single utility function of the dictator (Chiappori, 1997). This justification is reliant on the assumption that all other members have no bargaining power. While this might apply to the households of certain societies, perhaps those with strong patriarchal norms, it is unlikely to be applicable across all contexts (Deaton, 1997).

Another justification is offered by Samuelson (1956) in the Consensus Principle approach. In this explanation, the household acts as if it is a unitary entity because members precommit to a single household welfare function that is an increasing in terms of all member's utility functions. Thus, as household members work to maximise the objective function, the household behaves as if it is maximising a single utility function. The advantage in this is that it explains the household's behaviour in terms of individual preferences. However, this approach does not account for how the members agree upon the common objective function, which would require a harmonisation of conflicting interests in many cases (Haddad et al., 1997).

The third and most rigorously argued justification for the unitary approach is developed by Becker (1971, 1991) in his altruism model and Rotten Kid Theorem. In his model of the household, Becker assumes that the

household is made up of a household head who is altruistic, deriving utility from other household members consumption. Other members (the head's spouse and children) are egoistic, deriving utility only from their own consumption. With these assumptions, given sufficient wealth and altruism, the household head is incentivised to transfer resources to the other members. The critical implication is that any changes in the distribution of resources would not affect each members consumption levels, as the head would adjust the transfers to each member in order to maximise their utility (Chiappori, 1997). Because of these transfers, the total resources allocated to each member is an increasing function of total household resources. Thus, all non-head members are motivated to work towards maximising total household resources, rather than behaving rottenly, and results in all household members maximising the household head's utility function (Alderman et al., 1995; Donni & Ponthieux, 2012).

Within this model, Becker argues, the presence of an altruistic head provides sufficient justification for unitary behaviour even in the absence of the head having dictatorial power (Chiappori, 1997). All that is required is that each egoistic household member is capable of considering how their actions will impact the total household's resources (Donni & Ponthieux, 2012). However, several theorists have shown that the Rotten Kid Theorem only holds under highly restrictive conditions. Bergstrom (1989) demonstrates several cases where the head's transfer is independent of their income allocation. He points out that it is necessary for the head to be able to pre-commit to an allocation procedure. Additionally, Ben-Porath (1982) and Pollak (1985) argue that it is not sufficient for the head to be altruistic, they must also possess a certain amount of control over the distribution of resources. Thus, the distribution of power will necessarily play a role in determining household behaviour.

In addition to these theoretical difficulties, the unitary model has been contradicted by a growing number of empirical studies. The assumptions of the unitary model place a number of restrictions on the way that a unitary household can behave, the violations of which can be tested empirically. One prediction of the unitary model is that the restrictions placed on the household demand functions should result in the Slutsky matrix being negative semidefinite and symmetric (Chiappori & Mazzocco, 2017). A number of papers have tested and rejected this condition, including Lewbel (1995), Browning and Chiappori (1998), Dauphin and Fortin (2001), and Dauphin et al. (2011). However, this test is relatively demanding, requiring price variation to be observed over time and additional assumptions including exogenous price variation and separability (Chiappori & Mazzocco, 2017).

The more popular test of the unitary model is that which relies on the income-pooling hypothesis. This is based on the model's implication that the allocation of resources among household members should not affect total household consumption. For example, a simultaneous increase in a husband's income and equivalent decrease in a wife's income, should have no impact on household expenses. In other words, the unitary household acts as if resources are first pooled together, and then allocated irrespective of the income's sources (Alderman et al., 2015). The test requires an estimation of the households demand functions for a series of goods, seeing whether demand responses are the same across different member's resources. One of the test's appealing features is that the can be conducted without observed variation in prices (Chiappori & Mazzocco, 2017). Nor do individual consumption levels need to be observed, only aggregate household expenditure levels across several goods categories, so long as preferences for the goods differ across household members (Alderman et al., 1995).

Many studies that have tested and rejected the unitary model via the income-pooling hypothesis (Schultz, 1990; Thomas, 1990; Bourguignon et al., 1993; Fortin & Lacroix, 1997; Lundberg, Pollak, & Wales, 1997; Phipps & Burton, 1998; Attanasio & Lechene, 2002; Ward-Batts, 2008). By 1995 it was argued by Alderman et al. (1995) that it was 'time to shift the burden of proof', on the basis that the evidence was so overwhelmingly against the unitary model to require that anyone using this approach first justify why it was appropriate to apply to a particular context. Due to the weak theoretical foundations of the unitary model and contradictory empirical evidence, economists have sought to develop alternative models of intrahousehold allocation that can account for differing preferences and power relations amongst members of the household.

2.2 The collective model

As an alternative to the unitary approach, the collective approach was developed in a series of papers by Chiappori (1988, 1992), Bourguignon and Chiappori (1992) and Browning and Chiappori (1998). This approach is a generalisation of a number of non-unitary models, all with a common testable assumption - that the bargaining process produces efficient allocations of resources between members. In other words, keeping total household resources constant, the wellbeing of one household member cannot be increased by reallocating resources without lowering the wellbeing of another household member (Alderman et al., 1995). Several arguments exist to justify this assumption, but the one most commonly advanced has its basis in game theory, arguing that efficient allocations of resources amongst individuals will emerge spontaneously when interactions are repeated in a stationary environment, which results in the members exhausting the efficiency enhancing possibilities (Alderman et al., 1995). Proponents argue that a marriage, or any stable household, can be considered such a stationary environment (Donni & Ponthieux, 2012). Moreover, the assumption of efficiency is a straightforward way to extend rationality of individuals as developed in consumer theory to groups, thus the approach is often described as a model of collective rationality (Browning & Chiappori 1998).

While the allocation of resources is presumed to be efficient, the collective approach makes no assumption about the final distribution of the resources. This is the case in a simple illustration of the model where two spouses, both income earners, collectively bargain on how to spend their total household budget (Alderman et al., 1995). They first decide how much to spend on public goods (which both can enjoy) after which the residual is allocated between each member's private goods in accordance with what is known as a sharing rule. The sharing rule is the household's rule of thumb that determines how much weight is given to one spouse's consumption preferences over the other's (Deaton 1997). This sharing rule is in turn determined by the relative income earned by each spouse. If the one partner's income were to increase, relative to the other, this would shift the sharing rule in favour of their preferences, resulting in a reallocation of resources at a different, although still efficient, equilibrium (Chiappori & Mazzocco, 2017).

The spouses' relative income in the above example is what is known in the collective approach as a distribution factor. A distribution factor is any household characteristic that will alter the household consumption patterns by altering the sharing rule, and not by changing the individual member's preferences, or the household budget (Bourgiuignon et al., 2009). This is not limited to relative levels of members' income. Distribution factors can be thought of as influencing the members' bargaining power by adjusting the outside option of the individual; i.e. their wellbeing if they were to defect from the household (Alderman et al, 1995). Distribution factors used in research have included land and asset ownership, regional sex-ratios (which might determine future marriage prospects), divorce laws and the relative size of the spouses' familial networks (Bourguignon et al., 2009; Browning et al., 1994; Chiappori & Ekeland, 2009; Attanasio & Lechene, 2014).

The collective approach presents several advantages over the unitary model. A key feature is that, besides the efficiency assumption, the rules that determine how the household allocates resources are not assumed, unlike in the justifications of the unitary model. Rather, they emerge from the data. And thus, the assumptions of the collective approach are sufficient to generate testable restrictions and (with sufficient data) recover key structural features such as the sharing rule (Deaton, 1997; Bourguignon et al., 2009).

The primary testable restriction of the collective model is known as the proportionality condition. Because the distribution factors only affect demand through the sharing rule, the ratio of the responses of demands functions to shifts in the distribution factors must be equal to the ratio of the distribution factors effects on the sharing rule. As a result, all ratios of the partial derivatives of the consumption goods responses to the distribution factors should all be equal. Hence, the whether or not this condition holds can be tested if one is able to observe the consumption of at least two goods, and two distribution factors (Bourguignon et al., 2009; Chiappori & Mazzocco, 2017). Using the proportionality condition test, several researchers have tested the collective model using different data and have been unable to reject it (Bourguignon et al., 1993; Browning et al., 1994; Browning & Chiappori, 1998; Donni, 2007; Bobonis 2009; Bourguignon, Browning, &

Chiappori, 2009; Attanasio & Lechene, 2014). Another useful feature of the efficiency hypothesis is that it is also a nested restriction of the unitary model (Deaton 1997), and thus the proportionality condition can also be used to test the unitary model.

The proportionality condition relies on the assumption that distribution factors only influence household consumption through the sharing rule, independent of household preferences (Alderman et al., 1995; Deaton, 1997). As with empirical tests of the income pooling hypothesis, this makes it critical that the distribution factors are exogenous to the household characteristics (Chiappori & Mazzocco, 2017). If this is not the case, it is possible that the differences in distribution factors might simply capture differences in taste across households. This is arguably the biggest practical challenge when testing the collective model. Because of this, many tests seek to identify natural experiments that alter proxies of bargaining power independently of household preferences, such as Attanasio and Lechene (2014) and Bobonis (2009) who make use of the randomised rollout of the Mexican cash transfer program PROGRESA, which gave cash grants to women in low income households. Other tests make use of changes in aggregated variables that are determined at a societal or market level, such as the sex-ratio or changes to marriage laws (Chiappori, Fortin, & Lacroix, 2002).

A second test of the collective approach relies critically on the restrictions imposed on the Slutsky matrix, requiring that the impact of the distribution factors must not exceed size one (Chiappori & Ekeland, 2006). Similar to the Slutsky conditions of the unitary model, this test requires panel data with observable price changes and a series of additional assumptions to be accepted. Moreover, rank condition tests have poor statistical power in small sample contexts (Cambda-Mendez & Kapetanios, 2009). These restrictions have resulted in the test being less commonly used in the empirical literature.[4]

Besides the efficient allocation of consumption goods, the unitary and collective models also place restrictions on the allocation of each household members' time to labour supply, household production and leisure (Chiappori, 1992). Whereas the unitary model operates as if the household member's total available time is first 'pooled', and then allocated in a way that maximises a common utility function, the collective model is compatible with a process whereby an individual's time is efficiently allocated in terms of the household's sharing rule, based in turn on the individual's relative power to influence household decision making (Alderman et al., 1995; Doss, 2013). This means that when time use of household members is observable (this is commonly achieved with data from time use surveys) the income-pooling and proportionality condition tests can be conducted. Research that has used this method, such as Del Boca and Flinn (2012, 2014) for the United States, Vermeulen et al. (2006) for the Netherlands, and Dubois and Ligon (2011) for the Philippines, tend to reject the unitary model, but favour efficiency.

The collective model has also been extended to household production dynamics by Udry (1996), Apps and Rees (1997), Chiappori (1997) and Donni (2008). This is particularly useful when testing the efficiency of agricultural households, such as families engaged in subsistence farming in developing countries (Duflo & Udry, 2004; Chiappori & Mazzocco, 2017). In this extension, where households engage both in the consumption and production of different goods, the collective model requires that the inputs to household production is also allocated efficiently. Udry (1996) first developed a test based on this requirement and conducted it for farming households in rural Burkina Faso, where men and women tend separate plots of land. Productive efficiency requires that similarly productive plots should be equal in yield and input allocations, but Udry observed that the gender of the plot's owner predicted labour and fertiliser inputs, as well as plot yield. On this basis, Udry was able to reject both the unitary and collective model in this setting.[5]

Besides the collective approach, another broad category of models, known as non-cooperative models, have

[4] A third test developed by Bourguignon et al. (2009) termed the z-conditional demand approach, which reduces the proportionality condition to a test of single equation exclusion restrictions, will be presented later in more technical detail.

[5] The divergence in these results from the rest of the literature may arise for a variety of reasons: because of different norms, the independence of household resources, or because researchers use different measures to asses the collective decision making model (Bobonis, 2009; Rangel & Thomas, 2012).

also been developed in response to the shortfalls of the unitary framework. Unlike the collective approach, these models do not assume that the household reaches efficient allocation in production and consumption (Alderman et al., 1995). This framework is developed specifically for settings where individuals cannot enter into binding commitments with the other members of the household (Ulph, 1988; Carter & Katz, 1992; Lundberg & Pollak, 1993). Rather, each individual's actions are conditional on the behaviour of other members. This is modelled using Cournot-Nash equilibria, where individuals seek to maximise their own utility subject to their own budget constraint, taking other member's behaviour as given (Chiappori & Donni, 2009). This framework will lead to resource allocations that are not necessarily efficient.

The non-cooperative approach has several drawbacks. The approach requires a more fully structured model of how household's reach allocation decisions. Traditional formulations have required the assumption that household members adhere to traditional gender roles in terms of the division of labour to household production and the labour supply (Cherchye, De Rock, & Vermeulen, 2009). Practically, variation in price data is required for both the public and private goods (Cherchye, De Rock, & Vermeulen, 2010). As the limitation of data in many contexts prevents this more comprehensive approach, the collective approach is more widely utilised.

2.3 Evidence from other developing countries

While the majority of empirical testing of intrahousehold behaviour has been conducted in developed countries, a body of evidence is emerging for the developing world. The unitary model has been rejected by researchers in a variety of settings, including Haddad and Hoddinott (1994) for Côte d'Ivore, Goldstein and Udry (2008) for Ghana and Bobonis (2009) for Mexico. On the other hand, tests for the collective rationality produce varied results. Studies that have test the collective model via the proportionality condition, including Thomas and Chen (1994) for Taiwan and Quisumbing and Maluccio (2003) for Bangladesh, Ethiopia, Indonesia and South Africa, Duflo and Udry (2004) for Côte d'Ivoire and Dubois and Ligon (2011) for the Philippines, tend to fail to reject the collective model. However, studies based on production have rejected efficiency. Udry (1996) for Burkina Faso and Goldstein and Udry (2008) for Ghana reject the collective model when testing for efficiency in the allocation of inputs household production. Dauphin et al. (2015) reject efficiency when considering bigamous households in Burkina Faso.This variation in results demonstrates the need for a wider testing of intrahousehold models in developing countries in order to capture differences in household behaviour across a range of cultures and institutional backgrounds (Bargain, Kwenda & Ntuli, 2017).

The discussion so far may give the impression that the economic analysis of household decision making is primarily of academic interest, but the literature has important implications for policy-making, particularly in the developing world. Firstly, the understanding of intrahousehold resource allocation between members of a household has important implications on how poverty and inequality is measured (Alderman et al., 1995). If resources are equally distributed, measuring poverty or inequality at the household level versus individual level would produce the same result. The evidence has overwhelmingly shown that this is not widely the case. If the efficiency assumption of the collective model is deemed appropriate, the model can be used to calculate the household sharing rules, which can then be used to estimate poverty rates for individual household members (Deaton 1997; Bargain, Kwenda & Ntuli, 2017). Moreover, collective models offer the ability to analyse gender inequality within the household, as well as other forms of discrimination against vulnerable household members (e.g. children, the elderly). In the African context, research has shown evidence of spending discrimination in favour of boys in Malawi (Dunbar et al., 2013) but no difference in expenditure on boys versus girls in Côte d'Ivoire (Bargain et al., 2014).

The underlying household decision making process is also important in understanding the impact of public transfer schemes such as pensions, cash grants and land titling programs. While the unitary model predicts that the identity of the recipient is not important, many of the cited studies have shown that this is not the case. If incomes are not pooled, then the preferences of the recipient will affect the expenditure (Alderman et al., 1995). Many studies in the developing countries have suggested that women tend to spend more income

on child care and food (Alderman et al., 1995; Doss, 2013). Evidence from randomised roll outs of cash transfers have shown that increases in women's income from the transfer greatly increases child education, nutrition, heights and survival rates, relative to comparable increases in men's income (Behrman & Hoddinott, 2005; Maluccio & Flores, 2005; Bobonis, 2009; Lim et al., 2010). More generally, models of household decision making need to be considered as this process will determine the impact of the transfer on non-recipient household members, as this process may mitigate or enhance the impact of the transfer (Alderman et al., 1995).

2.4 Evidence from South Africa

A small literature has emerged testing household models for South Africa. For the most part, the consensus rejects the unitary model. Duflo (2003) tests the unitary model in the context of South Africa's pension scheme. She exploits the gender differences in pension eligibility criteria, whereby men become eligible at 65 and women at 60, as a natural experiment. She finds, for households containing cohabiting pensioners, that the gender of the grant recipient determines the amount spent on a couple's grandchildren, thus contradicting the unitary model. Using a more informal approach, Case (2002) investigates income pooling using data from a survey measuring the health outcomes of pension-receiving households, which also asked whether respondents pooled resources. The pension was found to have a stronger impact on non-pensioners living in household's that reported to pooled resources. However, the generalisation of these results might be limited by the fact that they are focus on households with in which pensioners reside.

Quisumbing and Maluccio (2003) use survey data from four countries (Bangladesh, Ethiopia, Indonesia and South Africa) to formally test the unitary model, by testing the income-pooling hypothesis, and the collective model. For South Africa, data on Indian and Black two partner households in KwaZulu-Natal are obtained from the 1998 KwaZulu-Natal Income Dynamics Study (KIDS). For both tests, assets owned by each partner are used as distribution factors. To deal with the potential endogeneity of intrahousehold asset distributions, each partner's asset shares are instrumented with lobola payments and other gifts exchanged by families at marriage, as well as each spouse's parents education: predictors of the asset distribution at marriage and thus the initial negotiation of the sharing rule. For South African households, as for the other countries considered, they reject the unitary model, but fail to reject the test for the collective model. However, the authors note that their results are weakened by the poor precision of their asset measures and the complexity of South African households, with many partners not co-residing.

Building on previous work, Maitra and Ray (2006) use the 1998 KIDS data set, along with households previously interviewed from the 1993 South Africa Integrated Household Survey, to test income pooling hypothesis for two partner households in KwaZulu-Natal, disaggregating partner income into various sources (earned income, unearned incomes from asset returns, social pensions and private transfers). To deal with potential endogeneity of these forms on income, they exploit the panel nature of the data set, and utilise a 3SLS procedure, instrumenting for education and migratory status of adult members. While their outcomes are sensitive to specifications of the time trend variable, in all specifications, they fail to reject the income pooling hypothesis for aggregated income and the principal goods considered. Their results differ from most the other evidence rejecting income pooling for South African households. However, when only unearned income is considered (both private and public transfers) their results suggest men and women do not pool their income. In this instance, Maitra and Ray tentatively attribute this to the 'separate accounts' explanation offered by Duflo & Udry (2004), where income from different sources are assigned to different 'mental accounts', which are then reserved for specific types of purchases.[6]

Wittenberg (2009) uses data from the 2008 time use survey to test the unitary model based on its restrictions on the allocation of household member's time use. Using a measure of familial relatedness, he finds that

[6]Wittenberg (2009) points out that Quisumbing and Maluccio (2003) and Maitra and Ray (2006) both suffer from the fact that the sample contains both black African and Indian households, and significant differences in income sources, consumption and culture between these groups might not be adequately controlled for.

women who are close relatives of other household members work more and allocate less time to leisure than female members who are distantly related. The opposite is true for men. Closely related male members work less and enjoy more leisure than distantly related members. This suggests that closely related men benefit from the altruism of closely related women, which they use to extract more leisure, whereas women cannot. This suggests that the identity of the individual contributing their time to the family pool determines how that time is utilised, thus contradicting the unitary model.

While the majority of studies on South African household decision making have sought to test the unitary model, few have sought to test the collective model. Besides Quisumbing and Maluccio (2003), Krueser (2009) is the only other study to test the collective model using South African data. He uses the 2008 wave of the National Income Dynamics Study to test both the unitary and collective model for black African two-partner households. Using male and female income shares as distribution factors, he rejects the unitary model for these households but fails to reject the collective model. He then goes on to use the collective model to produce structural estimates of the sharing rule. However, the study does little in the way of addressing the likely endogeneity issues that arise when using partner specific income shares as distribution factors, and so the test outcomes are not compelling.

Additionally, more structural formulations of the collective model have yet to be widely applied to the South African data. Such an exercise has been recently attempted by Bargain, Kwenda and Ntuli (2017) for two partner and single adult households using data from the 2010/2011 Income and Expenditure Survey. They use a more structured version of the collective mode to estimate the sharing rule for South African households, as well as produce estimates of gender differentials in welfare and poverty incidence within households. This paper does not test amongst the unitary and collective models, but relies on the findings of Duflo (2003) and Krueser (2009), to assume collective rationality, and thus proceed with the structral application of the model.

