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**KINSHIP AND CONSUMPTION: THE EFFECT OF SPOUSES'
OUTSIDE OPTIONS ON HOUSEHOLD PRODUCTIVITY**

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Kinship and Consumption: The Effect of Spouses' Outside Options on Household Productivity

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Abstract

This paper provides a causal reason for failure in productive efficiency in the household and explains why some households may be less efficient than others. In the theoretical model, spouses make labour allocation decisions in each period to generate income, facing a threat of divorce in the next period. This threat of divorce encourages spouses to invest in their outside options. If decision-making is noncooperative, asymmetric outside options lead to lower productivity. Using exogenous variation in inheritance rules in Malawi as a measure of outside options, the empirical results show that matrilineal households (where women have access to land) have 10% higher consumption than patrilineal households (where women have no access to land). These results are robust to a wide variety of specifications and are corroborated by an analysis of labour allocation and income. The results suggest that variation in spouses' outside options can help explain variation in household productivity.

Keywords: Productive efficiency, Households, Land rights, Matriliney, Malawi

JEL Classification: D12, D13, J12, J16

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1 Introduction

The collective model (Chiappori 1988, 1992) assumes that household outcomes are Pareto efficient: in producer-consumer households like those in Africa, this consists of productive efficiency (households produce on the production possibility frontier) and consumption efficiency (a reallocation of goods among household members cannot make one member better off without hurting another). Empirical tests have frequently failed to reject consumption efficiency (Browning et al. 1994, Browning and Chiappori 1998, Bobonis 2009). In contrast, evidence suggests that productive efficiency is often violated in farming households (Udry 1996, Udry and Goldstein 2008). This paper provides a causal reason for this failure in productive efficiency and explains why some households may be less efficient than others. I show that productive efficiency fails when spouses make noncooperative labour decisions and that in this inefficient setting, productivity is causally linked to the relative size of spouses' outside options.¹ The mechanism behind this effect lies in that fact that outside options can alter the returns to different types of labour, as spouses invest in their outside options due to the threat of divorce. The theoretical model shows that in a Pareto efficient world, labour decisions and consumption do not depend on outside options, while greater inequality in spouses' outside options moves households further away from efficiency. Efficiency is empirically rejected for a large, nationally representative sample of Malawi households and the results show that households where men own most of the land generate fewer resources and make inefficient labour allocation decisions.

Malawi offers a useful laboratory for studying the impact of outside options on households' behaviour due to its exogenously varying land rights. In particular, households may follow one of two types of descent or kinship: matriliney or patriliney. In Malawi, matrilineal and patrilineal tribal groups have co-existed since the mid-19th century (Phiri 1988).² Matriliney is considered to afford women greater autonomy than patriliney (Lamphere 1974, Davison 1997, Johnson 1988, Johnson and Hendrix 1982, Dyson and Moore 1983). In Malawi, descent is predetermined by the tribe membership an individual is born into. This provides a useful setting for analysing the effect of outside options on productive efficiency, making use of the fact that Malawi has one of the highest divorce rates in Africa, which makes it likely that outside options will be exercised.³

In order to understand the mechanisms behind spouses' behaviour in Malawi, I set out an infinite-horizon theoretical model of spouses' labour decisions. Spouses make a decision each period about how to split their time between agricultural and wage labour. There is an exogenous

¹In this paper, I define an individual's outside option as his or her utility when divorced.

²A matrilineal descent system is where inheritance passes through the female line. Family land is passed down from mother to daughter or, more traditionally, from brother to sister's son. A patrilineal descent system is where inheritance passes through the male line, from father to son. This affects property division following divorce, where household land tends to accrue to the wife in matriliney but to the husband in patriliney. In practice, matriliney exhibits relatively fair land rights while in patriliney, women have fewer rights to land. In this sense, kinship can be seen as exogenous variation in women's access to land. In this paper, I use the terms 'kinship' and 'descent' interchangeably to describe the system of land inheritance that a household follows.