Several gaps emerge in the South African literature testing intrahousehold models. Firstly, the majority of studies limit their analysis to two partner households, removing from their samples households with more than two adult decision makers. This removes the many non-nuclear living arrangements that characterise South African households (Budlender, 2003; Posel & Rogan, 2011). Secondly, no study as of yet focuses exclusively on households in a rural context. This is relevant given the likely cultural, institutional and socio-economic differences between urban and rural-agricultural households. Thirdly, while Quisumbing and Maluccio (2003) test amongst models using assets brought into the marriage, no study has explored the intrahousehold distributional effects of land transfer projects by gender. This is an important focus, given the relative importance of land as an asset for rural sub Saharan African homes (Doss, 2013) and for the purposes of evaluating the distributional impacts of such programs, which have the explicit mandate to empower women. This study seeks to fill these gaps in its focus on multi adult rural African households who are participants in land reform projects. Before undertaking this, in the following section we present a theoretical model underpinning my analysis.[7]

3 Theoretical Framework

Consider the case where the household consists of two members, A and B.[8] The household can spend its income on n consumption goods, which each partner's consumption of good i represented as q_i^A and q_i^B and $i = 1, ..., n$. The private consumption vectors of these goods are denoted by $\mathbf{q}^A$ and $\mathbf{q}^B$. The total household private consumption vector is denoted as $\mathbf{q} = (\mathbf{q}^A + \mathbf{q}^B)$. There is also a vector of m public goods, $\mathbf{Q}$ and so

[7]This is a generalised version of the collective model as developed by Chiappori, Browning, Bourguignon and their various coauthors (1988, 1997, 1998, 2009), and most closely follows Bobonis (2009) and Attanasio & Lechene (2014) in their application of this framework to an empirical setting.

[8]This assumption is not particularly restrictive. Firstly, a fair portion of the sample used in this analysis is composed of households with only two adults (See table 4). Secondly, the tests that are derived from this assumption can be applied to households with more than two decision makers (Attanasio & Lechene, 2014; Dauphin et al., 2015). For ease of explanation, we limit this presentation of household model to nuclear households.

total household consumption is $\mathbf{C} = (\mathbf{q} + \mathbf{Q})$. The budget constraint is

$$\mathbf{p}'(\mathbf{q}^A + \mathbf{q}^B) + \mathbf{P}'\mathbf{Q} = (\mathbf{p}' + \mathbf{P}')\mathbf{C} = y$$

Where y is total income, or total household expenditure. In the absence of price variation, all prices can be normalised to one and $\mathbf{p}$ is a $1 \times n$ vector of normalised prices for private goods, $\mathbf{P}$ is a $1 \times m$ vector of normalised prices for public goods. The partners' utility functions are represented as $u^A(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a})$ and $u^B(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a})$, where $\mathbf{a}$ is a vector of preference factors $\mathbf{a} = (\mathbf{a}^A, \mathbf{a}^B)$, which are any variables which act to directly alter the decision makers' preferences and tastes. Note that the private consumption of one member enters the utility function of the other. Following Browning and Chaippori (1998) this is to allow for the possibility that members are altruistic, but also describes consumption externalities that might occur.

Because individual preferences are not usually identical, there must be a mechanism by which the household reaches decisions about consumption choices. We present two mechanisms, one that results in the unitary model, and another that results in the generalised form of the collective model. Going forward, we denote the demand for good i as ξ_i when describing the properties that are shared by the demand functions for both private and public goods.

3.1 Demand functions under the unitary model

One way to construct a unitary model is to assume that households maximise a utility function that is a weighted sum of individual preferences. The critical assumption is that this weight is fixed. The household's decision making can be represented as a weighted sum of

$$\begin{aligned} \max_{q^A, q^B, \mathbf{Q}} \quad & \theta u^A(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a}) + (1-\theta) u^B(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a}) \\ \text{subject to} \quad & \mathbf{p}'(\mathbf{q}^A + \mathbf{q}^B) + \mathbf{P}'\mathbf{Q} = (\mathbf{p}' + \mathbf{P}')\mathbf{C} = y \end{aligned} \tag{1}$$

The weight θ gives the influence of partner A's preferences on the demand for goods and is bounded between one and zero.[9] When θ is fixed, it is the same as if the household operated under the single utility function $U(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a})$ which will produce demand functions $\xi_i(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a})$ for $i = 1, ..., n$.[10] The demand system satisfies the adding up, homogeneity and Slutsky symmetry conditions. When prices vary, the Slutsky matrix is negative semidefinite.

3.2 Demand functions under the collective model

Under the collective model, the household's consumption behaviour is *collectively rational*. This implies that the allocations to the household members are Pareto efficient. Because of this, the weight θ is not fixed, and now can be thought of as capturing the sharing rule (this is alternatively termed the Pareto weight in the literature). Now, the generalised household function can be expressed as:

$$\begin{aligned} \max_{q^A, q^B, \mathbf{Q}} \quad & \theta(y, \mathbf{a}, \mathbf{z}) u^A(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a}) + [1 - \theta(y, \mathbf{a}, \mathbf{z})] u^B(\mathbf{q}^A, \mathbf{q}^B, \mathbf{Q}, \mathbf{a}) \\ \text{subject to} \quad & \mathbf{p}'(\mathbf{q}^A + \mathbf{q}^B) + \mathbf{P}'\mathbf{Q} = (\mathbf{p}' + \mathbf{P}')\mathbf{C} = y \end{aligned} \tag{2}$$

The Pareto weight now depends on $(y, \mathbf{a}, \mathbf{z})$, where $\mathbf{a}$ and y are as defined above, and z are *distribution factors*, any variable that influences consumption behaviour, but not by acting through on individual preferences or the budget constraint. They act on demand solely through the Pareto weight θ.

[9] Note that this set up of the unitary model captures the specific case of a dictatorial household, where $\theta = 1$ and partner A is the dictator, or when $\theta = 0$ and person B is the dictator. In these cases, the non-dictator partner's utility function will fall away and the household will seek to maximise the dictators utility function.

[10] This is not the only possible representation of the unitary model, although this form allows it to be related to the collective model, where θ depends on distribution factors.

We can then solve the maximisation problem to create a system of household demand functions

$$\xi_i = \Xi(y, \mathbf{a}, \theta(y, \mathbf{a}, \mathbf{z})) \quad \forall i = 1, ..., n \tag{3}$$

These demand functions are assumed to be trice differential, continuous and homogeneous to degree zero. While the demand system does not satisfy Sultsky symmetry, the pseudo-Slutsky matrix of price responses is rank one and is equal to the sum of a symmetric matrix (Browning & Chiappori 1998).

Bourguignon et al. (2009) show that this demand system specification constitutes a necessary and sufficient condition for collective rationality. This condition places a restriction on the functional form of the demand function so that the distribution factors can only shift the demand for any good through an index that defines the relative weights for each decision maker. Notice that while preferences and income can be rationalised within the unitary model, the effect of a distribution factor on demand cannot be rationalised in the unitary model. Thus, distribution factors serve an essential role in testing for the collective model. In the absence of distribution factors, only the functional form assumptions can be used for identification, provided price variation is observed.

If more than one distribution factor is observable, then it is possible conduct a series of tests of the collective model. In section 3.3 below, we assume that a set of satisfactory distribution factors can be identified. Without a more structural modelling on how power is determined within the household, the designation of a household characteristic as a distribution factor, rather than a preference factor, is an identifying assumption and cannot be tested for. Identifying incontrovertible distribution factors has been a major challenge in the empirical literature. In section 5, we discuss the identifying assumptions that are made in this analysis in context of LRAD.

3.3 Proportionality Conditions for Pareto Efficiency

Without any other assumptions, the framework offers predictions about the consumption behaviour of households. It is possible to test whether Pareto efficiency holds, and also, whether specific forms of efficiency are observed, such as the income pooling of the unitary model. Tests for collective rationality differ depending on the types of data that are available. Here, we focus on tests that require no data on price variation. Bourguignon et al. (2009) show that from equation 3, two further conditions follow, all of which when tested are equivalent to testing for collective rationality.

One of these conditions is the proportionality condition. The fact that it follows from the collective demand system, equation 3, can be illustrated with a set of widely used distribution factor candidates: the respective member's income shares, y^A and y^B. Suppose the household has three sources of exogenous income y^A, y^B and income available to both members, ϕ. In this case, the household maximises its utility subject to total household income $y = y^A + y^B + \phi$. If total income is held constant, ξ_i does not depend on y^A, y^B, or $\mathbf{a}$, but it will in general depend on ϕ .Given this above framework it is possible to write θ as a function of each partners income share. If prices are assumed to be invariant, the demand function becomes

$$\xi_i(\theta, y^A, y^B, \phi) = \xi_i^A[\theta(y^A, y^B, \phi)] + \xi_i^B[(1-\theta)(y^A, y^B, \phi)]$$

Holding total income constant, ξ_i depends on θ, but not on the income shares y^A or y^B. This qualification can be expressed by replacing ϕ with y in the above expression, so that we can consider the effect of varying y^A and y^B while keeping y constant (which implies an adjustment of θ), so that

$$\xi_i(y^A, y^B, y) = \xi_i^A[\theta(y^A, y^B, y)] + \xi_i^B[y - \theta(y^A, y^B, \phi)]$$

By writing out the demand functions in this way, we have a powerful framework within which to test the collective model's restrictions. From this formulation, we can derive a nested test of both the efficiency property and the income pooling property. To do this, we examine household demands for the ith commodity,

ξ_i, change, when we change y^A

$$\frac{\partial \xi_i}{\partial y^A} = \frac{\partial \xi_i^A}{\partial \theta}\frac{\partial \theta}{\partial y^A} - \frac{\partial \xi_i^B}{\partial \theta}\frac{\partial \theta}{\partial y^A}$$

The first term on the left hand side is the change in member A's demand for good i, in response to a change in y^A and the second term is the change in person Bs demand for the good i, in response to a change in y^A, the negative sign is the result of the $(1-\theta)$ component of the Pareto weight. We can also right out an analogous and identical formulation for the change in ξ_i from a change in y^B

$$\frac{\partial \xi_i}{\partial y^B} = \frac{\partial \xi_i^A}{\partial \theta}\frac{\partial \theta}{\partial y^B} - \frac{\partial \xi_i^B}{\partial \theta}\frac{\partial \theta}{\partial y^B}$$

If income is pooled, then changes in partner specific incomes should not affect demand when total income is held constant. This implies that, the partial derivatives of the changes in ξ_i^A and ξ_i^B with respect to θ should be equal.

$$\frac{\partial \xi_i^A}{\partial \theta} = \frac{\partial \xi_i^B}{\partial \theta}$$

If this is the case, then the ratio of the two partials should be

$$\frac{\frac{\partial \xi_i}{\partial y^A}}{\frac{\partial \xi_i}{\partial y^B}} = \frac{(\frac{\partial \xi_i^A}{\partial \theta} - \frac{\partial \xi_i^B}{\partial \theta})\frac{\partial \theta}{\partial y^A}}{(\frac{\partial \xi_i^A}{\partial \theta} - \frac{\partial \xi_i^B}{\partial \theta})\frac{\partial \theta}{\partial y^B}}$$

This resolves into the equivalent ratios

$$\frac{\frac{\partial \xi_i}{\partial y^A}}{\frac{\partial \xi_i}{\partial y^B}} = \frac{\frac{\partial \theta}{\partial y^A}}{\frac{\partial \theta}{\partial y^B}} \tag{4}$$

The left hand ratio is the ratio of the demand for every good, over each distribution factor, conditional on total income. It is a key calculation in testing the collective approach. In order to be efficient, these ratios must be equivalent for all goods and also be equal to the distribution factor effects on the Pareto weights.

The right hand side of the expression is independent of i (it should be the same for any good that the household consumes), so we can test for Pareto efficiency within the household by estimating left hand ratio for as many goods as possible using the available data, and then testing whether they are the same. By replacing partner specific income shares with z_k and z_l, any two distribution factors, the proportionality condition can be stated generally as

$$\frac{\partial \xi_i / \partial z_k}{\partial \xi_i / \partial z_l} = \frac{\partial \xi_j / \partial z_k}{\partial \xi_j / \partial z_l} \quad \forall i, j, k, l \tag{5}$$

The proportionality condition has the following intuition: The effect of a change of the distribution factors on the demand for a goods should be equally proportional to the impact of the distribution factors on the Pareto weight, as the distribution factors only effect demand through the Pareto weight. Because the proportionality condition holds for the distribution factors' effects on all goods, the ratio of the partial derivatives should be equal for all goods.

Another feature of the equation 4 is that it is a generalised version of the efficiency that holds under the unitary model. When income is pooled, who contributes income makes no difference, so the ratios stated above should be equal to one.

$$\frac{\frac{\partial \xi_i}{\partial y^A}}{\frac{\partial \xi_i}{\partial y^B}} = \frac{\frac{\partial \theta}{\partial y^A}}{\frac{\partial \theta}{\partial y^B}} = \frac{\frac{\partial \xi_j}{\partial y^A}}{\frac{\partial \xi_j}{\partial y^B}} = 1$$

If z_k and z_l are partner specific, the test for income pooling can be stated more generally as

$$\frac{\partial \xi_i / \partial z_k}{\partial \xi_i / \partial z_l} = \frac{\partial \xi_j / \partial z_k}{\partial \xi_j / \partial z_l} = 1 \quad \forall i, j, k, l \tag{6}$$

This provides us with a set of nested tests, equations 5 & 6, requiring that the proportions are equal under collective rationality, and that the proportions are jointly equal to one under the unitary model.

Bourguignon et al. (2009) develop another test for the proportionality condition based on an alternative specification of the demand system which is consistent with collective rationality, which they term the z-conditional demand system. This approach helps address the empirical difficulties that arise when testing the proportionality condition, as it allows linear Wald tests of the restrictions.[11] This approach requires the additional assumption that there exists one distribution factor, z_1, that has a strictly monotonic influence on one of the consumption goods, j. If this is assumed, then C_j can be inverted on z_1

$$z_1 = g(y, \mathbf{a}, \mathbf{z}_{-1}, C_j)$$

Here, $\mathbf{z}_{-1}$ is a vector of all distribution factors except the first distribution factor z_1. This can be can substituted into the remaining demand functions for the remaining goods $i \neq j$

$$C_i = \xi_i(y, \mathbf{a}, z_1, \mathbf{z}_{-1}) = \xi_i(y, \mathbf{a}, g(y, \mathbf{a}, \mathbf{z}_{-1}, C_j), \mathbf{z}_{-1}) = \theta_i^j(y, \mathbf{a}, \mathbf{z}_{-1}, C_j)$$

Now, each demand function for goods $j \neq 1$ can be written as a function of the total expenditure, preferences, and all but the last distribution factors and the quantity of good j. The resulting system is referred to as the system of z-conditional demands. It is reduced in dimension by one as it contains one less distribution factor than the original system. Each new demand equation also has a new independent variable, C_j, or the budget share for good j. Based on this system, Bourguignon et al. (2009) demonstrate that the following condition can be derived

$$\frac{\partial \theta_i^j(y, \mathbf{a}, \mathbf{z}_{-1}, C_j)}{\partial z_k} = 0 \quad \forall i \neq j \; and \; k = 2, ..., K \tag{7}$$

This implies that the demand for any other good C_i, conditional on C_j, should be independent of not only z_1, but any other distribution factor. It is important to note that C_j is now endogenous in the demand for C_i as any unobservable determinants of the demand for the C_j are now a function of the demand for C_i. In order to address this, the common approach is to instrument C_j with z_1. The intuition behind equation 7 is that the size of the conditioning good C_j provides enough information to asses whether the household equilibrium stays on the efficiency frontier when relative power of the partners change (Bobonis, 2009). Therefore, the other distribution factors provide no additional information needed to assess whether efficiency holds.

These two conditions are the testable restrictions of the collective model. As long as we observe at least two distribution factors, and the consumption levels of at least two goods, we can distinguish between the unitary and collective models. Without variation in prices, these are the only testable restrictions of the collective model. It is also essential that for one of the distribution factors, it is possible to invert one of the demand functions. Thus, the demand for one good needs to be monotonically increasing with respect to at least one distribution factor.

In this analysis, we implement an empirical version of the test of the unitary approach, equation 6, and the tests of collective rationality based on the proportionality condition, equation 5, and on the z-conditional demand, equation 7. The main difficulty in this exercise is identifying two plausibly exogenous distribution factors. The LRAD program offers an opportunity to identify suitable candidates. In the following section We provide an overview of the LRAD program, describe of the evaluation data and then explain the choice of distribution factors that we use to conduct the tests.

[11] Non linear Wald tests are not invariant to mathematically equivalent restatements of the null hypothesis (Gregory and Veall, 1985; Lafontaine and White, 1986)

4 Land Reform, LRAD and Evaluation Data

4.1 Land reform and LRAD

The dispossession of land from the South African black majority was a cornerstone of colonial policy during the eighteenth and nineteenth centuries (Bundy, 1988; Keswell & Carter, 2014). The resulting racialised patterns of land ownership would be consolidated in the early twentieth century with the passing of the 1913 Natives Land Act, which prevented most of the black majority from purchasing land outside of the areas allocated to the homelands (Wolpe, 1972; Binswanger-Mkhize & Deininger, 1993). During the Apartheid era, policies placed further racial restrictions on land ownership, and implemented programs of forced removals and resettlement of those living in multiracial areas. The result left South Africa with one of the most unequal distributions of land ownership in the world, with the majority of black South Africans residing in urban townships and the homelands, deprived of access to productive farmland (Binswanger & Deininger, 1993).

In light of this, the first democratically elected government of the post-Apartheid era set land reform as a key agenda (Walker, 2001). The program was conceived as comprising of three pillars: restitution, tenure reform and redistribution. The objective of restitution is to restore land to those dispossessed by former racially discriminatory legislation and policy, with specific cases dealt through the Land Claims Court. Tenure reform, arguably the most wide reaching pillar, seeks to improve tenure security through a review of current land policy with an aim to develop more inclusive forms of land tenure. This is largely done through pilot projects and focuses on those living in the former homelands where land tenure is often insecure. Redistribution, the pillar under which LRAD falls, provides opportunities for black South Africans who are interested in gaining access to land, but are not eligible under the other two pillars.

In addition to these objectives, the development of the land reform program was subject to constitutional gender and equity mandates (Walker, 2006). This was in part to shift male-dominated traditional land holding patterns of the former homelands and rural commercial areas, which prevented women from gaining access to and control of land (Hart, Chandia & Jacobs, 2018).[12] Early policy documents of the Department of Land Affairs set targets for redistribution of farmland to black women, people with disabilities and black youth with an interest in farming (Walker, 2006).

Initially, land redistribution was conducted through the Settlement/Land Acquisition Grant (SLAG), which was conducted at the household level, focusing on poorer rural households. Beneficiary households received R 16 000 each to purchase land. Often, these small amounts were too little to acquire productive tracts of farmland, and so households joined together to form trusts and community property associations to receive the grants collectively and then purchase the land (Binswanger-Mkhize, 2014). A result of SLAG's household level focus is that few women became transfer recipients. Typically, the title deed was placed in the name of the household head, who were men for the majority of beneficiary households (Walker, 2006; Hart, Chandia & Jacobs, 2018). Women tended to only gain land ownership where they where the head of a single sex household (a minority of beneficiaries), or when they were married to a male household head in common property and the title deed was registered in both partners' names. Moreover, when grant amounts were combined to acquire land through CPAs, qualitative evidence suggests that women, including female household heads, had less control and influence over land within these structures (Walker, 2003).

During this initial phase, progress on land reform was slow and inefficient, with less than one per cent of commercial farmland having been redistributed by 1999 (Walker, 2006). In response, the South African

[12]Historical and contemporary accounts suggest that that within former homelands and rural areas, men are traditionally designated as the owners of property, particularly farmland and the family's homestead (Bundy, 1988; Catling, 2008; Hart, 2008; Klienbooi, 2013). These ownership patterns are largely based on customary, traditional and common law (Budlender et al., 2011). Despite this, women were largely responsible for the households food production for consumption, where men are primarily responsible for commercial farming. While early historical records and missionary reports describe instances of exclusive female land owners, typically in single sex households, it is men who have traditionally controlled land along with the majority of the household resources (Aliber and Hart, 2009; Catling, 2008; Hart, Chandia & Jacobs, 2018).

government overhauled the program, placing more emphasis on restructuring commercial agriculture, and created the LRAD program. LRAD differed from SLAG by shifting the focus from households to individuals or groups of self selected individuals (Walker, 2006; Keswell & Carter, 2014). Any black South African was eligible for a grant for land acquisition, provided they made a self-contribution, and used the land for agricultural purposes (Binswanger-Mkhize, 2014; Walker, 2006). Unlike earlier programs, LRAD's final policy document explicitly mandated that a third of the land redistributed through the program was to go to women (Walker, 2006). The program required that individuals lived on or near the land that they wished to acquire, and also barred individuals who held public office, were civil servants or their relatives from benefiting under the program (Keswell & Carter, 2014). Through LRAD, the state committed to transfer 30 per cent of commercial land from white to black owners by 2015 (Walker, 2006), a target that was not achieved (Hart, Chandia & Jacobs, 2018).