³Lifetime divorce probabilities in Malawi are between 40-65% (Reniers 2003). Over 40% of women remarry within the first two years after a divorce.

probability of divorce; land rights are important because they determine what share of land will accrue to which spouse on divorce. The model predicts that in a Pareto efficient allocation that maximises household resources, spouses' labour allocations do not depend on land rights. As a result, efficient household consumption does not depend on land rights. If spouses choose their labour allocations according to a Nash best response, an inefficient outcome results, where labour allocations and consumption are sensitive to land rights. This is because spouses do not take into account the impact of their choices on the consumption of their partner in the divorced state.

Using kinship as a measure of outside options, I find that consumption is significantly higher in households of matrilineal descent, where women have access to land. The regression results demonstrate that matrilineal households consume 10% more on average in real terms than patrilineal households, once a rich set of control variables is added, including variables capturing geography, such as temperature, rainfall and measures of soil quality. The consumption gap is robust to alternative specifications, sample restrictions and different measures of consumption. This higher consumption is not explained by lower savings.

The model predicts that this consumption gap can be explained by differences in labour allocation: I show that men use their endowment of time more productively in matrilineal households to generate a larger household 'pie'. In particular, patrilineal husbands allocate more time to agricultural labour and less to wage labour than matrilineal husbands. They also have lower wage earnings and lower consumption from purchases. I verify that the ratio of wages to agricultural productivity is higher in patrilineal than matrilineal households, a corollary of the model. Together with the consumption results, this provides strong evidence for the framework and allows two conclusions to be drawn: first, patrilineal households in Malawi are productively inefficient; second, this inefficiency is driven by outside options and noncooperative behaviour.

As an extension to these results, I also analyse whether all household members benefit from the increased resources of matrilineal households. Estimates of expenditure share functions show that while girls enjoy unambiguously higher spending on their clothing in matrilineal households, absolute spending on sons' education is significantly lower in matrilineal households, despite the fact that the household has more resources to share. Thus, children may lose out even if households come closer to efficiency.

This paper builds directly on the literature on efficiency in households. Similar to Udry (1996) and Udry and Goldstein (2008), I find that individuals overinvest in assets in which they are residual claimants and that a reallocation of household labour could increase household resources. There are two asymmetries that generate this result: asymmetry in land rights and asymmetry in labour market opportunities. If women in Malawi could work in the wage market to the same extent that men can, the asymmetry in land rights would be alleviated by wage work by patrilineal women, which could act to equalise consumption across patrilineal and matrilineal households. Thus, similar to the arguments in Quisumbing (1996, p.1588), "gender-based market imperfections" are one of the root causes of the productive inefficiency. This inefficiency also calls into question theoretical models of the household that assume Pareto efficiency, particularly in the context of developing

countries.

This paper also relates to the literature on property rights. Besley (1995) argues that individuals may underinvest in their plots due to a risk of expropriation; in the present paper, individuals may also overinvest if incentives are strong. Some authors argue that men’s weaker land rights in matrilineal households in Malawi result in lower long-term investment and, as a result, lower income (Place and Otsuka 2001, Kishindo 2010). In this paper, I find that weak land rights do reduce investment: matrilineal men spend less time on agricultural work than patrilineal men. However, this is beneficial to the household because weaker land rights help align private benefits more closely with household benefits.

This paper also relates to historical debate regarding matriliney in Malawi. In the first half of the 20th century, British colonialists, Christian missionaries and other groups believed that matriliney is detrimental to economic performance (Peters 1997). These beliefs resulted from the observation that the South is the poorest area in Malawi and is at the same time predominantly matrilineal. In addition to estimating the impact of outside options on productivity, this paper disentangles region and descent in Malawi to assess whether these historical criticisms of matriliney were justified.

The paper is structured as follows. In Section 2, I present a model of spouses’ labour allocation decisions in Malawi. In Section 3, I describe the empirical strategy and in Section 4 I estimate the effect of kinship on consumption. Section 5 examines labour allocation and Section 6 explores intra-household allocation. Section 7 concludes.

2 Household Decision-Making in Malawi

2.1 Marriage in Malawi

In this Subsection, I describe in more detail the rules governing land rights and other features of marriage in Malawi. Malawi is a poor country: 57% of rural households are at the poverty line.⁴ In rural Malawi, individuals belong to tribes, whose rules are particularly important for family life. Typically, tribes follow either matrilineal or patrilineal descent. Women are considered to be more autonomous in matrilineal than patrilineal communities because they have access to land. Land access is especially important in rural, horticultural societies such as Malawi, because it is a crucial source of livelihood. The other main asset is labour (Takane 2008).

In Malawi, kinship is spatially correlated. Figure 1, a map of Malawi, depicts this dispersion by district.⁵ Darker shading represents districts where matriliney is more prevalent, relative to patriliney. In the Southern region, most districts are predominantly matrilineal. In the Central region, there is a more equal balance of matrilineal and patrilineal communities. The Northern region has a strong patrilineal presence.

⁴In 2010. Figure from World Bank (<http://data.worldbank.org/country/malawi>).

⁵The prevalence of matriliney and patriliney by district is calculated based on the Living Standards Measurement Study data used in the empirical section of this paper. For the purposes of this map, in those villages where both types of descent are practised, half of the households are apportioned matrilineal descent while half are apportioned patrilineal descent. The figures are weighted based on the sampling strategy of the data (see footnote 20).

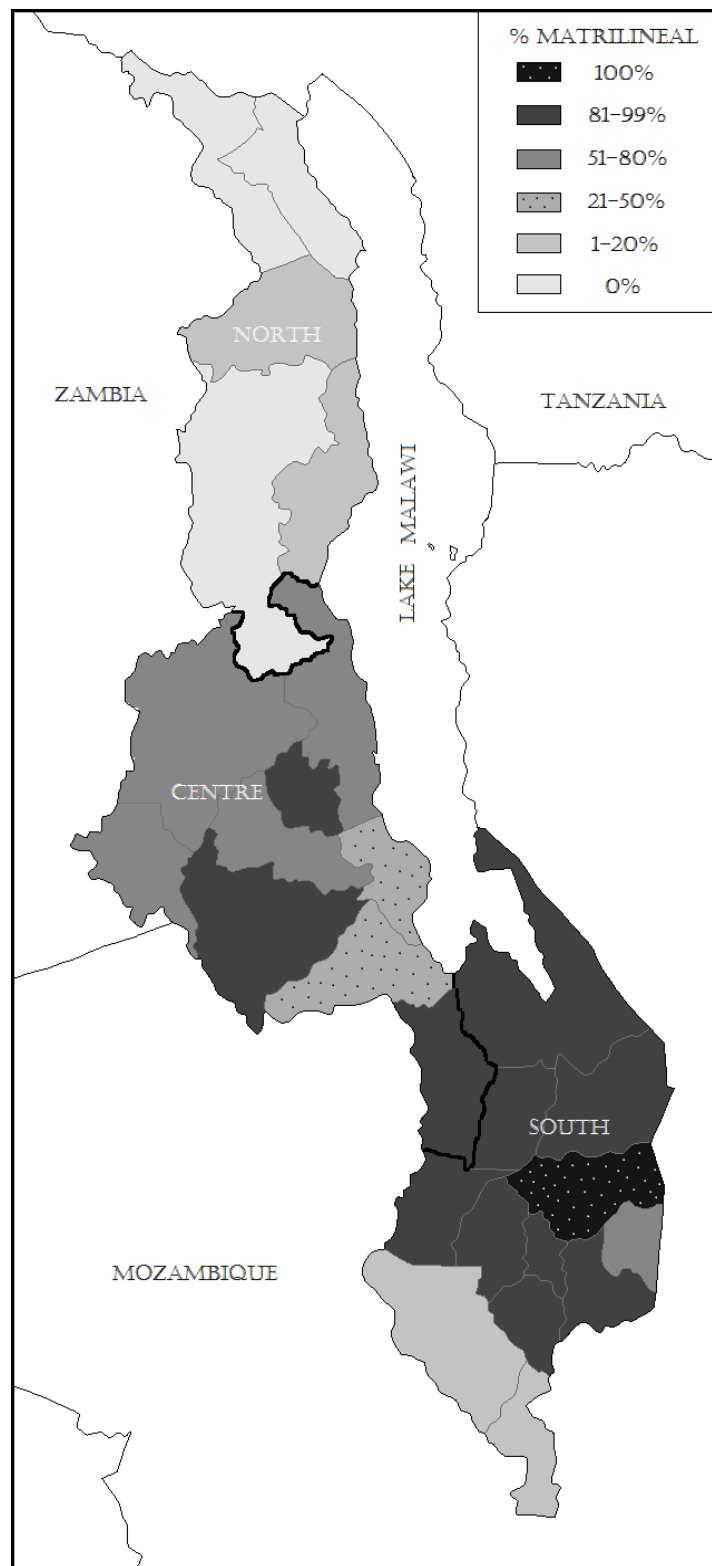


Figure 1: A map of Malawi depicting the prevalence of matriliney and patriliney by district.