LRAD's grant awarding process worked on the basis of a sliding scale that would increase with the amount contributed by the applicant. The minimum grant amount R 20 000 and requires a contribution of R 50 000 from the applicant. The maximum grant amount was R 100 000 and would have to have been matched by the applicant by an amount of R 40 000 (Ministry for Agriculture and Land Affairs, 2000). Applicants could make their contributions in cash, in-kind, or in the form of a commitment of labour to the project (Walker, 2006). In practice, beneficiaries living in similar locations would pool their grants together within a common project. This would be used to purchase agricultural land, which would become the shared property of the beneficiaries (Keswell & Carter, 2014). As with many market assisted programs, LRAD was intended to channel benefits to individuals with an established aptitude for agriculture. While this is advantageous in terms of program targeting, this self-selection makes any analysis of the households within the program less generalisable than if beneficiaries were randomly selected.

The shift from SLAG to LRAD produced a notable change in the gender patterns of land ownership amongst recipients: the wider establishment of ownership structures where women co-owned land alongside men (Walker 2009; Hart, Chandia & Jacobs, 2018). This resulted from two features of LRAD: the shift from household to individual beneficiary selection, and the requirement that beneficiaries contributed a share of the finances to purchase the land, or make a contribution in assets or in household labour to the projects. Because of this, less wealthy household heads were obliged to include other household members in order to pool resources in order to raise the own-contribution amount, resulting in women being included in household applications (Hart, Chandia & Jacobs, 2018). On the other hand, female applicants included the male household heads in their applications, as they were traditionally seen as the spokespersons of the household and the custodians of land. Moreover, post settlement support services tended to be male dominated and thus male members of the households are needed to utilise these services (Hart and Aliber, 2010). However, it is unclear whether this *de jure* share in ownership affects the *de facto* control in land, and if this influences the gender dynamics and joint decision making within households.

During operation, LRAD suffered from ineffective implementation and poor post-settlement support, which lead to the failures of many projects (Lahiff, 2007; Dawood et al., 2014). Eventually LRAD was 'starved of budget and ultimately side-lined' (Binswanger-Mkhize, 2014), and replaced by the Productive Land Acquisition Strategy (PLAS) by 2007.[13] Despite LRAD's problems, the evidence suggests that the LRAD program did have a positive impact on the livelihoods of beneficiaries. Keswell & Carter (2014) conduct the only properly specified impact evaluation of any land reform program in South Africa, and conclude that LRAD beneficiaries experienced a 25 per cent increase in their per capita consumption, with their living standards 150 per cent higher than their initial levels after three to four years.

[13]Departing from formal transfers of land, PLAS purchases land from willing buyers and leases the land to applicants. This lease hood is subject to a series of conditions, including the requirement that beneficiaries must prove they were farming the land, and consult with a designated mentor, typically a while farmer (Hart, Chandia & Jacobs, 2018)

4.2 Program evaluation data and descriptive statistics

The data employed in this analysis come from the 2007 national Quality of Life Survey of beneficiary households and communities participating in South Africa's land reform programs, undertaken for the Monitoring and Evaluation Program of the Department of Land Affairs.[14] The study was the final in a series of cross sectional surveys commissioned by the DLA to study the impact of land reform on the beneficiary livelihoods. The first was conducted in 1998/1999, followed by a subsequent survey in 2000/2001 (DLA, 2003). The most recent survey was implemented from 2005 until 2007[15] and captured information for 3 712 beneficiary households. For the purpose of this analysis, we begin by limiting the sample to the 1 762 households who were participants in the LRAD program at the time. This sample includes both beneficiary households who had received transfer of land grants from the program, as well as those who are still awaiting transfer.

As described previously, LRAD is implemented at the project level, which brought together several beneficiary households to work together on a single farm. The sampling procedure of these projects followed a multi-level design, with sample projects being selected from all projects within the study regions with a probability of selection proportional to the number of households and individuals involved (Keswell & Carter, 2014). After this random sample was selected, certain projects were screened out in order to remove weak projects and applications. Projects were removed from the sample if they had not received a 'designation memo' from the DLA, which indicates that the applicants had successfully navigated the administrative process necessary to achieve approval on the project. The projects that were screened out where then replaced with new, randomly selected projects. This process was repeated until the sample was replenished (Keswell & Carter, 2014).

The Quality of Life survey consisted of a household and a community questionnaire, with interviews conducted with a representative of each. The household survey was administered to a member of the household who could provide information on the various outcomes, usually a household head. Modules within the household survey were designed to measure the quality of life enjoyed by the members of the beneficiary household, as well as to assess the targeting and equity components of the land reform program (May, 2000).

An appealing feature of the data comes from the fact that the roster collected information on LRAD grant applications at the individual level. Information is collected on whether each household member applied for a land grant from the DLA, when they first applied for a grant, how much was applied for, and whether it was received. This information was collected for both households who had received transfer of the land grant from the DLA, as well as those still awaiting transfer. This information is essential for the identification strategy pursued in this analysis, which we discuss in section 5.[16] Further information on household-level characteristics are obtainable from the asset and project governance sections of the survey. Information was collected on the type of materials used to construct the household's residence, along with whether the household owned the homestead, both before and after transfer. The project governance section detailed the type of structure through which the project was governed and how the household heard about the program. Additionally, interviewers also recorded the date of interview, the language in which the interview was conducted, and took a series of GPS readings at the site of the homestead.

The household survey's module on expenditure, consumption and savings collected detailed information on monthly consumption patterns for food (both purchased and produced) and non-food items. Using the data collected on expenditures on *purchased* household items, monthly budget shares are constructed for 14 goods

[14]The data used in this analysis are based on that used in Keswell and Carter (2014). Deidentificed data files, meta data and do files of aggregate consumption data and grant information data provided by Malcolm Keswell. This analysis relies on data collected through the household survey, primarily from four of the household survey's modules: a household roster, a section on assets, a section on project governance and a section on expenditure, consumption and savings.

[15]Delays were caused by a hold up of fieldwork operations in certain areas.

[16]The household survey also included a section collecting plot level information, including the land's size and value, who possessed rights in the land, and the property scheme under which it was governed. However, for the majority of sampled LRAD projects, non responses meant that it was not possible to link plots with the identity of owners within the household. Moreover, this information was not available for households still awaiting transfer.

Table 1: Sample size after each restriction

Restriction made	Obs.
No restrictions (all households)	3 712
Only households engaged in LRAD	1 762
At least one man and woman in household	1 538
At least one grant applicant in household	1 283
Not all men/women have missing grant amounts	1 207
Data for all covariates	1 123
Final sample size	1 123

categories.[17] For foodstuff, budget shares are constructed for grains and other cereals, fruit and vegetables, sugar, meat and other food goods. For non-food goods, budget shares are constructed for alcohol and tobacco, hygiene products and entertainment, transport, adult clothing, healthcare, schooling expenses and a category for non-food items. Total household monthly expenditure is calculated as the sum of all expenditure across consumption groups, and is expressed in 2005 prices.[18] For each goods category, a budget share is constructed by dividing the monthly goods category expenditure by the households total monthly expenditure.

In addition to limiting the sample to households involved with LRAD, several other restrictions are made. Table 1 reports the size of the sample after each restriction is imposed. In order to test how demand for goods responds to male targeted transfers versus female targeted transfers, it is necessary that there are both adult men and women in the household.[19] For this reason, we restrict the sample to households who have at least one man and one woman woman residing within the home. Next, in order for the size of land grant to be used as distribution factor, it needs to be assignable to a decision maker, or at least a group of decision makers. In other words, at least one LRAD grant within the household needs to be applied for by an individual. Therefore, we also restrict the sample to households in which at least one adult applied for a grant individually.[20] Additionally, households are excluded where there are missing values for the size of the land grant for all male or female applicants in the household. This results in a sample consisting of 1 207 individuals, of which 786 had yet to receive a grant amount from the DLA, and 421 who had received transfer.[21]

4.2.1 Descriptive statistics

Table 2 reports the means and standard deviations for the various characteristics for all households, and the means for the households that had received transfer of the grant at the time of interview, and those who had not.[22] The final column presents the difference between the means across these two subgroups and whether this difference is significant. In part A of the table, the demographic and other basic household characteristics are presented, followed by the total household expenditures and grant shares in part B, and the budget shares in part C.

Part A of the table reports several basic characteristics of the sample households. The sample is drawn from all nine provinces, with 30 per cent of households located in KwaZulu-Natal. This geographic distribution is reflected in the fact that over 38 per cent of the households were interviewed in isiZulu. As all households are comprised of black South Africans, and about five per cent of the interviews were conducted in either English or Afrikaans, the language of interview provides a plausible proxy for the ethnic-linguistic group of

[17] Where non-food items are aggregated into yearly figures, the value is divided by twelve.

[18] Table 13 in the appendix details what items are included within each goods category.

[19] For the purposes of this analysis, a person is considered an adult when they are over the age of eighteen.

[20] This results in the final sample consisting of households where both men and women will co-own the land they acquire, households where only men acquire rights, and households where women only acquire rights.

[21] When the demand systems are estimated, missing values in covariates result in a sample of 1 123 observations.

[22] The separation of the sample into pre and post transfer groups motivated by the empirical strategy as described in section 5, which relies on an indicator variable for post treatment status.

Table 2: Descriptive Statistics

	Full Sample		Pre-Transfer	Post-Transfer	Difference
	Mean	s.d.	Mean	Mean	$\mu_{post} - \mu_{pre}$
A. Household Characteristics					
Household size	6.62	(3.75)	6.71	6.43	−0.27
Number of women	2.57	(1.60)	2.60	2.50	−0.11
Number of men	2.70	(1.93)	2.72	2.65	−0.07
Number of children age 0-12	1.92	(1.85)	1.91	1.93	0.02
Number of children age 13-18	1.03	(1.22)	1.09	0.91	−0.19**
Women with primary schooling (%)	69.75	(80.42)	70.51	68.24	−2.28
Men with primary schooling (%)	66.36	(36.78)	66.06	66.95	0.89
Mean education (yrs)	8.52	(2.94)	8.40	8.76	0.36*
Mean farming experience (yrs)	1.30	(3.06)	1.27	1.36	0.09
Household head is a man	0.71	(0.45)	0.68	0.78	0.09***
Household head age	53.22	(17.06)	52.59	54.45	1.85
Education of household head (yrs)	5.79	(4.57)	5.60	6.17	0.57*
Distance to DLA office (km)	95.83	(55.73)	92.82	101.77	8.94**
Mud floor	0.32	(0.47)	0.35	0.26	−0.09***
Own homestead	0.76	(0.43)	0.70	0.86	0.16***
Application year	2001.07	(3.27)	2001.60	2000.02	−1.58***
Province					
Limpopo	0.04	(0.20)	0.03	0.06	0.03**
Mpumalanga	0.11	(0.31)	0.11	0.10	−0.02
North West	0.11	(0.31)	0.10	0.13	0.04*
Gauteng	0.06	(0.24)	0.04	0.11	0.08***
Northern Cape	0.03	(0.17)	0.02	0.06	0.04***
Kwa-Zulu Natal	0.30	(0.46)	0.38	0.12	−0.26***
Free State	0.15	(0.36)	0.16	0.13	−0.03
Western Cape	0.03	(0.17)	0.03	0.02	−0.01
Eastern Cape	0.17	(0.38)	0.13	0.26	0.13***
Language of interview					
English	0.01	(0.11)	0.01	0.02	0.01
Afrikaans	0.04	(0.20)	0.04	0.05	0.01
IsiXhosa	0.19	(0.39)	0.15	0.27	0.11***
IsiZulu	0.38	(0.49)	0.46	0.21	−0.26***
Setswana	0.13	(0.34)	0.11	0.17	0.06**
Sesotho	0.20	(0.40)	0.19	0.22	0.02
SePedi	0.03	(0.17)	0.02	0.05	0.03**
SiSwati	0.01	(0.09)	0.01	0.01	0.00
Recipient Women	1.12	(1.05)	1.16	1.02	−0.14*
Recipient Men	1.28	(1.26)	1.32	1.20	−0.11
Women who are recipients (%)	49.65	(40.33)	50.61	47.75	−2.86
Men who are recipients (%)	53.72	(39.03)	54.07	53.02	−1.05
B. Household Resources (2005 ZAR)					
Household expenditures	2452.56	(3484.04)	2275.77	2802.45	526.69*
Household expenditures per capita	472.44	(811.55)	434.20	548.21	114.01*
Total grant amount going to:					
Women	74300.75	(370944.47)	82793.34	57453.83	−25339.51
Men	79660.90	(294204.33)	81700.61	75614.68	−6085.93
Average grant amount going to:					
Women	33561.95	(138819.28)	37641.69	25468.90	−12172.79
Men	45510.95	(220789.00)	50410.68	35791.26	−14619.42
C. Expenditure Shares (%)					
Grains	13.58	(9.98)	14.19	12.37	−1.82**
Fruits & Vegetables	7.28	(4.78)	7.28	7.30	0.02
Sugar	2.78	(2.61)	2.68	2.98	0.30
Meat	11.88	(7.93)	11.65	12.33	0.68
Other Food	8.80	(6.49)	8.94	8.51	−0.43
Alcohol & Tobacco	3.15	(5.92)	3.45	2.55	−0.90*
Hygiene	5.05	(5.12)	4.96	5.23	0.26
Transport	9.95	(12.07)	9.64	10.56	0.92
Child Clothing	2.39	(3.23)	2.60	1.97	−0.63***
Fuel	2.07	(3.79)	2.23	1.75	−0.48*
Adult Clothing	2.05	(2.68)	2.29	1.59	−0.69***
Healthcare	1.08	(2.63)	1.13	0.98	−0.14
Schooling	3.05	(5.93)	3.13	2.91	−0.21
Other Non-Foods	25.65	(17.35)	24.64	27.65	3.02**
Total Food	44.26	(20.11)	44.64	43.49	−1.15
Total Non Food	54.35	(19.45)	53.93	55.19	1.26
Observations	1207		786	421	1207

Note - The rightmost column reports the difference between means for the pre and post transfer groups.
Asterisks indicate whether the difference in means is statistically significant.
* p<0.05, ** p<0.01, *** p<0.001

the household residents.

There are on average 6.62 residents in each household, comprising of on average just over two and a half men, just over two and a half women, almost two children under the age of thirteen, and a child aged between thirteen and eighteen. Households tend to contain more than one adult of the same sex, with only 17 per cent of households being what the literature would consider nuclear (containing only two adults, each of the opposite sex), and just less than 40 per cent of households including less than two men or two women.[23] Average primary schooling among adults of the household, a proxy for literacy, is similar for both men and women, being 69,75 per cent and 66,36 per cent respectively. The majority of households are headed by men (70 per cent), and are on average 53.22 years of age.

Individual grant transfers tend to be directed to only a small number of household members. On average, households have 1.12 women recipients, and 1.28 male recipients. While the number of female grant applicants range from zero to five, and zero to five for male applicants, 65 per cent of households either have only one beneficiary, or two of the opposite sex. In these cases, the head of the household and their spouse are typically the recipients. However, male residents are slightly more likely to be recipients compared to women (49.65 versus 53.72 per cent).

Part B presents differences in household resources. Both total and average grant size differs by sex. Total grant size is lower for women compared to men (R 74 300.75 versus R 79 660.90) as well as average grant size for women than men (R33 561.95 versus R 45 510.95). The sampled households had average total monthly expenses of R 2 452.56, and per capita consumption at R 472.44 per month. This places average per capita household consumption on the just above the 2005 upper bound poverty line of R 413 (Statistics South Africa, 2014). Part C presents the expenditure shares of the goods categories. On average, households split their budget roughly equally between food and non-food items (44.26 per cent and 54.35 per cent respectively), with grains, cereals followed by meat-products taking up the largest share of the food basket, and the 'other non-food' category comprising more than half of non-food expenses.

Several mean household characteristics differ across households who are pre-transfer and those who are post-transfer. Households who have received transfer at the time of transfer applied earlier, and are less likely to reside in KwaZulu-Natal, corresponding with a lower share being interviewed in isiZulu. Households that are post-treatment are closer to the DLA offices. They are also more likely to own their home at the time of interview, and less likely that their home has a mud floor compared to those still awaiting transfer. Expenditure is on average R 526.69 higher (a greater per capita expenditure of R 114) for households who are post-transfer, reflecting both that households with higher incomes moved through the application process faster, as well as the positive impact the program had on beneficiary households (Keswell & Carter, 2014). While pre and post transfer groups do not differ significantly in their budgetary split between food and non-food items, there are small but significant reallocations across categories within the budget. Post transfer groups spend less on grains, and spend less on items in the 'other foods' category. The largest difference between these groups is for schooling expenditures, with post-transfer groups spending just over three per cent more on this share.

5 Distribution Factors

In order to conduct the unitary and proportionality tests, two plausible distribution factors need to be identified. This is arguably the most challenging task of this empirical exercise. In this analysis, we opt to use distribution factors based on the total of the reported values of each individual land grant applied for by men in a household, G_m and total of the reported values of each land grant applied for individually by women in the household, G_w.[24] As described above, LRAD grants are used to purchase or improve land.

[23] Refer to table 4 for a cross tabulation of resident men and women.

[24] These aggregates are calculated by summing the value (in 2005 ZAR) of the land grant that each household member had applied for as an individual, disaggregated by gender, as reported in the household roster. Values were either reported as zero,

Exogenous variation in the grant allocations across the men and women of the household, could arguably shift the claims that household members will have on the land that is purchased with them, and if this is the case shift the balance of power within the bargaining process.

Of course, the transfer of property rights is not the only way that LRAD might alter the relative distribution of power within the household, as the program confers benefits that vary across individuals. For example, whether a person is an active participant in the running of the land project, or is a member of the governance structure, would arguably shift their bargaining power within the home.[25] However, the size of the land grant is the most intuitive and straightforward shifter of 'power' transferred through the LRAD project. Furthermore, a focus on a transfer in grant size, and thus claim to land assets, connects this analysis with the body of empirical research on the role of asset ownership in improving female empowerment in the developing world (Doss 2003; Quisumbing & Maluccio, 2003).

Several features of the data make G_m and G_w appealing candidates for distribution factors. Firstly, both have varying non-zero values.[26] Secondly, G_m and G_w vary separately, with a correlation coefficient of 0.5437. This is evident in Figure 3, which presents a scatter plot of G_m against G_w , and Figure 4, focusing on households with G_m and G_w where values are less than 200 000. Also, there is no significant relationship between the households sum of land grants, $G_w + G_m$, and the share that was applied for by women $G_w/G_a = G_w/(G_w + G_m)$, as is evident in the scatter plot in Figure 5, indicating that variation in the relative share of women's claims on total household grant value is not determined by overall value. However, it is clear from Figures 3, 4 and 5 that the distribution bunches at certain values of G_w/G_a: where $G_w/G_a = 1$ (and $G_m = 0$) where $G_w/G_a = 0$ (and $G_w = 0$) and where $G_w/G_a = 0.5$ (where $G_m = G_w$). Table 3 shows the share of the data at these at these points, this suggests that for the majority of the data (73.3 per cent), either one gender received no grants, or each genders total grant value was equal. While theory places no requirement that the distribution of a distribution factors are not bunched at a value[27], this comes at the cost of a reduction in variation.

In order to meet the definition of a distribution factor, G_m or G_w need to be exogenous to household preferences. This is a strong assumption. Firstly, individual grant maximums imply that grants over a certain size require larger numbers of household residents. Fortunately, the number of men and women in the household is an observable characteristic and thus can be controlled for. However, the program required that individuals match the grant with their own contributions, either in the form of cash, or in the form of a pledge of an amount of livestock, farming equipment or future labour to the land project. Thus the grant amounts will be correlated with ex-ante (prior to application) distributions of wealth and human capital amongst members of the household. Moreover, other household preferences, such as taste for equality and gender allocations of labour might affect who applied for what amount. If these measures are correlated with preferences and the household budget, which is very likely, then the individual grant allocations will likely be endogenous.

The conventional procedure in this instance would be to use an instrumental variables approach, such as Quisimbing and Maluccio (2003), or to rely on an arbitrary discontinuity in the treatment eligibility of the transfer program, such as Lavy (2002) or Duflo (2003). However, a plausible instrument for individual land grant values is difficult to conceive of. There are no idiosyncrasies about the program that could produce differences in the eligibility requirements across men an women, such as differing age requirements across gender of the pension scheme used in Duflo (2003). While an inspection of the data indicates that the later the household applied, the larger the share of total household grant income was applied for in the names of female members, the association looses its significance once demographic controls are accounted for.

ranging between R 20 000 and R 100 000 - the maximum or minimum LRAD grant sizes - or missing. Households were dropped from the sample if either all men or all women had missing grant amounts. Otherwise, individual missing amounts were recorded as zero, and the member is considered a non-applicant.