In matrilineal marriages, the woman traditionally receives land from her natal kin. The couple works on this land as long as they are married. The husband is expected to work for his wife’s family and show that he is hard-working and useful (Roberts 1964). Should the couple divorce, the wife keeps all of the family land that she has been given. She continues to work on it and does not have to remarry. The husband, on the other hand, has to return to his village. He does not have any claims to his wife’s land. He may be given a temporary plot of land owned by his family to work on, with the understanding that this is only until he remarries. Marriage is the crucial way that a man obtains access to land in a matrilineal setting (Kishindo 2010).

Patrilineal marriages are in many ways the opposite of matrilineal marriages. Marriage is the primary way that a woman can obtain access to land in a patrilineal setting. The husband receives land from his natal kin, which the couple use to earn their livelihoods.⁶ If the couple divorce, the wife has no claims to her ex-husband’s land and is forced to return to her natal village, where she may receive a temporary plot of land. She faces pressure to remarry, however. Her family may discourage divorce because of the risk that her bridewealth will need to be repaid to her ex-husband’s family (Schatz 2002).⁷

Although traditions dictate that women inherit land in matrilineal settings and men inherit land in patrilineal families, in practice land rights tend to be fairer in matrilineal than patrilineal communities. Men can own land in both settings, but women have more access to land in matrilineal communities. Thus, kinship is in some ways exogenous variation in *women’s* access to land. This is also seen in the data used in this paper, where land ownership is fairer in matrilineal than patrilineal households (see Appendix A).

This exogenous difference is exploited in the present paper. This difference in land ownership is important because it determines the outside options of spouses.⁸ Malawi has one of the highest divorce rates on the continent: almost every other marriage dissolves (Reniers 2003). As a result, the possibility of divorcing and exercising one’s outside option is a serious consideration in individuals’ decision-making.

Although land rights follow a clear set of rules based on descent, the rules for other property are less clear-cut, especially in the case of divorce. Consumption goods tend to be shared equally

⁶The question of primogeniture, where inheritance passes to the oldest son at the expense of other sons, is important to address here. There is no definitive evidence on whether this takes place in Malawi. However, the important distinction for this paper is between the land access rights of a husband and his wife, rather than a husband and his brothers. Even if a man has older brothers and inherits less land than them in a patrilineal setting, he still inherits some land or at least has access to the family’s land should he need it. This is in contrast to his wife who, by virtue of being a patrilineal woman, has fewer land rights than her brothers.

⁷Bridewealth is when the husband-to-be or his kin pay an amount in money or kind to the woman’s family. Some researchers argue that the origins of bridewealth are in compensating the woman’s family for their economic loss due to the value of the woman’s labour.

⁸Marital residence adds an interesting nuance to the outside options of spouses. Living in the wife’s village (matrilocal) cements a woman’s power in the household because she is surrounded by her kin. In contrast, patrilocal can increase the husband’s outside option because he is surrounded by his own kin. A matrilineal man is only likely to reside patrilocally if he has no sisters or if the family is particularly wealthy (Peters 1997). Patrilineal couples almost always locate patrilocally. However, marital residence is affected by circumstances and may be endogenous to unobserved factors, such as marriage market characteristics. This is in contrast to lineage, which is exogenous.

on divorce.

There is a strong degree of labour specialisation in rural Malawi. Almost all households derive a substantial amount of their income from agriculture. Women tend to engage in agricultural labour, performing many tasks on their own (Hirschmann and Vaughan 1983). Men usually work agriculturally and for wages. It is rare for women to work for wages, unless they are unmarried (Spring 1995). This implies that men are predominantly responsible for providing a household's consumption goods (Schatz 2002). Domestic labour is predominantly carried out by women (Spring 1995).

Historically, matriliney has been attacked on various economic grounds. In particular, matrilineal marriages have been said to deter husbands from investing in household land, since they have weaker rights to it should the couple divorce (Phiri 1983). For example, Richard Kettlewell, director of agriculture in Malawi between 1950-1959, was a British civil servant who held a grudge against matriliney because of this hypothesised effect of tenure insecurity. He was involved in a program in the 1950s that aimed to give land titles to men, which ultimately failed (Peters 1997, Peters 2002, Barrett et al 2002). Despite negative outside influences, matriliney has remained surprisingly prevalent in Malawi, with around 60% of rural households being matrilineal.

2.2 A Model of Labour Allocation of Farming Households

The objective of this model is to examine how a person's optimal decision between agricultural and wage labour depends on his or her outside option. Although I focus on agricultural and wage labour here with outside options determined by land rights and wage income, this model could easily be applied to other settings where spouses can use particular types of labour to improve their outside options.

There is an infinite number of time periods t . There is a continuum of identical agricultural plots of measure 1, each of size L . They are indexed by $p \in [0, 1]$. Agricultural labour on each plot consists of all household members' agricultural labour on that plot, where it is assumed for now that there are $i = 1, \dots, N$ household members. Agricultural labour on plot p is thus a vector of the agricultural labour of household members: $h_t^p = (h_t^{1,p}, \dots, h_t^{N,p})$. Since all plots are identical, optimal agricultural labour supply is the same across all plots: $h_t^{1,p} = \bar{h}_t^1 \forall i$ and $h_t^p = h_t$. Since there is a measure 1 of plots, total agricultural labour supply by each individual is $\int_0^1 \bar{h}_t^i dp = h_t^i$. Individuals have time 1 available to them in each period, which they split between agricultural labour (h_t^i) and wage labour ($1 - h_t^i$). Individual i 's wage is w_i . Agricultural output today depends on land size and agricultural labour yesterday and is determined by the following function: $y_t^p = f(L, h_{t-1}^p)$. Thus, total output in each period is $\int_0^1 y_t^p dp = y_t$.

If the couple is married today, there is an exogenous probability of divorce in the next period, $\delta \in (0, 1)$. If the couple divorces, they remain divorced forever and there is no possibility of remarriage. Suppose the couple is married today. Then, the payoff is today's wage income plus the income from yesterday's agricultural labour plus the present value of all future incomes, taking into

account the probability of divorce. In marriage, all income is shared according to an exogenous sharing rule, regardless of the source of the income: individual i receives a share α^i of household income, where $\sum_1^N \alpha^i = 1$. In divorce, household member i receives a share λ^i of plots, where $\sum_1^N \lambda^i = 1$. Any wage income that is earned in the divorced state is kept in full by the income earner.

There are two objectives in analysing this model: first, to characterise the efficient labour allocation and second, to characterise the inefficient labour allocation and how it depends on land rights, represented by λ^i .

2.2.1 The Efficient Labour Allocation

Pareto efficiency in this model is synonymous with productive efficiency, as the sharing of resources for consumption is exogenous to the model. The efficient labour allocation maximises the present value of household resources.⁹ Starting with a couple that is married today, the household value function today is given by

$$V(h_{t-1}) = \max_{h_t} f(L, h_{t-1}) + \sum_{i=1}^N w^i(1 - h_t^i) + \beta\{(1 - \delta)V(h_t) + \delta \sum_{i=1}^N \tilde{V}^i(h_t)\}, \quad (1)$$

where β is the discount factor and $\tilde{V}^i$ is the value function of individual i in the single state, to be defined shortly. Thus, household welfare consists of household resources today plus the present value of all future household resources, taking into account the probability of divorce. It is implicitly assumed that all individuals are valued equally in household welfare.