[25] Then again, such effects might also be endogenous to ex-ante power.

[26] where $G_m \neq 0$ for 78,5 % of the data and $G_w \neq 0$ for 73,5 % of the data.

[27] Indeed, indicator variables have been used to test collective and unitary rationality (Duflo, 2003; Bobonis, 2009)

To address the endogeneity concern, an alternative set of distribution factors are employed: interaction terms between total grant amount by gender and an indicator for the household having received the land grants from the DLA at the time of interview. This strategy exploits the fact that the survey collected information on the size of the land grant each household member applied for, regardless of whether the household members had received those amounts by the time of the interview. What follows is a justification as to why this approach addresses the potential endogeniety of the distribution factors.

5.1 Interaction terms as distribution factors

We make two assumptions which will be later interrogated. Firstly, we assume that grant transfers only influence bargaining power after they have been transferred to the applicant (An application alone will not affect one's bargaining position). Secondly, we assume that a household's post-transfer status is random: i.e household status is exogenous to any household characteristics that might affect expenditure decisions. To emphasise this, we will refer to households that are post-transfer at the time of interview as being in the treatment group, and those that are not as being in the control group.

Given these assumptions, Figures 1 and 2 illustrate the causal pathways through which household preferences can influence household consumption, and how this differs across the treatment and control groups. Figure 1 illustrates the case of the treatment group, in which two channels are distinguished. The first channel is through which household preferences determine the grants going to women and men, which, once transferred will alter consumption. The second channel captures any other pathway through which preferences affect consumption. Figure 1 illustrates the endogeneity problem encountered if one were to use relative grant sizes as a distribution factor. Any unobservable pathways would confound any estimates of the impact of grant shares on household demand. Figure 2 illustrates the channels through which household characteristics

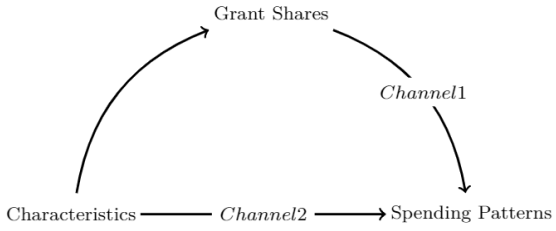


Figure 1: Treatment group

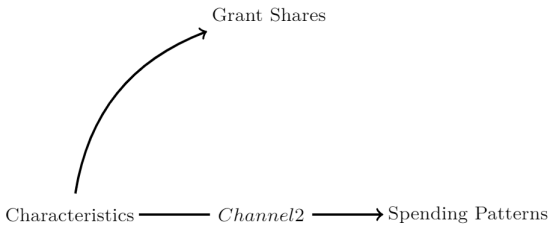


Figure 2: Control group

affect spending patterns in the control group. Because the grant has not yet been transferred, only the second channel is a potential pathway. While preferences can influence grant applications, grant applications cannot influence the budget structure, and thus channel one is closed. This highlights an important feature. Having assumed exogeneity of treatment assignment, the difference in the association between grant sizes and household demand in the control versus the treatment group captures the *transfer* effect operating through channel one. This allows for the construction of plausible distribution factors by interacting each genders grant size with the treatment indicator.

To illustrate this, consider a specification where the gender distribution of the total land grant amount is expressed as the share of the total grant amount that is received by women, G_w/G_a. In this specification, the budget share of good j is regressed on G_w/G_a , a treatment indicator T and an interaction term between the two. In line with a standard coefficient interpretation, the coefficient on the interaction term indicates how the effect of G_w/G_a on the demand for good j differs between the treatment and control groups. As group assignment is assumed exogenous to household characteristics, this difference reflects the difference in impact that an increase in G_w/G_a has on demand, relative to the association that G_w/G_a has with demand in the control group. In effect, the presence of G_w/G_a, along-side the interaction term, controls for the unobserved factors which in it's absence might be correlated with the interaction term.

In the absence of exogenous variation in G_w/G_a, this offers an alternative way to observe whether such variation would have a significant effect in the budget structure. If there is no difference in the effect of G_w/G_a across treated and control groups, then there is no effect occurring through the first channel. This argument also applies to specifications where the gender distribution of land grants is expressed as two separate regressors, G_w and G_m, indicating the total amount going to men and women respectively, along with two interaction terms for each.[28] This specification produces two plausible distribution factors , and under the unitary model, it is expected that these two coefficients would be equal across demand functions.

Given confidence in this approach, we now turn to interrogating the reliability of the assumptions upon which it is based. Would it be the case that the distribution of land grants can only alter the budget structure once the grant has been transferred? Expectation of a future grants may influence bargaining power. For example, it may be the case that household members can use their expectation of a future grant distribution, as leverage within pre-transfer bargaining processes. In this case, there will still be an open first channel for those in the control group. Nevertheless, it seems likely that the bargaining power received from *received* grant transfers would differ from the power received from *expected* transfers. Uncertainty over the date of transfer would likely diminish the impact of expectations. As long as the influence of expectations is not equivalent to the actual transfer, this approach remains plausible. The second assumption that post transfer status is exogenous is less certain. This concern is addressed in the following section.

5.2 Extracting exogeneity in post transfer status

To identify exogenous variation in post transfer status, we rely on the identification strategy pursued in Keswell and Carter (2014), in which they estimate the impact of LRAD grant recipiency on total household consumption. This research design relies on features of the LRAD implementation process, where at several stages during the application process (registration, committee approvals, signing of sales contracts), bureaucratic hold ups would result in highly variable delays in the beneficiaries receiving their land. Due to these delays, otherwise similar households that could have received land grants sooner were still in the administrative pipeline at the time of the survey interview for reasons largely independent of their household characteristics (Keswell & Carter, 2014).

This being said, whether the household has received transfer at the time of interview is not generated by a pure experiment. Because of the potential confounders, the differences in mean characteristics across the pre and post transfer groups in table 2 cannot be treated simply as casual impact estimates. One possible source of such confounding may arise from the fact that the households who are still pre-treatment at the time of the survey interview applied later to the program. As a result, application time might proxy for the eagerness of households to join the program, their anticipation of expected gains, or their preference for risk. Indeed, as can be seen from table 2, post-transfer households are on average 1.58 years earlier than households still awaiting transfer. This difference is statistically significant. These results suggest that it is necessary to control for these variables within any statistical approach.

Along with the application date, another possible source of confounding might arise from the fact that better applicants might move faster through LRAD's implementation pipeline, resulting in better applicants being more likely to be post-transfer at the time of interview. Looking exclusively at post-transfer households, Keswell and Carter (2014) show that applicants who had been post transfer for longer, had taken less time to move through the pipeline, independent of application date. In order to address this concern, it is necessary to control for any factors that might affect the speed of transfer and might be correlated with other household characteristics. At several points in the application process, the chances of an individual application to quickly progressing to the next stage of the process was reliant on the applicants' ability to signal that they had a strong interest and background in farming in order to justify the expenditure of state resources. To control for these factors, covariates are included to account for differences in education in years of members

[28] Put differently, the terms G_w and G_m control for any endogenous determinants of grant *applications*, leaving the interaction terms to capture the effect of exogenous variation in grant *transfers*.

of the households, the average number of years of farming experience held by the participants, the value of agricultural tools and equipment contributed by the project, whether the household contributed financially to the application, and whether they contributed livestock.

Additionally, as most of the households in the sample report not having access to a telephone, proximity to the department offices will allow the household to move through the complex application process at a faster speed. Thus, another class of factors control for the accessibility of the household to the DLA offices. These include the straight line distance between the site of the land project and the nearest Department of Land Affairs.[29] It may be the case that stronger applicants relocate to project sites more proximate to DLA offices, thereby making distance endogenous to household characteristics (Carter & Keswell, 2014). To address this concern, distance can be interacted with an indicator for whether the majority of household members moved to be part of the project, taking on a value of one if they did.

In addition to controlling for these potential confounders, endogeniety is constrained by the highly selective process of the LRAD beneficiaries. In order to be within the sample, households must have first self-selected into the LRAD applicant pool, and then must navigate through a multi stage screening process, with applicants with similarly high chances kept in the application pool, while applicants who are unlikely to succeed being filtered out (Carter & Keswell, 2014). This results in a homogenisation of households, which limits the potential that unobservable differences between groups within the sample.

The following empirical strategy relies on the assumption that there are sufficient observable characteristics to control for any confounders that may be correlated with spending decisions that determine the speed at which the household passes through the application pipeline. If this is done, it is possible to proceed using the interaction terms, as described above, as plausible distribution factors. What follows is a discussion of how this strategy is implemented in order to test the collective and unitary tests.

6 Empirical Implementation

6.1 Tests based on an estimation of the standard demand system

In this section, we describe the econometric models used to test the unitary and collective model, along with the assumptions necessary for identification. As stated above, each household has a demand function for each consumption good, as a function of prices, household resources, gender specific grant application amounts and household and individual level characteristics. These demand functions can be estimated using the Working-Lesser Engel equations

$$\ln \xi_{ji} = \alpha_j + \beta_{j1} T_i \ln G_{wi} + \beta_{j2} T_i \ln G_{mi} + \gamma_{ji} \ln \left(\frac{y_i}{n_i}\right) + \delta_j \mu_i + \epsilon_{ji} \tag{8}$$

Where $\ln \xi_i$ is the household demand for good j measured in terms of the log transformed household budget share for good j, in household i.[30] $\ln G_{mi}$ and $\ln G_{wi}$ are the log transformed female and male specific grant amounts, each interacted with post transfer status indicator T_i to form the distribution factors.[31] μ_i is a collection of controls for household characteristics that are expected to affect household consumption besides land grant allocations, including the treatment indicator and grant amounts. n is household size, and $\frac{y_i}{n_i}$ is household consumption per capita. ϵ_{ji} is the error term, containing unobservable determinants of the demand for each good.

[29] Calculated from GPS readings taken at interview sites and DLA offices.

[30] To report effects as elasticises for the demand system (for ease of interpretation), all log transformations are performed via the inverse hyperbolic sine transformation $\ln \xi_i = \ln (\xi_i + 1)$, in order to have defined values where the household budget share is zero. The tests conducted are robust to this specification.

[31] Inverse hyperbolic sine transformations are also performed on grant amounts. Again, the tests are robust to this transformation.

The vector of household characteristics include a series of demographic controls for the number of resident men and women[32], as well as the number of children by age group (0-5 years, 6-12 years, 13-18 years) and by gender. Also included are variables for the share of household adults who are wage labourers, casual labourers, and self employed by gender. As a proxy for ex-ante bargaining power, an indicator is included for the share of men and women who report being married. Also included are indicators for the residence having a dirt floor, the household owning the residence and the province. In addition, a control is included to capture the date of the interview. This is in order to control for seasonal patterns of household expenditures and agricultural income, as well as changes in prices over time. While there is no data detailing the ethnicity, religion or race group of household members (factors which may influence preferences), these characteristics are proxied by a variable indicating the language in which the interview was conducted.

In keeping with the identification strategy, a variable for the date of application is controlled for. Several variables are also included in order to control for household characteristics which might impact the speed at which the household moves through the application pipeline, as well to control for any ex-ante bargaining power between genders. These include the age, gender and level of education of the household head, the years of farming experience of the household head, the number of household members with commercial farming experience, and the average number of years of experience. Variables are also included to indicate the value of tools and equipment committed to the project, and whether the household committed livestock, and whether the household heard about the program directly from a government official.[33]

The demand system is estimated for the logarithmic transformation of the monthly budget shares for 14 goods categories: grains and cereals, fruit and vegetables, sugar, meat and meat products, other food items, alcohol and tobacco, hygiene and entertainment, transport, child clothing, adult clothing, fuel, healthcare, schooling and other non-food goods.[34] Estimating the system for budget shares instead of expenditure levels controls for different levels of expenditure across households. Additionally, analysing budget shares capture the trade-offs in consumption choices that households make, as an increase in the budget share of one item must result in the decrease of others.

The unitary model implies that consumption is only determined by total resource contributions, and as a consequence the distribution of grant transfers within the household will not play a role in determining intrahousehold resource allocation. This implies, conditional on total expenditure, that each gender specific land grant coefficients are equivalent across all goods ($\beta_{j1} = \beta_{j2}$ for all j), which can be tested via a linear Wald test. On the other hand, under the alternative collective model, a change in a partner's resource contribution will have a varied impact on the demand for a good.

Additionally, under the collective model, it is also possible to estimate the demand effects of the female and male specific land grant distribution factors. This enables the formulation of the proportionality condition test: that the ratio of the distribution factor coefficients is the same for each good

$$\frac{\beta_{j1}}{\beta_{j2}} = \frac{\beta_{k1}}{\beta_{k2}} \quad \forall \; goods \; j, k, j \neq k$$

Because there is no information on price variation, all of the regular price terms in the standard Working-Lesser Engel curve are contained in the error terms. Unaddressed, this would bias our β estimates. The standard way of dealing with this is to estimate the demand curves for all goods as a joint system using a Seemingly Unrelated Regression (SUR) approach. In order to conduct the proportionality tests, the demand equations can be jointly estimated as a system via SUR, and then cross-equation restrictions over the distribution

[32]The specification departs from the typical formulation of the Working-Lesser system by disaggregating household size by gender. This to observe whether demand responds differently to increases in household size depending on the gender of an additional resident, and in order to control for the variation in $\ln G_w$ and $\ln G_m$ determined by household composition.

[33]All variables for demographic and household characteristics are added as covariates in all demand specifications. Coefficients estimates are not reported in main tables. Detailed descriptions of these variables and their construction is provided in table 14 in the appendix.

[34]The goods items that are included in each category are listed in table 13 in the appendix.

factor coefficients are tested. Here, the Wald test formulation can be used to test the restrictions. However, a major issue with this test is the fact that nonlinear Wald test statistics are non-invariant to mathematical reformulation of the null (Bourguignon et al., 2009). To address this issue, the robustness of these results will be assessed by conducting linear joint tests using the z-conditional demand system.

6.2 Test based on an estimation of the z-conditional demand system

I use the z-conditional approach to addresses the challenges of empirically testing the proportionality condition. In order to implement this strategy, it is necessary to assume that the female distribution factor has a monotonic influence on the budget share of one of the goods. It will be shown that the best candidate for such a good is the healthcare consumption good category. Following Bourguignon et al. (2009) the demand equation for the conditioning good, ξ_1 can then be inverted on female distribution factor

$$T_i \ln G_{fi} = \frac{\ln \xi_{1i}}{\beta_{11}} - \frac{\alpha_1}{\beta_{11}} - \frac{\beta_{11}}{\beta_{11}} T_i \ln G_{mi} - \frac{\gamma_1}{\beta_{11}} \ln(\frac{y_i}{n_i}) - \frac{\delta_1}{\beta_{11}} \mu_i + \frac{1}{\beta_{11}} \epsilon_{1i}$$

This can be substituted into all other demand functions for the remaining goods, resulting in the z-conditional demand system

$$\ln \xi_{ji} = (\alpha_j - \frac{\alpha_1 \beta_{j2}}{\beta_{11}}) + \frac{\beta_{j2}}{\beta_{11}} \ln \xi_{1i} + (\beta_{j1} - \frac{\beta_{11}\beta_{j2}}{\beta_{12}}) T_i \ln G_{mi} + (\gamma_j - \frac{\gamma_1 \beta_{j2}}{\beta_{11}}) \ln(\frac{y_i}{n_i}) + (\delta_j - \frac{\delta_1 \beta_{j2}}{\beta_{11}}) \mu_i + \epsilon_{ji} - \frac{\beta_{j2}}{\beta_{11}} \epsilon_{1i}$$

This applies to all goods $j \neq 1$. A Wald test of the joint significance of each coefficient estimates on the male LRAD grant distribution factor, $T_i \ln G_m$ across all goods will be the same as a test of the proportionality condition (Bobonis; 2009). Using this specification, ξ_{ji} is clearly endogenous in the demand for healthcare, the latter being correlated with ϵ_{1i}. However, as we have already assumed that the female LRAD grant transfer $T_i \ln G_w$ is exogenous in terms of demand, it is possible to use it the distribution factor as an instrumental variable to address this endogeneity problem, via three stage least squares (3SLS).

7 Results

This section is divided into three parts. First, we present the results for the demand system estimated without the interaction term distribution factors, first without measures of each gender's land grant amount $\ln G_{fi}$ and $\ln G_{mi}$ and then with these terms included. The purpose of this is to evaluate household consumption response to income, and to assess whether there are any higher order income effects for household per capita expenditure, and whether the system without any grant terms would be properly specified. Secondly, we present the results of the demand system where the specifications include the interaction distribution factors $T_i \ln G_{fi}$ and $T_i \ln G_{mi}$[35]. Using these estimates we conduct the income pooling hypothesis test, and the proportionality conditionality test. Thirdly and last, after investigating potential nonlinear effects of the distribution factors on consumption in order to identify a good that is monotonically increasing in a distribution factor, we present estimates for the system using the z-conditional approach and conduct the z-conditional test for collective rationality.

7.1 Income effects: The demand system without distribution factors

I begin by estimating the demand system, based on equation 8, without the distribution factors. This system includes demographic and household characteristics, including those relevant to the land project that the household is involved in.[36] In table 7, We present only the coefficients on the log transformed total expenditure per capita along with its square, along with the coefficients on the number of resident men and

[35]For ease of interpretation, the distribution factors are denoted as $(Transfer \times \ln G_m)$ and $(Transfer \times \ln G_w)$ in later tables.

[36]Detailed descriptions of these variables are presented in sections B and C of table 14 in the appendix

women in the household. Also reported is the χ^2 test for the joint significance of the two log per capita expenditure terms for each good, along with the p-value for the joint test beneath it.

From the results, it is clear that there are significant, non-zero income effects for many of the budget shares. For the households, goods such as transport and expenditure on items in the other food category are luxuries at the low end of the income distribution, and then become necessities as income increases. Conversely, sugar, grains, child clothing and schooling are necessities at the lower end of the income distribution, while they become luxuries at the upper end of the income distribution. There are also significant, non-zero (albeit small) effects for the number of resident men and women. As the number of resident men increase, the coefficient signs would suggest a reallocation of spending from food to non-food items. Additionally, expenditure shares of adult's clothing increases as male household members increase, but the share spent on children's clothing decreases. Increases in the number of women in the household is associated with increases in schooling expenditure, and decreases in the share of the budget spent on alcohol and tobacco, and meat. This might be reflective of differences in preferences between men and women.[37] The χ^2 test of the joint significance of the coefficients on the expenditure term and its square is significant across 11 of the 14 goods. Based on these results, we proceed by using higher order expenditure terms in the subsequent regressions.[38]

In table 8, we estimate the same demand system, but include variables for the inverse hyperbolic log transformation of the total value of land grants by gender, $\ln G_w$ and $\ln G_m$. Comparing the coefficients on the income variables between tables 7 and 8, it is clear the estimated income effects are robust to the inclusion of each gender's total land grant income. Nevertheless, there are significant non-zero coefficients for these variables across several goods. Both $\ln G_w$ and $\ln G_m$ is negatively associated with the household's budget for meat goods. For other goods, the results suggest that demand responses associated with total grant value differs by the gender of the recipients. Interestingly, the budget share of expenditure on healthcare and schooling is has a significant, small but positive association with women's total grant value, while not being significantly responsive to increases in log transformed men's grant income.

As discussed above, it is likely that $\ln G_w$ and $\ln G_m$ are endogenous to bargaining power dynamics prior to grant application. For this reason, we interact the post-transfer indicator with $\ln G_w$ and $\ln G_m$ respectively to generate more plausible distribution factors, which we use to estimate the demand system in the following subsection. Nevertheless, we also conduct the proportionality and unitary tests based on the estimates reported in table 8, treating $\ln G_w$ and $\ln G_m$ as if they were satisfactorily exogenous distribution factors. The χ^2 test for the joint significance of the coefficient estimates of the distribution factors rejects that these are equal ($\chi^2(25)$ statistic = 40.671; p-value = 0.02) and the nonlinear joint test of the proportionality condition fails to reject the null hypothesis of Pareto efficiency ($\chi^2(13)$ statistic = 4.889; p-value = 0.96).

7.2 The demand system with distribution factors

Table 9 reports the coefficients for the re-estimated demand system allowing for consumption shares to respond to the two distribution factors: 1) the log transformation of total value of men's land grants, interacted with the transfer indicator $T_i \ln G_m$, and 2) the log transformation of the total value of women's' land grants, interacted with the treatment indicator $T_i \ln G_w$.