On divorce, individual i 's welfare consists of his or her share of the agricultural output generated by yesterday's labour plus any wage income he or she earns today plus the present value of all future incomes that will be earned. Since the divorced individual is the only agricultural worker on his or her plots, we can redefine the production function for simplicity: output when single is $f^S(L, h_{t-1}^i)$. Thus, a household that is married in period $t - 1$ but divorced in period t has the following welfare for each individual i in period t :

$$\tilde{V}^i(h_{t-1}) = \max_{h_t^i} \lambda^i f(L, h_{t-1}) + w^i(1 - h_t^i) + \sum_{s=t+1}^{\infty} \beta^{s-t} \{\lambda^i f^S(L, h_{s-1}^i) + w^i(1 - h_s^i)\}. \quad (2)$$

One interesting point about this function is that a given household member's agricultural labour while married contributes to the agricultural income of *all* household members tomorrow, even if the household dissolves. Thus, there is potential for externalities through labour choices.

In order to characterise the efficient labour allocation of each household member i , one needs

⁹This is a similar set-up to Udry and Goldstein (2008). Maximising household resources is implied by utility maximisation under risk neutrality or if insurance markets are complete.

to solve the problem in (1). Differentiating with respect to h_t^i yields

$$-w^i + \beta\{(1 - \delta)\frac{\partial V(h_t)}{\partial h_t^i} + \delta \sum_{j=1}^N \frac{\partial \tilde{V}^j(h_t)}{\partial h_t^i}\} = 0 \quad \forall i. \quad (3)$$

By the envelope theorem,

$$\begin{aligned} \frac{\partial V(h_t)}{\partial h_t^i} &= \frac{\partial f(L, h_t)}{\partial h_t^i} \text{ and} \\ \frac{\partial \tilde{V}^j(h_t)}{\partial h_t^i} &= \lambda^j \frac{\partial f(L, h_t)}{\partial h_t^i}. \end{aligned}$$

Thus, replacing in equation (3) yields

$$\begin{aligned} \frac{w^i}{\beta} &= (1 - \delta) \frac{\partial f(L, h_t)}{\partial h_t^i} + \delta \sum_{j=1}^N \lambda^j \frac{\partial f(L, h_t)}{\partial h_t^i} \\ \Leftrightarrow \frac{w^i}{\beta} &= \frac{\partial f(L, h_t)}{\partial h_t^i}. \end{aligned} \quad (4)$$

Thus, the efficient labour allocation requires that each individual sets his or her marginal product of agricultural labour equal to his or her wage, taking into account the discount factor, which affects the return to agricultural labour. This is the natural efficiency condition that should arise in a situation where individuals are choosing between different types of labour.

The important point to notice is that this condition does not depend on λ^i : individuals' labour allocation should not depend on land rights. As a consequence, the amount of household resources should also not depend on λ^i . This leads to the following proposition:

Proposition 1 *If the labour allocation is efficient, then it should not depend on λ^i . Similarly, household resources should not depend on λ^i . The converse is also true: if labour allocation and household resources are found to depend on λ^i , then the household is not making a productively efficient choice.*

2.2.2 The Individually Optimal Labour Allocation

To derive the individually optimal labour allocation, I assume that individuals behave non-cooperatively as in, for example, Ulph (1988). Thus, each individual chooses their labour allocation h_t^i taking the labour allocation of all other household members as given. The individual value function in period t , where the couple begin married, is

$$W^i(h_{t-1}) = \max_{h_t^i} \alpha^i [f(L, h_{t-1}) + \sum_{i=1}^N w^i (1 - h_t^i)] + \beta\{(1 - \delta)W^i(h_t) + \delta \tilde{V}^i(h_t)\}.$$

Differentiating with respect to h_t^i yields the first-order condition

$$-\alpha^i w^i + \beta(1 - \delta) \frac{\partial W^i(h_t)}{\partial h_t^i} + \beta \delta \frac{\partial \tilde{V}^i(h_t)}{\partial h_t^i} = 0 \quad \forall i. \quad (5)$$

By the Envelope Theorem,

$$\frac{\partial W^i(h_t)}{\partial h_t^i} = \alpha^i \frac{\partial f(L, h_t)}{\partial h_t^i}.$$

Substituting this into equation (5) yields

$$\frac{w^i}{\beta} = (1 - \delta + \delta \frac{\lambda^i}{\alpha^i}) \frac{\partial f(L, h_t)}{\partial h_t^i}. \quad (6)$$

Thus, the individually optimal allocation of individual i is efficient if and only if

$$\lambda^i = \alpha^i. \quad (7)$$

If condition (7) does not hold, then the relative sizes of λ^i and α^i determine how time is split between agricultural and wage labour. This is explained in the following proposition:

Proposition 2 *If $\lambda^i > \alpha^i$, then individual i overinvests in agriculture (h_t^i is too high, relative to its efficient level). If $\lambda^i < \alpha^i$, then individual i underinvests in agriculture (h_t^i is too low, relative to the efficient level). If $\lambda^i = \alpha^i$, then individual i 's choice of labour allocation is efficient.*

2.2.3 Applying the Model to Malawi

In order to apply the two Propositions to the context of Malawi, a few assumptions are needed. First, I assume that there are only two household members: $i = 1, 2$. Thus, the land rights of the household can be characterised by a single parameter, λ , which represents the share of land accruing to the husband on divorce. Similarly, the sharing rule in marriage can be characterised by α , the share of consumption received by the husband. Second, I assume that the wage offered to the wife is low enough such that she optimally sets her wage work to zero: $h_t^2 = 1 \quad \forall t$. This is justified both by the evidence on wages and the observation that wives tend not to work in the wage sector (see Telalagić (2013)). Together, these assumptions imply that, in a noncooperative setting, household labour is characterised by a selfish decision made by the husband only. Similarly, household resources are affected by the husband's labour allocation decision and how that may or may not depend on his share of land, λ , and his share of consumption, α .

In order to apply the model to the structure of land rights in Malawi, it must be true that λ is higher in patrilineal than matrilineal societies: $\lambda_P > \lambda_M$. The actual value of λ in each society is ambiguous, although evidence suggests that λ is greater than $\frac{1}{2}$ in both societies: Appendix A shows that, on average, patrilineal men own 73% of sole-owned household land, while matrilineal

men own 52% of sole-owned household land. This suggests that although men do own more land in both societies, the share of land owned by men is lower in matriliney than patriliney. This reflects that fact that these land rights systems have undergone changes over the years due to external influence, particularly in moving matriliney in the direction of patriliney (see the discussion in Subsection 2.1). In fact, the exogenously varying descent can be interpreted as exogenous variation in women's land access. I assume that α is close to $\frac{1}{2}$ in both kinship systems: this is because consumption goods tend to be shared equally on divorce, and it is unlikely that a household where the husband owns all the land will not provide any consumption to the wife. Thus, λ is assumed to be further away from $\frac{1}{2}$ than α_P and α_M (the sharing rule in patrilineal and matrilineal households respectively). These assumptions and observations can be summarised in the following statement:

$$\frac{\lambda_P}{\alpha_P} > \frac{\lambda_M}{\alpha_M} \geq 1. \quad (8)$$

For simplicity, I also assume that the per-period divorce probability (δ) and the discount factor (β) are constant. This leads to the following proposition, which directly translates into testable implications of the model.

Proposition 3 *1) Patrilineal households are inefficient and patrilineal husbands overinvest in agriculture. 2) Matrilineal households may or may not be efficient. 3) Patrilineal households are further away from the efficient allocation than matrilineal households. Thus, patrilineal husbands spend more time on agriculture and generate fewer household resources than matrilineal husbands.*

The model also has implications for the relationship between the wage and agricultural productivity, which can be tested. Since patrilineal husbands are predicted to engage in more agricultural labour than matrilineal husbands, the following must also be true:

Corollary 1 *The ratio of wages to agricultural productivity is higher for patrilineal than matrilineal husbands.*

Finally, it is possible to provide indicative evidence for assumption (8). The methods for testing this, Propositions 1, 2 and 3 and Corollary 1 are discussed in Section 3.