Several comments can be made. Firstly, the distribution factors are not significant for many of the goods. However, in the demand functions for grains and hygiene the coefficient estimate on the male distribution factor is, while small, significant, being respectively positive and negative in direction. In the demand for alcohol and tobacco, the estimated coefficient on the female distribution factor is significant. Under the unitary rationality, the coefficients of the distribution factors are equal for each good. The joint significance

[37] The sign and significance of these coefficients are robust to the alternative specifications as set out in tables 6 , 8 and 9

[38] Table 6 presents a specification where log transformed expenditure per capita can only enter demand linearly. While this specification also produces significant coefficients for 11 of the 14 goods, the quadratic specification allows for the possibility that the responsiveness of demand for a good to income might differ over the income distribution.

test for the distribution factor coefficients estimates rejects the null hypothesis that they are equal ($\chi^2(13)$ statistic = 44.828 p-value =0.017), rejecting the income pooling hypothesis. On this basis, we reject the unitary model as an accurate description of household decision making. On the other hand, these estimates do not violate the restrictions of the collective model. The joint test of the (nonlinear) proportionality condition fails to reject the null hypothesis of allocative efficiency ($\chi^2(13)$ statistic = 2.816 p-value =0.999). This suggests that the household decision makers are able to make efficient allocations with regards to consumption. However, the inability to reject the proportionality condition might simply be because the nonlinear Wald test suffers from low statistical power. As a robustness check, we conduct the test of Pareto efficiency using the alternative, z-conditional demand system formulation in the following subsection.

7.3 The z-conditional demand system

For the z-distributional approach to be used, there must exist two observable distribution factors and two goods categories (Bourguignon et al., 2009). Moreover, it is necessary for one of the distribution factors to have a positive, monotonic impact on at least one of the goods. To assess whether this is the case, we first estimate the system allowing the distribution factors to enter nonlinearly. Table 10 reports the results of a system specified to include the two distribution factors, along with their squares. The main result is that apart from healthcare, all quadratic terms on both distribution factors are not significantly different from zero at the five per cent level. The coefficients for the demand for healthcare indicate that, conditional on household expenditures, consumption share for this good has a monotonic relationship with the female distribution factor. Given this result, this good will be used to perform the inversion for the z-conditional demand approach test.

Table 11 presents results of the test for collective rationality, using the z-conditional demand system, with the log transformed expenditure share in healthcare as the conditional good, and $T_i \ln G_m$ the remaining distribution factor. To do this, a 3SLS approach is used. Here, the instrument used to invert the conditioning good's demand equation is $T_i \ln G_w$.

The estimates for the unconditional demand system presented in table 9. The coefficient on the male grant distribution factor is significant for a number of goods. In the z-conditional distribution, it is significant nowhere. Unsurprisingly, the Wald test for significance of the coefficients fails to reject the null hypothesis ($\chi^2(12)$ statistic = 1.765 p-value =1). As Bourguignon et al. (2009) show, the requirement that the estimated male distribution factor coefficient is equal to zero for at least one of the consumption goods is the same as the proportionality condition test. As with the nonlinear Wald tests performed on the coefficient estimates presented in table 9, this alternative test also fails to reject the null hypothesis that household decision makers reach efficient allocation decisions regarding consumption.

8 Conclusion

The evidence presented in this paper suggests that rural South African farm households cannot be described as monolithic entities, as if they are unaffected by the reallocation of resources controlled by household members. Rather, when land rights are transferred to specific household members, expenditure responses are sensitive to the gender of the recipient. This is consistent with other evidence rejecting the income pooling hypothesis for black South African households (Krueser, 2009; Duflo, 2003; Wittenberg, 2009), as well as evidence from other parts of the developing world. Moreover, we present evidence that despite heterogeneity in preferences, rural South African farm households are able to reach an efficient allocation of resources with respect to consumption.

What relevance does this have for land reform policy? While the rejection of the unitary model implies that the gender of the land grant recipient does affect household demand response to grant size, these estimated effects are very small. Moreover, these small responses to women's grant increases are perhaps not aligned

with policy desirable expenditure reallocations (increased spending on children and healthcare) that have often been observed when cash-grant programs target women (Duflo, 2003; Bobonis 2009). This is not to say that land asset transfers to women is undesirable, but that, at least in the case of LRAD, a substantial shift in expenditure towards schooling and healthcare is not an observed outcome when women received larger shares of property rights.

Most importantly, the these results suggest that, in a rural setting of non functional land markets, and precarious food security, farming households are able to make consumption decisions in a way that the well being of one member cannot be improved without decreasing the well being of another. This evidence suggests that collective models of intrahousehold allocation are an accurate depiction of agricultural household decision making for those engaged in land reform. Again, this does not suggest that improving the status of women is either impractical or undesirable. This simply implies that thinking about these issues in the context of a collective rationality framework is likely to be beneficial for both policy design and economic analysis (Rangel & Thomas, 2012). Specifically, this suggests it would be fruitful to apply more structural versions of the collective model to this context, allowing the estimation of intrahousehold inequality, individual level poverty levels, as well as to make predictions of how other member's consumption levels respond to different groups benefiting through land reform programs.

These results are subject to three limitations which need to be addressed in further research. Firstly, the identification strategy has relied on the self-selection of beneficiaries into the LRAD program, as well as their likely homogenisation through the filtering of the administration process.While being consistent with Krueser (2009) and Quisumbing and Maluccio (2003), this means that external validity of the results can only be generalised to other rural households, or all black South African households, with caution. It would be beneficial to test whether collective rationally holds for farming households engaged in other land reform schemes such as SLAG or PLAS, in order to assess regularities or explain differences across different institutional and cultural settings.

Secondly, this analysis is reliant on the assumption that preferences systematically differ between men and women, and thus changes in the bargaining power of women relative to men affects household resource allocation decisions. As Doss (2005) points out, although this is an easy way of categorising people, doing so might ignore differences between members of each gender, such as age, marital status and seniority. Analysis using these measures would be complicated by the endogeneity of household formation. Collecting further data that enables researchers to establish the different bargaining positions and consumption preferences of household members would help develop a more nuanced picture of decision making within the household.

Lastly, this analysis relies on the assumption that LRAD's grant transfers resulted in female beneficiaries gaining substantive and enforceable rights in land, thus improving their intrafamilial bargaining position. But as Hart, Chandia and Jacobs (2018) point out, whether this is the case might depend on ex-ante gender dynamics and whether contracts can be practically enforced. Further research needs to be conducted to understand whether the the transfer of formal rights in land translate into control.

Tables and Figures

Figure 3: Men's versus women's total land grants

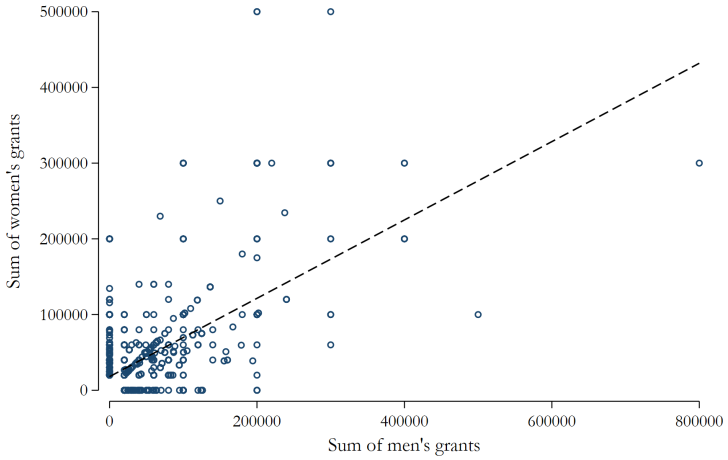
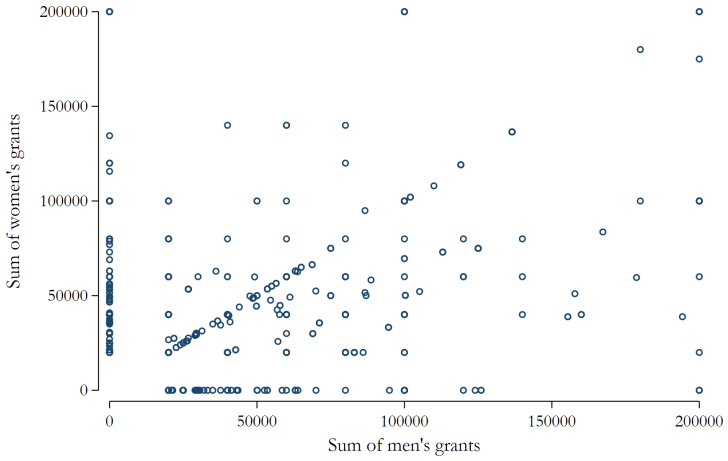


Figure 4: Men's versus women's total land grants (less than R 200 000)



Note - For clarity, this figure presents only the observations in Figure 3 where both G_m and G_w are less than R200 000.

Figure 5: Men's versus women's total land grants

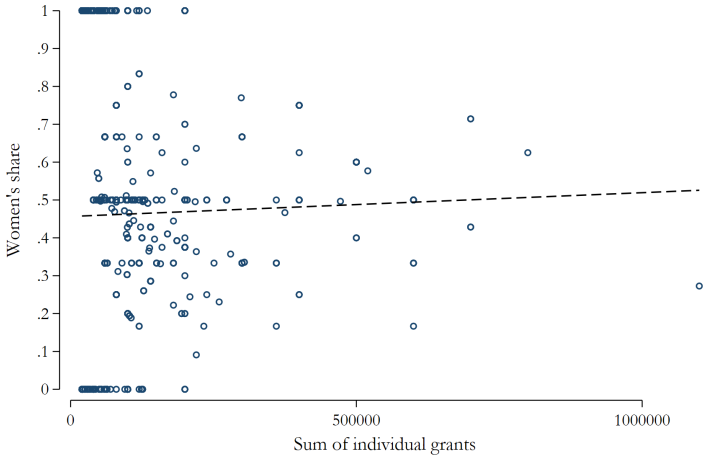


Table 3: Women's share of total household grants: Values across sample

Share is	%
0	26.5
Between 0 and 0.5	17.8
0.5	24.9
Between 0.5 and 1	8.9
1	21.9
Total	100.0

Table 4: Household composition: Resident adults

	Men							
Women	1	2	3	4	5	6	7	Total %
1	17	7	4	1	1	0	0	31
2	9	8	6	2	2	1	1	28
3	5	5	5	3	3	1	0	22
4	3	3	3	1	1	1	0	13
5	1	1	2	1	2	0	0	7
Total %	35	24	19	9	9	3	1	100

Note- Table presents a cross tabulation of the number of resident men and women in households. Frequency of distribution in each cell expressed as percentages.

Table 5: Household composition: Grant applicants

	Men						
Women	0	1	2	3	4	5	Total %
0	0	25	1	0	0	0	27
1	18	23	7	1	2	0	51
2	4	4	2	2	2	0	14
3	0	1	1	2	1	1	6
4	0	0	0	0	0	0	1
5	0	0	0	0	0	1	1
Total %	22	54	12	5	4	2	100

Note- Table presents a cross tabulation (cell percentages) of the number of male and female grant applicants across households.

Table 6: Linear Income Effects: System of Demand Functions without Distribution Factors

	Dependant Variable: ln(budget share of ...)													
	Grains	Fruit & Veg	Sugar	Meat	Other Food	Alc. & Tob.	Hygiene	Transport	Child Clothes	Adult Clothes	Fuel	Healthcare	Schooling	Other non-food
$\ln(y/n)$	-0.0563***	-0.0238***	-0.0131***	-0.0270***	-0.0151***	-0.00529**	-0.0107***	0.0443***	-0.00445***	-0.00112	-0.00386**	0.00194*	0.00645***	0.0994***
	(-19.16)	(-13.46)	(-14.70)	(-9.07)	(-5.87)	(-2.18)	(-5.29)	(9.19)	(-3.47)	(-1.02)	(-2.55)	(1.70)	(2.62)	(16.94)
Number of women	-0.000257	-0.00120	0.000123	-0.00427**	-0.00289*	-0.00366**	-0.000154	0.00210	0.000124	-0.000996	-0.000994	-0.000940	0.00449***	0.00824**
	(-0.14)	(-1.06)	(0.22)	(-2.25)	(-1.76)	(-2.36)	(-0.12)	(0.68)	(0.15)	(-1.42)	(-1.03)	(-1.29)	(2.86)	(2.20)
Number of men	-0.00590***	-0.00393***	-0.00193***	-0.00311*	-0.00331**	0.00353***	-0.00198*	0.00580**	-0.00202***	0.00250***	-0.00184**	0.000394	0.00151	0.00972***
	(-3.55)	(-3.94)	(-3.85)	(-1.85)	(-2.29)	(2.58)	(-1.73)	(2.13)	(-2.78)	(4.03)	(-2.15)	(0.61)	(1.09)	(2.93)
r2	0.51	0.29	0.40	0.25	0.16	0.13	0.19	0.19	0.13	0.12	0.19	0.09	0.17	0.40
p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	1123													

Note - Coefficient estimates and t-statistics (in parenthesis) from SUR estimation of the household demand system are presented. Dependant variables are the inverse monotonic sine transformation of the budget shares for the 14 goods categories, described in detail in table 13. Explanatory variables are listed on the left and include the number of male and female residents along with $\ln(y/n)$, which is the inverse hyperbolic sine transformation of monthly per capita expenditure. Higher order expenditures, distribution factors and grant terms are not included in this specification. All demographic, household and LRAD-specific characteristics as described in section 6 (full list in sections B and C of table 14) are controlled for but coefficients are not presented.

+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Table 7: Higher Order Income Effects: System of Demand Functions without Distribution Factors

	Dependant Variable: ln(budget share of ...)													
	Grains	Fruit & Veg.	Sugar	Meat	Other Food	Alc. & Tob.	Hygiene	Transport	Child Clothes	Adult Clothes	Fuel	Healthcare	Schooling	Other non-foods
$\ln(y/n)$	-0.158***	-0.0118	-0.0276***	0.0307+	0.0436***	-0.0144	-0.0138	0.140***	-0.0327***	0.00326	0.0103	-0.00143	-0.0314*	0.0749*
	(-8.25)	(-1.01)	(-4.73)	(1.57)	(2.59)	(-0.90)	(-1.03)	(4.41)	(-3.89)	(0.45)	(1.03)	(-0.19)	(-1.94)	(1.94)
$\ln(y/n)^2$	0.00856***	-0.00101	0.00123**	-0.00486***	-0.00494***	0.000767	0.000260	-0.00804***	0.00238***	-0.000370	-0.00119	0.000284	0.00319**	0.00206
	(5.37)	(-1.04)	(2.52)	(-2.99)	(-3.53)	(0.58)	(0.23)	(-3.04)	(3.40)	(-0.61)	(-1.44)	(0.45)	(2.37)	(0.64)
Number of women	-0.000702	-0.00114	0.0000594	-0.00402**	-0.00263+	-0.00370**	-0.000167	0.00252	0.000000400	-0.000977	-0.000931	-0.000954	0.00432***	0.00813**
	(-0.38)	(-1.01)	(0.10)	(-2.12)	(-1.61)	(-2.39)	(-0.13)	(0.82)	(0.00)	(-1.39)	(-0.96)	(-1.31)	(2.76)	(2.17)
Number of men	-0.00656***	-0.00385***	-0.00203***	-0.00274+	-0.00293**	0.00347**	-0.00200*	0.00643**	-0.00220***	0.00252***	-0.00175**	0.000372	0.00127	0.00955***
	(-4.00)	(-3.85)	(-4.04)	(-1.63)	(-2.02)	(2.53)	(-1.74)	(2.36)	(-3.05)	(4.06)	(-2.04)	(0.58)	(0.91)	(2.87)
$\chi^2(2)$	405.47	182.49	223.63	91.85	47.30	5.10	28.09	94.41	23.72	1.42	8.57	3.11	12.54	287.36
p-value	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.49	0.01	0.21	0.00	0.00
Observations	1123													

Note - Coefficient estimates and t-statistics (in parenthesis) from SUR estimation of the household demand system are presented. Dependant variables are the inverse monotonic sine transformations of the budget shares for the 14 goods categories, described in detail in table 13. Explanatory variables are listed on the left, include the number of male and female residents along with $ln(y/n)$, the inverse hyperbolic sine transformation of monthly per capita expenditure, and it's square. The third last row reports the test of joint significance of the two per capita expenditure terms. Each tests' respective p-value is also presented. All demographic, household and LRAD-specific characteristics as described in section 6 (full list in sections B and C of table 14) are controlled for but coefficients are not presented.

+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Table 8: Effect of Grant Income on Household Demand

	Dependant Variable: ln(budget share of ...)													
	Grains	Fruit & Veg.	Sugar	Meat	Other Food	Alc. & Tob.	Hygiene	Transport	Child Clothes	Adult Clothes	Fuel	Healthcare	Schooling	Other non-foods
$\ln G_m$	-0.000634	-0.000254	-0.000131	-0.00162***	-0.000280	-0.0000342	0.000405	0.00105	0.0000104	-0.000262+	-0.000358+	0.0000924	0.000409	0.00156*
	(-1.38)	(-0.90)	(-0.93)	(-3.45)	(-0.69)	(-0.09)	(1.25)	(1.36)	(0.05)	(-1.50)	(-1.48)	(0.51)	(1.05)	(1.66)
$\ln G_w$	-0.000206	-0.000662**	-0.000175	-0.00127**	-0.000859*	0.000579	0.000000371	0.000851	-0.000195	-0.000350*	-0.000255	0.000571***	0.00101**	0.000952
	(-0.38)	(-2.01)	(-1.05)	(-2.31)	(-1.80)	(1.28)	(0.00)	(0.95)	(-0.82)	(-1.71)	(-0.90)	(2.68)	(2.21)	(0.87)
Transfer	0.0193***	0.00817**	0.00220	0.00207	0.00537	-0.00962**	0.00188	-0.0143+	-0.00699***	-0.00286	-0.00167	0.00129	-0.0134***	0.00787
	(3.33)	(2.31)	(1.23)	(0.35)	(1.05)	(-1.98)	(0.46)	(-1.48)	(-2.73)	(-1.30)	(-0.55)	(0.56)	(-2.74)	(0.67)
$\ln(y/n)$	-0.163***	-0.0146	-0.0285***	0.0272	0.0411**	-0.0116	-0.0139	0.145***	-0.0315***	0.00320	0.0100	-0.000890	-0.0269*	0.0758*
	(-8.54)	(-1.26)	(-4.86)	(1.40)	(2.44)	(-0.73)	(-1.04)	(4.57)	(-3.74)	(0.44)	(1.00)	(-0.12)	(-1.67)	(1.96)
$\ln(y/n)^2$	0.00898***	-0.000763	0.00130***	-0.00454***	-0.00472***	0.000524	0.000263	-0.00848***	0.00228***	-0.000358	-0.00117	0.000230	0.00279**	0.00197
	(5.66)	(-0.79)	(2.67)	(-2.80)	(-3.36)	(0.39)	(0.24)	(-3.21)	(3.25)	(-0.59)	(-1.40)	(0.37)	(2.08)	(0.61)
Number of women	-0.000531	-0.00113	0.0000908	-0.00342*	-0.00261+	-0.00358**	-0.000357	0.00220	0.0000110	-0.000879	-0.000787	-0.000948	0.00430***	0.00749**
	(-0.29)	(-1.00)	(0.16)	(-1.81)	(-1.59)	(-2.30)	(-0.27)	(0.71)	(0.01)	(-1.25)	(-0.81)	(-1.30)	(2.74)	(1.98)
Number of men	-0.00601***	-0.00315***	-0.00182***	-0.00117	-0.00209	0.00292**	-0.00211*	0.00527*	-0.00212***	0.00286***	-0.00145+	-0.000108	0.000186	0.00837**
	(-3.52)	(-3.03)	(-3.48)	(-0.67)	(-1.39)	(2.04)	(-1.76)	(1.86)	(-2.81)	(4.42)	(-1.62)	(-0.16)	(0.13)	(2.41)
Unitary test	$\chi^2(25) = 40.671$ [p-value = .02]													
Proportionality test	$\chi^2(13) = 4.889$ [p-value = .96]													
Observations	1123													

Note - Coefficient estimates and t-statistics (in parenthesis) from SUR estimation of the household demand system are presented. Dependant variables are the inverse monotonic sine transformation of the budget shares for the 14 goods categories, described in detail in table 13. Explanatory variables are listed on the left and include the number of male and female residents along with $\ln(y/n)$, which is the inverse hyperbolic sine transformation of monthly per capita expenditure. All demographic, household and LRAD-specific characteristics as described in section 6 (full list in sections B and C of table 14) are controlled for but coefficients are not presented.

+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Table 9: Tests for Unitary and Collective Rationality: Effect of Distribution Factors on Household Demand

	Dependant Variable: ln(budget share of ...)													
	Grains	Fruit & Veg.	Sugar	Meat	Other Food	Alc. & Tob.	Hygiene	Transport	Child Clothes	Adult Clothes	Fuel	Healthcare	Schooling	Other Non-Foods
Transfer × $\ln G_w$	0.000428	-0.0000109	-0.00000474	-0.00131+	0.000199	0.000517	-0.000366	0.00107	-0.0000234	0.000217	-0.000657+	-0.000135	-0.000686	0.000852
	(0.49)	(-0.02)	(-0.02)	(-1.48)	(0.26)	(0.71)	(-0.60)	(0.74)	(-0.06)	(0.66)	(-1.45)	(-0.40)	(-0.94)	(0.48)
Transfer × $\ln G_m$	0.00159*	0.000321	0.000455+	0.000229	0.0000925	0.00179**	-0.000550	-0.000894	0.000961**	0.000611*	-0.000407	-0.000337	-0.000392	-0.00320+
	(1.65)	(0.54)	(1.53)	(0.23)	(0.11)	(2.21)	(-0.81)	(-0.56)	(2.26)	(1.66)	(-0.80)	(-0.89)	(-0.48)	(-1.63)
$\ln G_w$	-0.000789	-0.000250	-0.000129	-0.00115**	-0.000352	-0.000221	0.000538	0.000657	0.0000195	-0.000340+	-0.000120	0.000141	0.000657	0.00124
	(-1.42)	(-0.74)	(-0.75)	(-2.02)	(-0.71)	(-0.47)	(1.37)	(0.71)	(0.08)	(-1.61)	(-0.41)	(0.64)	(1.39)	(1.10)
$\ln G_m$	-0.000777	-0.000777**	-0.000338*	-0.00135**	-0.000893+	-0.0000619	0.000198	0.00117	-0.000539*	-0.000569**	-0.000107	0.000692***	0.00115**	0.00209+
	(-1.21)	(-1.98)	(-1.71)	(-2.06)	(-1.57)	(-0.12)	(0.44)	(1.09)	(-1.91)	(-2.34)	(-0.32)	(2.74)	(2.12)	(1.60)
Transfer	0.00161	0.00540	-0.00181	0.0106	0.00293	-0.0297**	0.00975	-0.0150	-0.0154**	-0.0101*	0.00728	0.00539	-0.00436	0.0294
	(0.12)	(0.64)	(-0.43)	(0.76)	(0.24)	(-2.57)	(1.00)	(-0.65)	(-2.52)	(-1.92)	(1.01)	(0.99)	(-0.37)	(1.05)
$\ln(y/n)$	-0.165***	-0.0150	-0.0291***	0.0267	0.0410**	-0.0139	-0.0132	0.146***	-0.0327***	0.00242	0.0105	-0.000461	-0.0265+	0.0802**
	(-8.64)	(-1.29)	(-4.96)	(1.37)	(2.43)	(-0.87)	(-0.98)	(4.60)	(-3.90)	(0.33)	(1.05)	(-0.06)	(-1.64)	(2.07)
$\ln(y/n)^2$	0.00914***	-0.000727	0.00135***	-0.00448***	-0.00471***	0.000707	0.000211	-0.00860***	0.00238***	-0.000297	-0.00119	0.000196	0.00277**	0.00160
	(5.75)	(-0.75)	(2.76)	(-2.76)	(-3.35)	(0.53)	(0.19)	(-3.25)	(3.40)	(-0.49)	(-1.43)	(0.31)	(2.06)	(0.50)
Number of men	-0.00570***	-0.00310***	-0.00175***	-0.00123	-0.00206	0.00326**	-0.00223*	0.00520*	-0.00196***	0.00298***	-0.00157*	-0.000175	0.0000665	0.00789**
	(-3.33)	(-2.96)	(-3.32)	(-0.70)	(-1.36)	(2.27)	(-1.85)	(1.82)	(-2.59)	(4.58)	(-1.74)	(-0.26)	(0.05)	(2.27)
Number of women	-0.000638	-0.00116	0.0000553	-0.00349*	-0.00261+	-0.00370**	-0.000329	0.00231	-0.0000647	-0.000918	-0.000782	-0.000927	0.00430***	0.00777**
	(-0.34)	(-1.02)	(0.10)	(-1.85)	(-1.59)	(-2.38)	(-0.25)	(0.75)	(-0.08)	(-1.30)	(-0.80)	(-1.27)	(2.74)	(2.06)
Unitary test	$\chi^2(25) = 44.828$ [p-value = .017]													
Proportionality test	$\chi^2(13) = 2.984$ [p-value = 1]													
Observations	1123													

Note - Coefficient estimates and t-statistics (in parenthesis) from SUR estimation of the household demand system are presented. The demand system is as eqn. 8. Dependant variables are the inverse monotonic sine transformations of the budget shares for the 14 goods categories, described in detail in table 13. Explanatory variables are listed on the left, and include the two interaction-term distribution factors: $T_i \ln G_w$ and $T_i \ln G_m$ along with the the components of these terms ($\ln G_m$, $\ln G_w$ and T_i), terms for household per capita expenditure and its square ($\ln(y/n)$ and $\ln(y/n)^2$), terms for the number of male and female residents, detailed descriptions of which can be found in section A of table 14 of the appendix. Nonlinear Wald tests of the joint significance of the distribution factors' correlations (the test for unitary rationality) and for the joint significance of the ratio of the distribution factors' correlations (the proportionality test) are also presented. Each test's respective p-value is also presented. All demographic, household and LRAD-specific characteristics as described in section 6 (full list in sections B and C of table 14)are controlled for but coefficients are not presented (full estimates are presented in table 12.

+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Table 10: Higher Order Effects of Distribution Factors

	Dependant Variable: ln(budget share of ...)													
	Grains	Fruit & Veg	Sugar	Meat	Other Food	Alcohol & Tobacco	Hygiene	Transport	Child Clothing	Adult Clothing	Fuel	Healthcare	Schooling	Other Non-Foods
Transfer × lnG_m	-0.00727	0.000313	-0.00294+	0.00721	0.000494	0.00991*	-0.00276	-0.00181	0.000785	-0.00131	0.00367	-0.00528**	-0.00879+	0.00568
	(-1.12)	(0.08)	(-1.48)	(1.09)	(0.09)	(1.83)	(-0.61)	(-0.17)	(0.28)	(-0.53)	(1.08)	(-2.08)	(-1.61)	(0.43)
(Transfer × lnG_m)^2	-0.00122*	-0.000428	-0.000303+	-0.000873	-0.000147	0.0000351	-0.000350	0.00214**	-0.0000137	-0.000176	0.000294	-0.000633**	-0.000671	0.00211+
	(-1.91)	(-1.10)	(-1.55)	(-1.34)	(-0.26)	(0.07)	(-0.78)	(2.02)	(-0.05)	(-0.73)	(0.88)	(-2.52)	(-1.25)	(1.63)
Transfer × lnG_w	0.0139*	0.00489	0.00328+	0.00907	0.00190	0.000557	0.00352	-0.0235**	0.000125	0.00212	-0.00380	0.00685**	0.00655	-0.0228+
	(1.93)	(1.11)	(1.49)	(1.24)	(0.30)	(0.09)	(0.70)	(-1.97)	(0.04)	(0.78)	(-1.01)	(2.42)	(1.08)	(-1.56)
(Transfer × lnG_w)^2	0.000796	0.0000148	0.000299*	-0.000567	-0.0000294	-0.000695+	0.000200	0.00000778	0.0000154	0.000170	-0.000358	0.000443**	0.000739+	-0.000827
	(1.43)	(0.04)	(1.75)	(-1.00)	(-0.06)	(-1.49)	(0.51)	(0.01)	(0.06)	(0.80)	(-1.23)	(2.02)	(1.57)	(-0.73)
r2	0.53	0.30	0.41	0.28	0.17	0.14	0.19	0.21	0.14	0.12	0.19	0.11	0.19	0.41
p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	1123													

Note - Coefficient estimates and t-statistics (in parenthesis) from SUR estimation of household demand system are presented. Dependant variables are the inverse monotonic sine transformation of the budget shares for 14 goods, described in detail in table 13. Explanatory variables listed on the left are the single and quadratic terms for the two distribution factors. All demographic, household and LRAD-specific characteristics as described in section 6 (full list in sections B and C of table 14) are controlled for but coefficients are not presented.

+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Table 11: Z-conditional Demand System and Test for Collective Rationality with Male Distribution Factor

	Dependant Variable: ln(budget share of ...)												
	Grains	Fruit & Veg.	Sugar	Meat	Other food	Alc. & Tob.	Hygiene	Transport	Child Clothes	Fuel	Adult Clothes	Schooling	Other non-foods
ln(budget share of	2.427	2.935	1.811	15.77	-0.0237	-4.405	4.479	-15.03	0.782	6.523	-1.804	5.516	-19.88
healthcare)	(0.20)	(0.27)	(0.28)	(0.31)	(-0.00)	(-0.28)	(0.30)	(-0.31)	(0.18)	(0.31)	(-0.27)	(0.30)	(-0.31)
Transfer $\times$ lnG_m	0.00172	0.00120	0.000945	0.00559	0.000113	0.000195	0.000909	-0.00540	0.00111	0.00188	-0.00000219	0.00146	-0.00942
	(0.42)	(0.33)	(0.44)	(0.33)	(0.05)	(0.04)	(0.18)	(-0.33)	(0.78)	(0.27)	(-0.00)	(0.24)	(-0.44)
Transfer	-0.00205	-0.00634	-0.00892	-0.0669	0.00565	-0.00591	-0.0123	0.0557	-0.0185	-0.0267	-0.000411	-0.0344	0.118
	(-0.04)	(-0.14)	(-0.32)	(-0.31)	(0.18)	(-0.09)	(-0.19)	(0.27)	(-1.01)	(-0.30)	(-0.01)	(-0.43)	(0.43)
Proportionality test	$\chi^2(12) = 1.765$ [p-value = 1]												
Observations	1125												

Note - Coefficient estimates and t-statistics (in parenthesis) from 3SLS estimation of the household demand system are presented. Dependant variables are the inverse monotonic sine transformation of the budget shares for the 12 remaining goods, described in detail in table 13. Instrument for healthcare budget share is distribution factor $T_i lnG_w$. Wald tests of the joint significance of distribution factors $T_i \ln G_w$ correlations in the z-conditional demand system (the collective rationality test). Each tests' respective p-value is also presented. All demographic, household and LRAD-specific characteristics as described in section 6 (full list in sections B and C of table 14) are controlled for but coefficients are not presented.
+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Appendix

Table 12: Effect of Distribution Factors on Household Demand (Table 9 with reported control estimates)

	Dependant Variable: ln(budget share of ...)													
	G & C	F & V.	Su	M	OF	A& T	Hy	T	CC	AC	F	H	E	ONF
Transfer × $\ln G_w$	0.00043	-0.000011	-0.0000047	-0.0013+	0.00020	0.00052	-0.00037	0.0011	-0.000023	0.00022	-0.00066+	-0.00013	-0.00069	0.00085
	(0.49)	(-0.02)	(-0.02)	(-1.48)	(0.26)	(0.71)	(-0.60)	(0.74)	(-0.06)	(0.66)	(-1.45)	(-0.40)	(-0.94)	(0.48)
Transfer × $\ln G_m$	0.0016*	0.00032	0.00045+	0.00023	0.000093	0.0018**	-0.00055	-0.00089	0.00096**	0.00061*	-0.00041	-0.00034	-0.00039	-0.0032+
	(1.65)	(0.54)	(1.53)	(0.23)	(0.11)	(2.21)	(-0.81)	(-0.56)	(2.26)	(1.66)	(-0.80)	(-0.89)	(-0.48)	(-1.63)
$\ln G_w$	-0.00079	-0.00025	-0.00013	-0.0011**	-0.00035	-0.00022	0.00054	0.00066	0.000020	-0.00034+	-0.00012	0.00014	0.00066	0.0012
	(-1.42)	(-0.74)	(-0.75)	(-2.02)	(-0.71)	(-0.47)	(1.37)	(0.71)	(0.08)	(-1.61)	(-0.41)	(0.64)	(1.39)	(1.10)
$\ln G_m$	-0.00078	-0.00078**	-0.00034*	-0.0014**	-0.00089+	-0.000062	0.00020	0.0012	-0.00054*	-0.00057**	-0.00011	0.00069***	0.0012**	0.0021+
	(-1.21)	(-1.98)	(-1.71)	(-2.06)	(-1.57)	(-0.12)	(0.44)	(1.09)	(-1.91)	(-2.34)	(-0.32)	(2.74)	(2.12)	(1.60)
Transfer	0.0016	0.0054	-0.0018	0.011	0.0029	-0.030**	0.0097	-0.015	-0.015**	-0.010*	0.0073	0.0054	-0.0044	0.029
	(0.12)	(0.64)	(-0.43)	(0.76)	(0.24)	(-2.57)	(1.00)	(-0.65)	(-2.52)	(-1.92)	(1.01)	(0.99)	(-0.37)	(1.05)
$\ln(y/n)$	-0.16***	-0.015	-0.029***	0.027	0.041**	-0.014	-0.013	0.15***	-0.033***	0.0024	0.010	-0.00046	-0.026+	0.080**
	(-8.64)	(-1.29)	(-4.96)	(1.37)	(2.43)	(-0.87)	(-0.98)	(4.60)	(-3.90)	(0.33)	(1.05)	(-0.06)	(-1.64)	(2.07)
$\ln(y/n)^2$	0.0091***	-0.00073	0.0013***	-0.0045***	-0.0047***	0.00071	0.00021	-0.0086***	0.0024***	-0.00030	-0.0012	0.00020	0.0028**	0.0016
	(5.75)	(-0.75)	(2.76)	(-2.76)	(-3.35)	(0.53)	(0.19)	(-3.25)	(3.40)	(-0.49)	(-1.43)	(0.31)	(2.06)	(0.50)
Number of men	-0.0057***	-0.0031***	-0.0017***	-0.0012	-0.0021	0.0033**	-0.0022*	0.0052*	-0.0020***	0.0030***	-0.0016*	-0.00018	0.000066	0.0079**
	(-3.33)	(-2.96)	(-3.32)	(-0.70)	(-1.36)	(2.27)	(-1.85)	(1.82)	(-2.59)	(4.58)	(-1.74)	(-0.26)	(0.05)	(2.27)
Number of women	-0.00064	-0.0012	0.000055	-0.0035*	-0.0026+	-0.0037**	-0.00033	0.0023	-0.000065	-0.00092	-0.00078	-0.00093	0.0043***	0.0078**
	(-0.34)	(-1.02)	(0.10)	(-1.85)	(-1.59)	(-2.38)	(-0.25)	(0.75)	(-0.08)	(-1.30)	(-0.80)	(-1.27)	(2.74)	(2.06)
Girls age 0-5	-0.0060**	-0.0036*	-0.0026***	-0.0045+	0.0026	-0.0046*	-0.0018	0.0071	-0.00083	-0.00046	0.00063	0.0011	-0.0065**	0.018***
	(-2.00)	(-1.95)	(-2.82)	(-1.47)	(0.97)	(-1.83)	(-0.86)	(1.42)	(-0.63)	(-0.40)	(0.40)	(0.92)	(-2.57)	(2.98)
Girls age 6-12	-0.0072***	-0.0026+	-0.0026***	0.0015	-0.00021	-0.0020	0.000082	0.0037	0.0026**	0.00013	-0.0012	0.0011	0.0065***	-0.00017
	(-2.61)	(-1.54)	(-3.03)	(0.54)	(-0.09)	(-0.86)	(0.04)	(0.81)	(2.16)	(0.13)	(-0.84)	(1.06)	(2.80)	(-0.03)
Girls age 13-18	-0.0030	-0.0051***	-0.00091	-0.0031	-0.0051*	-0.0031	-0.0021	0.0093*	0.0040***	-0.0024**	0.0017	0.0019+	0.0021	0.0047
	(-0.93)	(-2.60)	(-0.93)	(-0.94)	(-1.80)	(-1.16)	(-0.94)	(1.74)	(2.87)	(-1.99)	(1.03)	(1.52)	(0.77)	(0.72)
Boys age 0-5	-0.0024	-0.0060***	-0.0020**	-0.0049*	-0.0016	0.0031	-0.0043**	0.0065	-0.0012	-0.0022**	-0.00023	-0.0012	-0.0021	0.018***
	(-0.89)	(-3.60)	(-2.40)	(-1.76)	(-0.65)	(1.35)	(-2.27)	(1.42)	(-1.01)	(-2.17)	(-0.16)	(-1.11)	(-0.89)	(3.24)
Boys age 6-12	-0.0022	-0.0027*	-0.00051	-0.0017	0.00017	-0.00077	0.00055	0.0016	-0.00047	0.00038	-0.0013	0.00093	-0.0021	0.0070
	(-0.81)	(-1.65)	(-0.61)	(-0.63)	(0.07)	(-0.34)	(0.29)	(0.37)	(-0.40)	(0.37)	(-0.92)	(0.88)	(-0.92)	(1.29)
Boys age 13-18	-0.0017	-0.0012	-0.0016*	0.0043+	-0.0012	-0.0037+	-0.00052	-0.0017	0.0036***	-0.0024**	0.0070***	-0.00083	0.0060**	-0.0061
	(-0.58)	(-0.69)	(-1.84)	(1.47)	(-0.46)	(-1.52)	(-0.26)	(-0.35)	(2.86)	(-2.17)	(4.66)	(-0.74)	(2.48)	(-1.05)
Share of women: casual labourers	0.0063	0.0065	-0.0044	0.011	-0.0061	0.0075	-0.0074	0.017	-0.0029	-0.00099	-0.0030	0.0054	-0.022***	-0.0072
	(0.63)	(1.07)	(-1.43)	(1.08)	(-0.68)	(0.89)	(-1.05)	(1.00)	(-0.65)	(-0.26)	(-0.57)	(1.38)	(-2.59)	(-0.35)
Share of men: Casual labourers	-0.0018	0.0076	-0.0046+	0.015+	0.013+	0.0040	0.012*	0.0030	0.0054	-0.0030	-0.0021	0.0051	-0.021***	-0.031+
	(-0.19)	(1.34)	(-1.60)	(1.58)	(1.63)	(0.52)	(1.89)	(0.19)	(1.31)	(-0.86)	(-0.44)	(1.39)	(-2.72)	(-1.63)
Share of women: Wage labourers	-0.010	-0.00057	-0.0021	-0.0085	-0.0046	-0.00049	0.0093*	-0.019	0.0020	0.0021	0.0024	0.0014	0.0011	0.026+
	(-1.28)	(-0.12)	(-0.88)	(-1.05)	(-0.66)	(-0.07)	(1.68)	(-1.44)	(0.57)	(0.69)	(0.57)	(0.44)	(0.16)	(1.63)
Share of men: Wage labourers	-0.0064	-0.0028	-0.0024	0.0017	0.0054	-0.0010	0.0084*	0.010	-0.0011	-0.00042	0.0038	-0.00094	-0.021***	0.0068
	(-0.98)	(-0.71)	(-1.18)	(0.26)	(0.94)	(-0.19)	(1.82)	(0.92)	(-0.39)	(-0.17)	(1.10)	(-0.37)	(-3.75)	(0.51)
Share of women: Wage labourers	0.0081	0.0054	0.0054*	0.0035	0.012	-0.00012	0.0092	-0.038**	-0.0027	0.0022	0.0051	-0.0024	-0.022**	0.015
	(0.78)	(0.85)	(1.70)	(0.33)	(1.28)	(-0.01)	(1.27)	(-2.23)	(-0.59)	(0.55)	(0.94)	(-0.58)	(-2.49)	(0.72)
Share of men: Self-employed	-0.0067	0.0082	-0.0027	-0.00026	0.0027	-0.013+	0.0069	0.044***	-0.00013	-0.0075**	0.0011	0.0040	-0.017**	-0.018
	(-0.68)	(1.37)	(-0.91)	(-0.03)	(0.31)	(-1.55)	(0.99)	(2.69)	(-0.03)	(-2.00)	(0.22)	(1.03)	(-2.06)	(-0.87)
Share of women: Married	0.011	-0.0065	0.0068***	0.0069	-0.012*	0.0030	-0.0029	-0.00069	0.0037	-0.0016	-0.0082*	0.0068**	0.015**	-0.020
	(1.36)	(-1.27)	(2.63)	(0.80)	(-1.65)	(0.42)	(-0.48)	(-0.05)	(1.00)	(-0.50)	(-1.85)	(2.06)	(2.12)	(-1.15)
Share of women: Married	-0.0045	-0.00010	-0.0031	0.012	0.0096	-0.0034	-0.011*	0.0028	-0.00073	0.0089***	0.0042	-0.0053+	-0.0087	-0.00095
	(-0.52)	(-0.02)	(-1.17)	(1.31)	(1.26)	(-0.47)	(-1.73)	(0.20)	(-0.19)	(2.70)	(0.93)	(-1.56)	(-1.19)	(-0.05)
Share of women: With primary school	0.0025	-0.0016	0.0014*	-0.00059	-0.0025	-0.0025	-0.0015	-0.0054	-0.00080	-0.00086	0.000028	0.00059	0.0010	0.0097*
	(0.98)	(-0.98)	(1.76)	(-0.22)	(-1.08)	(-1.16)	(-0.82)	(-1.24)	(-0.70)	(-0.87)	(0.02)	(0.58)	(0.47)	(1.83)
Share of men: With primary school	-0.0016	-0.0015	-0.0018	0.0092	-0.0049	-0.014**	0.0074+	0.026**	0.0029	0.0014	-0.0035	0.00010	0.0045	-0.023+
	(-0.22)	(-0.33)	(-0.82)	(1.25)	(-0.77)	(-2.36)	(1.45)	(2.18)	(0.93)	(0.52)	(-0.93)	(0.04)	(0.74)	(-1.60)
Date of interview	0.00065***	0.00011+	0.000074**	-0.000030	0.00028***	-0.00028***	-0.000041	-0.00051***	-0.00017***	-0.0000053	-0.000086+	-0.000048	-0.00020**	0.00022
	(6.04)	(1.61)	(2.23)	(-0.27)	(2.95)	(-3.07)	(-0.55)	(-2.84)	(-3.62)	(-0.13)	(-1.52)	(-1.14)	(-2.22)	(1.01)
Afrikaans	-0.0015	0.014	-0.0065	-0.037+	-0.021	0.0075	-0.0051	0.086**	0.0089	0.0057	0.0025	-0.030***	-0.012	-0.017
	(-0.06)	(0.97)	(-0.90)	(-1.54)	(-0.99)	(0.38)	(-0.31)	(2.18)	(0.85)	(0.63)	(0.20)	(-3.16)	(-0.61)	(-0.35)
IsiXhosa	0.0062	-0.023*	0.012*	-0.066***	-0.055***	0.0043	-0.057***	0.11***	0.0030	-0.0064	-0.0078	-0.035***	-0.0073	0.11**
	(0.30)	(-1.82)	(1.92)	(-3.11)	(-3.01)	(0.25)	(-3.90)	(3.29)	(0.32)	(-0.82)	(-0.72)	(-4.28)	(-0.41)	(2.55)

Table 12 continued: Effect of Distribution Factors on Household Demand (Table 9 with reported control estimates)

IsiZulu	0.035+	-0.012	-0.0094+	-0.025	-0.0082	0.0014	-0.034**	0.11***	0.019**	0.011	0.013	-0.027***	-0.0062	-0.066+
	(1.64)	(-0.91)	(-1.44)	(-1.14)	(-0.44)	(0.08)	(-2.30)	(3.07)	(2.03)	(1.39)	(1.16)	(-3.26)	(-0.35)	(-1.53)
Setswana	0.0094	0.011	-0.0077	0.013	-0.038*	-0.012	0.0090	0.057+	0.013	0.0086	0.012	-0.030***	0.0033	-0.050
	(0.40)	(0.76)	(-1.08)	(0.53)	(-1.85)	(-0.63)	(0.55)	(1.46)	(1.27)	(0.97)	(1.02)	(-3.25)	(0.17)	(-1.05)
Sesotho	0.025	0.00092	-0.011+	-0.0088	-0.049**	-0.0065	0.0041	0.032	0.015	0.0077	0.012	-0.027***	0.0052	-0.0016
	(1.07)	(0.06)	(-1.51)	(-0.36)	(-2.31)	(-0.33)	(0.24)	(0.80)	(1.41)	(0.86)	(0.95)	(-2.94)	(0.26)	(-0.03)
SePedi	-0.077***	-0.020	-0.015*	0.012	-0.056**	0.011	0.011	0.10**	0.022*	0.017+	0.019	-0.030***	0.0057	-0.0025
	(-2.75)	(-1.16)	(-1.73)	(0.41)	(-2.28)	(0.47)	(0.56)	(2.16)	(1.80)	(1.57)	(1.31)	(-2.71)	(0.24)	(-0.04)
SiSwati	-0.026	0.046**	-0.030***	-0.028	0.090***	-0.019	-0.069***	0.11**	0.0080	-0.0071	-0.011	-0.019+	-0.00022	-0.046
	(-0.83)	(2.47)	(-3.17)	(-0.89)	(3.32)	(-0.75)	(-3.17)	(2.18)	(0.59)	(-0.61)	(-0.66)	(-1.59)	(-0.01)	(-0.73)
Xitsonga	-0.12***	-0.014	-0.029**	0.042	-0.023	-0.017	-0.012	0.042	0.032*	0.020	0.011	-0.035**	0.0068	0.10
	(-2.85)	(-0.51)	(-2.22)	(0.96)	(-0.60)	(-0.46)	(-0.41)	(0.58)	(1.70)	(1.24)	(0.47)	(-2.04)	(0.19)	(1.15)
Mpumalanga	-0.077***	-0.0087	-0.012+	0.0021	-0.044**	0.017	0.050***	-0.087**	0.023**	0.023**	0.0029	0.00079	0.026	0.083+
	(-3.06)	(-0.57)	(-1.49)	(0.08)	(-1.96)	(0.80)	(2.84)	(-2.07)	(2.04)	(2.42)	(0.22)	(0.08)	(1.21)	(1.63)
North West	-0.082***	-0.022*	-0.0097+	-0.029	-0.013	0.027+	0.055***	-0.072**	0.024***	0.011	-0.0017	0.00066	0.014	0.10**
	(-3.97)	(-1.72)	(-1.53)	(-1.38)	(-0.73)	(1.59)	(3.82)	(-2.08)	(2.61)	(1.38)	(-0.15)	(0.08)	(0.79)	(2.46)
Gauteng	-0.075***	-0.024**	-0.0092+	0.030+	0.0047	0.0069	0.055***	-0.040	0.025***	0.0052	-0.011	0.0037	0.040**	0.000065
	(-4.06)	(-2.09)	(-1.61)	(1.59)	(0.29)	(0.44)	(4.24)	(-1.28)	(3.04)	(0.74)	(-1.15)	(0.51)	(2.53)	(0.00)
Northern Cape	-0.081***	-0.040***	-0.00089	0.0020	-0.022	0.0081	0.035**	-0.10***	0.025**	0.011	0.0048	0.0050	0.016	0.14***
	(-3.49)	(-2.82)	(-0.13)	(0.08)	(-1.08)	(0.42)	(2.17)	(-2.67)	(2.46)	(1.24)	(0.40)	(0.55)	(0.81)	(3.04)
KwaZulu Natal	-0.070***	-0.0033	-0.013*	-0.018	-0.044**	0.022	0.060***	-0.096**	0.028**	0.015+	0.023*	0.012	0.037*	0.052
	(-2.86)	(-0.22)	(-1.68)	(-0.73)	(-2.02)	(1.07)	(3.50)	(-2.35)	(2.55)	(1.61)	(1.81)	(1.21)	(1.76)	(1.05)
Free State	-0.12***	-0.025**	-0.017***	-0.016	0.013	0.020	0.040***	-0.040	0.025***	0.019***	0.012	0.00036	0.014	0.080**
	(-6.49)	(-2.15)	(-2.89)	(-0.86)	(0.81)	(1.31)	(3.05)	(-1.28)	(3.10)	(2.68)	(1.19)	(0.05)	(0.87)	(2.11)
Western Cape	-0.11***	-0.040**	-0.021**	0.049*	-0.0027	0.028	0.063***	-0.11**	0.046***	0.012	-0.0032	0.0086	0.017	0.076
	(-3.96)	(-2.33)	(-2.40)	(1.72)	(-0.11)	(1.19)	(3.16)	(-2.44)	(3.70)	(1.08)	(-0.22)	(0.78)	(0.71)	(1.33)
Eastern Cape	-0.041+	0.011	-0.012+	0.020	0.0096	0.0031	0.081***	-0.12***	0.031***	0.026***	0.021+	0.0064	0.037*	-0.061
	(-1.56)	(0.71)	(-1.52)	(0.74)	(0.41)	(0.14)	(4.37)	(-2.75)	(2.67)	(2.61)	(1.54)	(0.61)	(1.67)	(-1.14)
Application date	0.000024	-0.00038***	0.0000074	-0.000016	-0.000032+	0.000026	-0.000020	0.000047	0.000013	0.0000083	0.00000032	-0.0000052	0.000037*	-0.000049
	(1.03)	(-2.68)	(1.03)	(-0.67)	(-1.53)	(1.33)	(-1.19)	(1.21)	(1.23)	(0.93)	(0.03)	(-0.57)	(1.85)	(-1.03)
Heard through government official?	-0.0031	-0.0027	0.0021+	0.0045	-0.0047	-0.0088**	-0.0094***	0.0091	-0.0028	-0.00038	-0.0024	-0.00070	0.0083**	0.010
	(-0.65)	(-0.95)	(1.46)	(0.93)	(-1.13)	(-2.24)	(-2.83)	(1.17)	(-1.38)	(-0.21)	(-0.98)	(-0.38)	(2.09)	(1.07)
Matched contribution?	-0.0033	0.0037	0.00014	-0.0078	0.0063	-0.0029	-0.00060	-0.0059	0.0034	0.0015	-0.00080	-0.0043	0.018***	-0.0065
	(-0.44)	(0.80)	(0.06)	(-1.00)	(0.93)	(-0.46)	(-0.11)	(-0.47)	(1.02)	(0.51)	(-0.20)	(-1.43)	(2.74)	(-0.42)
Moved to join?	0.016**	0.0016	0.0059***	-0.014**	-0.000080	0.0013	-0.0000059	-0.010	-0.0010	-0.0036	0.0025	-0.00087	0.016***	-0.014
	(2.45)	(0.39)	(2.87)	(-2.01)	(-0.01)	(0.24)	(-0.00)	(-0.94)	(-0.34)	(-1.44)	(0.71)	(-0.33)	(2.92)	(-1.05)
Mean farming experience (yrs)	-0.00014	0.0011**	0.00045**	0.0029***	0.00081	0.00063	-0.00050	-0.00048	-0.00070**	-0.00018	-0.00029	-0.00071**	0.00031	-0.0033**
	(-0.19)	(2.55)	(2.02)	(3.93)	(1.26)	(1.04)	(-0.99)	(-0.40)	(-2.20)	(-0.65)	(-0.75)	(-2.48)	(0.51)	(-2.22)
Share of men: Have farming exp.	-0.0030	-0.00088	-0.00052	0.00065	0.0017	-0.0018	-0.0013	-0.0019	0.00043	-0.00012	0.0081***	-0.00037	-0.0029+	0.00076
	(-1.32)	(-0.64)	(-0.75)	(0.28)	(0.85)	(-0.96)	(-0.81)	(-0.50)	(0.44)	(-0.14)	(6.86)	(-0.41)	(-1.52)	(0.17)
Share of women: Have farming exp.	0.0029	-0.0021	-0.0013+	-0.0025	-0.0019	0.0016	-0.00032	0.0086*	0.00089	0.000048	-0.0039***	-0.000077	-0.0011	-0.0012
	(1.08)	(-1.25)	(-1.56)	(-0.92)	(-0.81)	(0.72)	(-0.17)	(1.92)	(0.75)	(0.05)	(-2.76)	(-0.07)	(-0.48)	(-0.21)
Head age	-0.000067	-0.000023	-0.000017	0.00024*	0.00015	-0.00036***	-0.000014	-0.000046	-0.000021	-0.00019***	-0.000029	0.00011**	-0.000086	0.00035
	(-0.48)	(-0.27)	(-0.40)	(1.69)	(1.20)	(-3.14)	(-0.15)	(-0.20)	(-0.35)	(-3.56)	(-0.40)	(2.05)	(-0.73)	(1.24)
Head is a man?	-0.0033	0.0038	-0.000024	-0.0044	-0.0086+	0.0035	0.0071+	0.0064	-0.00078	-0.0052**	-0.0065**	-0.0060**	0.0020	0.011
	(-0.54)	(1.01)	(-0.01)	(-0.70)	(-1.59)	(0.69)	(1.64)	(0.62)	(-0.29)	(-2.24)	(-2.01)	(-2.47)	(0.39)	(0.88)
Education of head (yrs)	-0.0011*	-0.00017	-0.00066***	-0.0015**	0.00047	-0.00014	-0.00037	-0.000066	0.00068**	0.00024	-0.00019	-0.00047*	0.0012**	0.0019+
	(-1.74)	(-0.43)	(-3.33)	(-2.22)	(0.82)	(-0.26)	(-0.83)	(-0.06)	(2.40)	(0.98)	(-0.55)	(-1.87)	(2.27)	(1.48)
Mud floor?	0.0080+	0.0075**	0.0067***	0.0080+	0.0032	0.011***	0.0046	-0.021**	0.0042*	0.0024	0.0015	0.00048	0.0019	-0.037***
	(1.54)	(2.38)	(4.20)	(1.50)	(0.70)	(2.60)	(1.25)	(-2.38)	(1.84)	(1.22)	(0.56)	(0.24)	(0.42)	(-3.50)
Own homestead?	-0.0020	-0.0020	0.00019	0.016***	-0.0024	-0.0081**	-0.0075**	0.011	-0.0020	-0.0020	0.0015	-0.00069	0.0070*	-0.0089
	(-0.43)	(-0.71)	(0.13)	(3.28)	(-0.59)	(-2.07)	(-2.27)	(1.42)	(-0.98)	(-1.12)	(0.63)	(-0.37)	(1.77)	(-0.94)
Value of tools	0.0000064	0.000016	0.000018	0.0000065	-0.0000054	0.000035	-0.000058	-0.000011	-0.000020	-0.000039+	0.000036	0.000036	-0.0000033	0.000091
	(0.10)	(0.41)	(0.89)	(0.10)	(-0.09)	(0.64)	(-1.26)	(-1.00)	(-0.71)	(-1.55)	(1.04)	(1.39)	(-0.06)	(0.68)
Contributed livestock?	0.0051	0.0041	0.0033**	0.0063	0.0012	-0.0054	-0.0028	-0.0019	-0.0023	-0.0057***	-0.0044*	-0.0036*	0.0037	0.0020
	(1.09)	(1.43)	(2.31)	(1.32)	(0.30)	(-1.36)	(-0.85)	(-0.24)	(-1.11)	(-3.19)	(-1.80)	(-1.95)	(0.93)	(0.21)
Distance to DLA office	0.000083**	-0.0000072	-0.000019+	-0.000047	-0.000026	0.000047	0.000016	-0.000026	0.0000091	0.0000099	-0.000039*	0.000020	-0.000043	0.0000072
	(1.97)	(-0.28)	(-1.46)	(-1.10)	(-0.70)	(1.35)	(0.54)	(-0.37)	(0.49)	(0.62)	(-1.77)	(1.19)	(-1.21)	(0.08)
Moved × Distance to DLA office	0.00018	0.000025	0.000090**	0.00020+	0.000027	0.000099	-0.000044	0.00030	-0.00013**	-0.000025	0.00017**	0.000012	-0.00037***	-0.00052*
	(1.38)	(0.31)	(2.23)	(1.49)	(0.23)	(0.90)	(-0.48)	(1.37)	(-2.32)	(-0.50)	(2.54)	(0.24)	(-3.37)	(-1.94)

Table 12 continued: Effect of Distribution Factors on Household Demand (Table 9 with reported control estimates)

Constant	-0.25 (-1.33)	0.051 (0.44)	0.047 (0.81)	0.19 (0.98)	-0.39** (-2.33)	0.59*** (3.70)	0.17 (1.27)	0.35 (1.10)	0.39*** (4.61)	0.028 (0.39)	0.14 (1.43)	0.11+ (1.53)	0.36** (2.25)	-0.74* (-1.90)
Unitary test	$\chi^2(25) = 44.828$ [p-value = .017]													
Prop test	$\chi^2(13) = 2.984$ [p-value = 1]													
Observations	1123													

Note - table presents coefficent estimates and t-statistics (in parenthesis) from SUR estimation for the same specification reported in table 9, but also reports coefficients for all controls which are described in detail in table 14.The base of category of language variable is English, and the base category of the province variable is Limpopo. Dependant variables are the inverse monotonic sine transformation of the budget shares for the 14 goods categories and presented in the same order as in table 9, titles abbreviated for formatting purposes (G&C = Grains and Cereals; F&V = Fruit and Vegetables; Su = Sugar; OF = Other Food; M = Meat; A&T = Alcohol and Tobacco; Hy = Hygiene; T = Transport; KC = Children's clothing; Adult Clothing; F = Fuel; H = Healthcare; E = Schooling; ONF = Other non foods).

+ p<0.15, * p<0.10, ** p<0.05, *** p<0.001.

Table 13: Expenditure items within goods categories

Goods category	**Items included**
Grains and cereals	Maize grain, mealie meal, rice, bread, wheat flour and breakfast cereal.
Fruit and vegetables	Potatoes, tomatoes, sweet potatoes, carrots, beet roots, onions and other roots, pumpkin, squash, green vegetables, tinned vegetables, bananas, apples, peaches, citrus and tinned fruit.
Meat and meat products	Mutton, beef, pork, goat meat, tinned meat, polony, chicken, eggs, mopani worms, seafood and tinned fish.
Sugar	Sugar.
Other food	Vegetable oil, peanuts, peanut butter, other nuts, margarine and butter, cheese, jam, milk, baby formula, soft food and other food expenditure.
Alcohol and tobacco	Alcohol and tobacco.
Entertainment and hygiene	Entertainment expenses (cinema, music, gambling, lotto), soap, cosmetics, shampoo, newspapers and books.
Transport costs	Petrol, bus, taxi and other transport costs.
Fuel	Wood, paraffin, charcoal, coal, candles, gas, purchasing/charging batteries and diesel oil.
Child clothes	Shoes and clothes for children.
Adult clothes	Shoes and clothes for adults.
Education expenses	University, college and school fees, books and uniforms, and other school expenses.
Healthcare	Medical aid, dentists, doctors and nurses, hospital and clinic fees, medical supplies and traditional healer's fees.
Other non-food	Kitchen equipment, pots, pans, lamps, torches, home maintenance, bedding, sheets, blankets, towels, furniture and other appliances, life insurance, funeral policies, medical aid, short term insurance and other items.

Note - Table displays the expenditure items that are included in each goods category. Items are an exhaustive list of those reported in the Expenditure, Consumption and Saving module of the 2005 Quality of Life survey household questionnaire. All expenditure expressed in 2005 ZAR prices, with prices deflated where interview was conducted in later years. For food items, expenditure is the reported value of *purchases* of item in the last month. Value of items gifted, received or produced (which are reported for some items) are not included in calculations. Food goods categories are calculated as the sum of monthly expenditures on each item within category. Where a non-food item is reported as monthly expenditure (items within alcohol and tobacco, transport, fuel, and entertainment and hygiene categories) the goods category is also calculated as the sum across values of items. Remaining non-food goods categories contain items expressed in terms of annual expenditure. Where appropriate, item expenditure is first divided by 12 before aggregating total expenditure for the goods category. Monthly household expenditure is calculated as the sum of all goods categories. Budget shares are calculated by dividing the value of the goods category by the monthly household expenditure. Demand systems are estimated using the inverse hyperbolic sine transformation of the budget shares.

Table 14: Variable Descriptions

A. Key variables	
Post transfer indicator (T)	Indicator taking on the value of one if the household had received transfer of individual land grants from the DLA. This was established from whether the household was administered a survey for 'beneficiary' or 'control' households, the former only being administered if any member of the household had received a grant transfer from the DLA. Where household appeared in beneficiary group, but individuals had yet to receive individual grant transfers, the indicator was set as zero.
Total value of land grants applied for by men (G_m)	Aggregate of individual land grants applied for by adult men. Values taken from responses to question in household roster asking the value of the each land grant applied for by an individual. Where values are missing, the value of the land grant applied for is considered zero, and individual is not considered a grant applicant. If all amounts for men within the household are reported as missing, then the household is dropped from the sample.
Total value of land grants applied for by women (G_w)	G_w is constructed identically to G_m, but for resident women.
Monthly household expenditure (y)	Total monthly expenditure y (in 2005 ZAR) computed as the total spending on all goods categories listed in table 13.
Household Size (n)	Number of individuals (of all ages) listed in the household roster.
Monthly household per capita expenditure (y/n)	Total monthly expenditure (in 2005 ZAR), divided by household size.
$\ln(y/n)$, $\ln G_w$ & $\ln G_m$	The inverse hyperbolic sine transformation of monthly household per capita expenditure (y/n), total value of women's land grants and total value of men's land grants respectively.
B. Household characteristics	
Number of women in household	Number of resident women older than eighteen listed in the household roster.
Number of men in household	Number of resident men older than eighteen listed in the household roster.
Number of children by gender and age category	A series of variables talking on the number of resident children listed in the household roster falling within the following age-gender groups: 0-5 year old boys, 0-5 year old girls, 6-12 year old boys, 6-12 year old girls, 13-18 year old boys, 13-18 year old girls.
Household head is a man (indicator)	An indicator variable taking on the value of one if the household head is a man. Household head as identified in the household roster.
Age of household head	Age (years) of household head as reported in the household roster.
Education level of household head	Level of education (years of schooling) of household head as reported in the household roster.
Share of men/women with primary age schooling	Number of resident men/women who reported having a level of education of grade two or higher, divided by number of men/women. Used as a proxy for literacy.
Share of men/women married	Number of men/women who reported being married, divided by number of resident men/women.
Share of men/women working as casual labourers	Number of resident men/women who reported being casual laborers as their primary occupation, divided by number of resident men/women.
Share of men/women working as wage labourers	Number of resident men/women who reported being wage labourers as their primary occupation, divided by number of resident men/women.
Share of men/women self employed	Number of resident men/women who reported being self employed as their primary occupation, divided by number of resident men/women.

Table 14 continued: Variable descriptions

Mean farming experience (years)	Derived from responses to household roster question: How many years of farming does [individual] have? Taken as mean of number of years for adult household members. Missing values recoded as zero.
Mud floor (indicator)	An indicator variable taking on the value of one if the household's current dwelling has a mud floor. In the case of post-transfer households, this is based on their status prior to transfer. In the case of a pre-transfer households, this based on their current status.
Own homestead (indicator)	An indicator variable taking on the value of one if the household reported owning the dwelling in which members reside. In the case of post-transfer households, this is based on their status prior to transfer. In the case of a pre-transfer households, this based on their current status.
Language of interview	Categorical variable for the language in which interview is conducted, as reported in the administration section of the survey. Recorded by the interviewer .
Date of interview	The date of interview, as recorded by the interviewer. Expressed as days between date of interview and Jan1, 1960
Province	Categorical variable for the province where household is located as reported in administration section of survey. Recorded by interviewer
C. Land project characteristics	
Application date	Imputed from response to question: When did individual apply for a grant from the DLA? Answer given in month/year format. Application date for the household set as median application date of individual applicants in the household. Expressed as number of days between application date and 1st Jan, 1960.
Application year	Year reported from response to question: When did individual apply for a grant from the DLA? Answer given in month/year format.
Number of grant applicant men/women	Number of men/women in the household who applied for a grant. Individual considered a grant applicant where there is 1) a land grant application date and 2) a non-zero grant value reported for individual in household roster.
Heard about program from government	Indicator taking on the value of one if the household reported hearing about LRAD through a representative of the DLA or another government official
Tools contributed	The estimated value (in 2005 ZAR) of the agricultural tools and equipment contributed to the LRAD project.
Animals contributed (indicator)	An indicator taking on the value of one if animals and livestock were contributed to the LRAD project.
Matched amount (indicator)	Indicator taking on the value of one if the household made a matching contribution for the grant amount in cash, rather than in kind or in labour.
Moved to site (indicator)	Indicator taking on the value of one if the household moved to be part of the project.
Distance to DLA office	Straight line distance between site of interview at project site and nearest DLA office. GPS coordinates captured by interviewer.

Note - Table presents descriptions of key variables used in analysis. All variables are constructed from responses to the household questionnaire of the 2005 Quality of Life survey. Sections B and C contain characteristics that are controlled for in all SUR and 3SLS estimations of the household demand system.

References

Alderman, Harold, Pierre-Andre Chiappori, Lawrence Haddad, John Hoddinott, and Ravi Kanbur, "Models of the household: Is it time to shift the burden of proof?," *The World Bank Research Observer*, 1995, *10* (I), 1–19.

Apps, Patricia, "Collective labor supply and household production," *Journal of Political Economy*, 1997, *105* (1), 178–90.

Attanasio, Orazio, Gabriella Berloffa, Richard Blundell, and Ian Preston, "From earnings inequality to consumption inequality," *Economic Journal*, 2002, *112* (478), C52–C59.

Attanasio, Orazio P. and Valérie Lechene, "Efficient Responses to Targeted Cash Transfers," *Journal of Political Economy*, 2014, *122* (1), 178–222.

Bargain, Olivia, Olivier Donni, and Prudence Kwenda, "Intrahousehold distribution and poverty: Evidence from Côte d'Ivoire," *Journal of Development Economics*, 2014, *107*, 262–76.

Bargain, Olivier, Prudence Kwenda, and Miracle Ntuli, "Gender Bias and the intrahousehold distribution of resources: Evidence from African nuclear households in South Africa," *Journal of African Economies*, 2018, *27* (2), 201–226.

Becker, Gary, *The economics of discrimination*, 2 ed., Chicago: University of Chicago Press, 1971.

____ , *A treatise on the family*, Cambridge: Harvard University Press, 1991.

Behrman, J.R. and John Hoddinott, "Programme evaluation with unobserved heterogeneity and selective implementation: The Mexican PROGRESA impact on child nutrition," *Oxford Bulletin of Economics and Statistics*, 2005, *67* (4), 547–69.

Ben-Porath, Yoram, "Economics and the family-match or mismatch? A review of Becker's A treatise on economics and the family," *Journal of Economic Inequality*, 1982, *20* (1), 55–64.

Bergstrom, Theodore, "A fresh look at the rotten kid theorem and other household mysteries," *The Journal of Political Economy*, 1989, *97* (5), 1138–1159.

Binswanger-Mkhize, Hans P, "From failure to success in South African land reform," *African Journal of Agricultural and Resource Economics*, 2014, *9* (4), 253–269.

Binswanger-Mkhize, Hans P. and Klaus Deininger, "South African land policy: The legacy of history and current options," *World Development*, 1993, *21* (9), 1451–1475.

Bobonis, Gustavo J., "Is the Allocation of Resources within the Household Efficient? New Evidence from a Randomized Experiment," *Journal of Political Economy*, 2009, *117* (3), 453–503.

Bourguignon, F., M. Browning, Pierre-André Chiappori, and V. Lechene, "Intra household allocation of consumption: a model and some evidence from French data," *Annales d'Economie et de Statistique*, 1993, (29), 137–156.

Bourguignon, François and Pierre André Chiappori, "Collective models of household behavior: An introduction," *European Economic Review*, 1992, *36* (2-3), 355–364.

____ , **Martin Browning, and Pierre-André Chiappori**, "Efficient intra-household allocations and distribution factors: implications and identification.," *The Review of Economic Studies*, 2009, *76* (2), 503–528.

Browning, M. and Pierre-André Chiappori, "Efficient intra-household allocations: A general characterization and empirical tests," *Econometrica*, 1998, *66* (6), 1241.

Browning, Martin, François Bourguignon, and Pierre-André Chiappori, "Income and outcomes: A structural model of intrahousehold allocation," *Journal of Political Economy*, 1994, *102* (6), 1067–96.

Budlender, D, S Mgweba, K Motsepe, and L Williams, *Women, Land and Customary Law*, Forest Town, Johannesburg: Community Agency for Social Enquiry, 2011.

Budlender, Debbie, "The Debate about Household Headship," *Social Dynamics*, 2003, *29* (2), 48–72.

Bundy, C, *The rise and fall of the South African peasantry*, Claremont: David Philip, 2011.

Camba-Mendez, Gonzalo and George Kapetanios, "Statistical tests and estimators of the rank of a matrix and their applications in econometric modelling," *Econometric Reviews*, 2009, *28* (6), 581–611.

Carter, Micheal and Elizabeth Katz, "Household resource allocation when income is not pooled: A reciprical claims model of household economy. Working Paper. International Food Policy. Washington D.C.," 1992.

Case, Anne, "Health, income and economic development," in "Annual World Bank Conference on Development Economics 2001/2002" 2002, pp. 221–241.

Cherchye, Laurens, Bram De Rock, and Frederic Vermeulen, "Opening the black box of intrahousehold decision making: Theory and nonparametric empirical tests of general collective consumption models," *Journal of Political Economy*, 2007, *75*, 553–574.

____ , **Thomas Demuynck, and Bram De Rock**, "Revealed preference analysis of non-cooperative household consumption," *The Economic Journal*, 2011, *121* (555), 1073–1096.

Chiappori, Pierre-André and Costas Meghir, "Intrahousehold inequality," *Working Paper*, 2014.

Chiappori, Pierre-Andre and Maurizio Mazzocco, "Static and intertemporal household decisions," *Journal of Economic Literature*, 2017, *55* (3), 985–1045.

Chiappori, Pierre-André, "Rational household labor supply," *Econometrica*, 1988, *56* (1), 63–90.

____ , "Collective labour supply and welfare," *Journal of Political Economy*, 1992, *100* (3).

____ , "Introducing household production of labour supply," *Journal of Political Economy*, 1997, *105* (1).

____ **and Olivier Donni**, "Non-unitary models of household behavior: A survey of the literature," in Alberto Molina, ed., *Household Economic Behaviors*, Berlin: Springer, 2011, pp. 1–40.

____ , **Bernard Fortin, and Guy Lacroix**, "Marriage market, divorce legislation, and household labor supply," *Journal of Political Economy*, 2002, *110* (1), 37–72.

Contreras, Dante, Duncan Thomas, and Elizabeth Frankenberg, "Distribution of power within the household and child health. MPRA Paper 80075, University Library of Munich, Germany, revised Mar 2002.," 1997.

Dauphin, Anyck, Abdel-Rahmen El Lahga, Bernard Fortin, and Guy Lacroix, "Are children decision-makers within the household?," *The Economic Journal*, 2011, *121* (553), 871–903.

____ , Bernard Fortin, and Guy Lacroix, "How falsifiable is the collective model? A new test with an application to monogamous and bigamous households in Burkina Faso. IZA Discussion Paper No 9002. Bronn, Germany," 2015.

Deaton, Angus, *The analysis of household surveys* 1997.

Deere, Carmen and Magdalena Leon, "The gender asset gap: Land in Latin America," *World Development*, 2003, *31* (6), 925–947.

Del Boca, Daniela and Christopher Flinn, "Endogenous household interaction," *Journal of Econometrics*, 2012, *166* (1), 49–65.

____ and ____ , "Household behavior and the marriage market," *Journal of Economic Theory*, 2014, *150* (C), 515–550.

Department of Land Affairs, "Annual Report, 1 April 2003, Pretoria.," 2003.

Donni, O, "Collective female labour supply," *Economic Journal*, 2007, *117* (2005), 94–119.

Donni, Olivier, "Household behavior and family economics," in "Mathematical Models in Economics: The Encyclopaedia of Life Support Systems," Université de Cergy-Pontoise, 2008.

____ and Sophie Ponthieux, "Economic approaches to household behavior: from the unitary model to collective decisions," *Travail, genre et sociétés*, 2011, *26* (2), 67.

Doss, Cheryl, "The effects of intrahousehold property ownership on expenditure patterns in Ghana," *Journal of African Economies*, 2006, *15* (1), 149–180.

____ , "Intrahousehold bargaining and resource allocation in developing countries," *World Bank Research Observer*, 2013, *28* (1), 52–78.

Dubois, Pierre and Ethan Ligon, "Incentives and nutrition for rotten kids: intrahousehold food allocation in the Philippines. UC Berkeley: Department of Agricultural and Resource Economics, UCB.," 2011.

Duflo, Esther, "Grandmothers and Granddaughters: Old-Age Pensions and Intrahousehold Allocation in South Africa," *The World Bank Economic Review*, 2003, *17* (1), 1–25.

____ and Christopher Udry, "Intrahousehold resource allocation in Côte D'Ivoire: Social norms, separate accounts and consumption choices," *NBER Working Papers*, 2004, *1542*, 33–36.

Dunbar, G. R., Arthur Lewbel, and Krishna Pendakur, "Children's resources in collective households: Identification, estimation and an application to child poverty in Malawi," *American Economic Review*, 2013, *103* (1), 438–71.

Dungumaro, W, "Gender Differentials in Household Structure and Socioeconomic Characteristics in South Africa," *Journal of Comparitive Family Studies*, 2008, *39* (4), 429–451.

Ekeland, Ivar and Pierre-André Chiappori, "The economics and mathematics of aggregation: Formal models of efficent group behaviour," *Foundations and Trends in Microeconomics*, 2009, *5* (1-2), 1–151.

Field, Erica, "Fertility responses to urban land titling programs: The roles of ownership security and the

distribution of household assets. Working Paper: Harvard University.," 2003.

____ , "Entitled to work: Urban property rights and labour supply in Peru," *The Quarterly Journal of Economics*, 2007, *122* (4), 1561–1602.

Fortin, Bernard and Guy Lacroix, "A test of the unitary and collective models of household labour supply," *Economic Journal*, 1997, *107* (443), 993–55.

Goldstein, Markus and Christopher Udry, "The profits of power: Land rights and agricultural investment in Ghana," *Journal of Political Economy*, 2008, *116* (6), 981–1022.

Gregory, A and M Veal, "Formulating wald tests of nonlinear restrictions," *Econometrica*, 1985, *53* (6), 1465–1468.

Haag, Berthold R., Stefan Hoderlein, and Krishna Pendakur, "Testing and imposting slutsky symmetry in nonparametric demand systems," *Journal of Econometrics*, 2009, *153* (1), 33–50.

Haddad, Lawrence and John Hoddinott, "Women's income and boy-girl anthropometric status in the Cote d'Ivoire," *World Development*, 1994, *22* (4), 543–553.

Hart, T and M Aliber, "The need for an engendered approach to agricultural technology," *Agenda*, 2010, *24* (84), 75–90.

Hart, Tim GB and M Aliber, "Should subsistence agriculture be supported as a strategy to address rural food insecurity," *Agrekon*, 2009, *48* (4), 434–458.

____ **, Margaret Chandia, and Peter T Jacobs**, "Land reform and changing gender patterns in rural farmland ownership," *Agenda*, 2018, *32* (4), 111–120.

Keswell, Malcolm and Michael R. Carter, "Poverty and land redistribution," *Journal of Development Economics*, 2014, *110*, 250–261.

Krueser, Friedrich, "Do Family Bonds Bind? Testing the Unitary and Collective Models of Household Behaviour on South African Data. Working Paper. Stellenbosch University, Stellenbosch," 2009.

Lahiff, Edward, "Willing Buyer, Willing Seller': South Africa's failed experiment in marketled agrarian reform," *Third World Quarterly*, 2007, *28* (8), 1577–1597.

Lim, S.S., L. Dandona, J.A. Hoisington, S.L. James, M.C. Hogan, and E. Gakidou, "India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: An impact evaluation," *The Lancet*, 2010, *375* (9730), 2009–23.

Lu, Z and M King, "Obtaining any wald statistic you want," *Economics Letters*, 1986, *83*, 359–364.

Lundberg, Shelly and Robert A Pollak, "Separate spheres bargaining and the marriage market," *Journal of Political Economy*, 1993, *101* (6), 988–1010.

Lundberg, Shelly J, Robert A Pollak, and Terence J Wales, "Do husbands and wives pool their resources ? Evidence from the United Kingdom child benefit," *Journal of Human Resources*, 1997, *32* (3), 463–480.

Maitra, Pushkar and Ranjan Ray, "Intra-household resource allocation and their impact on expenditure patterns: Comparative evidence from South Africa and Pakistan," *Journal of Development Economics*,

2003, *71*, 23–49.

____ and ____ , "Household expenditure patterns and resource pooling: Evidence of changes in post-apartheid South Africa," *Review of Economics of the Household*, 2006, *4* (4), 325–347.

Maluccio, John A. and R Flores, "Impact evaluation of a conditional cash transfer program: The Nicaraguan Red de Proteccio 'n social. research report 141," Technical Report, International Food Policy Research Institute, Washington DC 2005.

marie Baland, Jean and Roberta Ziparo, "Intra-household bargaining in poor countries. WIDER Working Paper, No 2017/108. UNU-WIDER, Helsinki," 2017.

May, Julian, Thilde Stevens, and Annareth Stols, "Monitoring the impact of land reform on quality of life: A South Arican case study," *A. Social Indicators Research*, 2000, *58* (293).

Ministry for Agriculture and Land Affairs, "Land redistribution for agricultural development: A sub-programme of the land redistribution programme, Final document, Version 3," Technical Report, Ministry for Agriculture and Land Affairs, Pretoria 2000.

Naidoo, Jesse, "The Power of Tests for Pareto. Efficiency Within the Family. Job Market Paper, University of Chicago, Chicago," 2017.

Orazem, Peter F., Lawrence Haddad, John Hoddinott, and Harold Alderman, "Intrahousehold resource allocation in developing countries: Models, methods, and policy," *American Journal of Agricultural Economics*, 1999, *81* (2), 480.

Phipps, Shelley A. and Peter S. Burton, "What's mine is yours? The influence of male and female incomes on patterns of household expenditure," *Economica*, 1998, *65* (260), 599–613.

Pitt, Mark M. and Shahidur R. Khandker, "The impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter?," *Journal of Political Economy*, 1998, *106* (5), 958–996.

Pollak, Robert A, "A transaction cost approach to families and households," *Journal of Economic Literature*, 1985, *23* (2), 581–608.

Posel, Dorrit and Michael Rogan, "Women , income and poverty : Gendered access to resources in Post-Apartheid South Africa," *Agenda*, 2009, *23* (81), 25–34.

Quisumbing, Agnes R. and John A. Maluccio, "Resources at marriage and intrahousehold allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa," *Oxford Bulletin of Economics and Statistics*, 2003, *65* (3), 283–327.

Rangel, Marcos and Duncan Thomas, "Gender, production and consumption: Allocative efficency within farm households. Working paper: Princeton University," 2012.

Samuelson, Paul A., "Social indifference curves," *The Quarterly Journal of Economics*, 1956, *70* (1), 1–22.

Schultz, Paul, "Testing the neoclassical model of family labor supply and fertility," *Journal of Human Resources*, 1990, *25* (4), 599–634.

Statistics South Africa, "Poverty Trends in South Africa: An examination of absolute poverty between 2006

and 2011," Technical Report, Statistics South Africa, Pretoria 2014.

Udry, Christopher, "Gender, agricultural production, and the theory of the household," *Journal of Political Economy*, 1996, *104* (5), 1010–1046.

Ulph, Alistair, "Bargaining structures and delay in innovation," *Scandinavian Journal of Economics*, 1988, *90* (4), 475–91.

Vermeulen, Frederic, Olivier Bargain, Miriam Beblo, Denis Beninger, Richard Blundell, Rasco Car-Raquel, Maria Concetta Chiuri, Franois Laisney, Valerie Lechene, Nicolas Moreau, and Michal Myck, "Collective models of labor supply with nonconvex budget sets and non-participation: A calibration approach," *Review of Economics of the Household*, 2006, *4*.

Walker, C, "Piety in the sky? Gender policy and land refrom in South Africa," *Journal of Agrarian Change*, 2003, *3* (1-2), 113–148.

____ , "Elusive Equality: Women, property rights and land reform in South Africa," *South African Journal on Human Rights*, 2009, *25* (3), 467–490.

Walker, Cherryl, "Agrarian change, gender and land reform. A South African case study," Technical Report, United Nations Research Institute for Social Development, Geneva 2001.

____ , "Women, gender policy and land reform in South Africa," *Politikon*, 2006, *32* (2), 297–315.

Wang, Shing Yi, "Property rights and intra-household bargaining," *Journal of Development Economics*, 2014, *107*, 192–201.

Ward-Batts, Jennifer, "Out of the wallet and into the purse: Using micro data to test income pooling," *Journal of Human Resources*, 2008, *43* (2), 325–351.

Witbooi, K, "Land reform, tradition and securing land for women in Namaqualand," in Ben Cousins and P Hebinck, eds., *In the shadow of Policy: Everyday practices in South African land and agrarian reform*, Johannesburg: Wits University Press, 2013.

Wittenberg, Martin, "The intra-household allocation of work and leisure in South Africa," *Social Indicators Research*, 2009, *93* (1), 159–164.

Wolpe, Harold, *Capitalism and cheap labour power in South Africa: from segregation to apartheid*, London: Routledge, 1972.

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