2.2.4 Extensions to the model

There are several possible extensions to the model; I discuss the effect of these extensions on Proposition 1. First, one can relax the assumption of exogenous probability of divorce. Including divorce as a choice variable would allow spouses to decide between the divorced and married states in the next period. Let us restrict ourselves to the case where only men hold the power to divorce: in this case, they would choose divorce in the next period as long as the present value of payoffs under divorce is greater than the present value of payoffs under marriage.¹⁰ This comparison does

¹⁰See Telalagić (2013) for a model of marriage in Malawi where women use divorce as an incentive mechanism to encourage men to generate consumption.

not have an unambiguous answer, but depends on two countervailing forces: first, divorce is better because the husband does not have to share his wage income. It may also be better if $\lambda > \alpha$, because then he will receive a larger share of agricultural income. Second, marriage is better because the husband can benefit from the wife's labour, which increases the amount of income available. Thus, the choice between marriage and divorce depends on the wife's productivity and on the relationship between λ and α . Supposing the husband chooses to divorce, this is tantamount to setting $\delta = 1$. In this case, λ would have an even stronger positive effect on agricultural labour because the returns to investing in agriculture increase. This would lead to an even further decrease in household resources. However, if the husband chooses to remain married, then the effect of λ on agricultural labour is zero, as the divorced state never occurs. The reality will, of course, lie somewhere in between these two scenarios. In the efficient scenario, it still remains the case that λ should have no effect on labour and resources, even if divorce is a choice variable.

One can also make more realistic assumptions about the divorce probability, δ . The contextual evidence shows that divorce rates are higher in matrilineal communities: thus, $\delta_M > \delta_P$. In condition (6), an increase in δ when $\lambda > \frac{1}{2}$ increases the coefficient on the marginal agricultural product, increasing optimal agricultural labour supply for the husband. Thus, setting $\delta_M > \delta_P$ would dampen the positive effect of λ on agricultural labour, as the divorce rate would move agricultural labour in the opposite direction. This extension would not affect the prediction that the efficient labour supply is independent of λ .

Another possible extension is to relax the assumption that α and λ are independent (or that α is the same for patrilineal and matrilineal households). It is intuitive that α should be higher for patrilineal than matrilineal households; allowing for this would reduce the magnitude of the effect of λ on agricultural labour. However, as long as α and λ are not perfectly correlated, the effect of λ on individually optimal agricultural labour would persist. In fact, this is the subject of Section 6.

A further way to extend the model would be to allow agricultural labour to generate an income in the current period in addition to the next period. The primary force that drives men toward wage labour is that agricultural labour does not generate any immediate consumption; thus, allowing for immediate agricultural income would increase the return to agricultural labour, with a similar effect to reducing the wage. Thus, optimal agricultural labour in both the inefficient and efficient settings would increase. The independence of labour and λ in the efficient setting would persist.

Another way to extend the model would be to introduce utility functions with diminishing returns. This would introduce consumption smoothing in the husband's decision, acting to equalise consumption across the married and divorced states. The relationship between λ and agricultural labour would then also depend on the risk aversion of the husband. In the efficient setting, this would also introduce an element of risk sharing across the spouses in the divorced state.

3 Empirical Strategy

The general relationship this paper aims to inform on is the effect of spouses' outside options on productive efficiency in the household. The model in the previous Section sets out one way of thinking about this relationship. Proposition 3 suggests two main relationships to be tested: first, whether consumption depends on land rights and second, whether husbands' labour allocation depends on land rights. In addition, Corollary 1 suggests comparing the ratio of wages to agricultural productivity between patriliney and matriliney. Finally, some evidence for Assumption (8) shall be provided. This Section sets out how these four tests are carried out.

To measure land rights, I use kinship: whether the household is matrilineal or patrilineal. This is the best measure of land rights in Malawi, as kinship governs how land is shared following divorce. Using landholdings directly is problematic as not all land is owned solely by the husband or wife: some households only report jointly owned land or land owned by other members of the family. For these types of land, it is not possible to be certain about how this land would be shared if this couple divorced. Therefore, calculating λ would involve assumptions, which may affect the results. The other problem with using actual landholdings is that they may be endogenous to unobservables that may impact consumption and labour outcomes, such as parental wealth. On the other hand, kinship does not suffer from either of these problems: it offers an exogenous measure of λ and does not require any assumptions to be made by the researcher regarding divorce. Although it does not provide a household-specific value of λ , it does tell us that λ is lower in matrilineal households than patrilineal households, which is a sufficient test for Propositions 1, 2 and 3.

3.1 The Effect of Kinship on Consumption

The Propositions of the model can be summarised as follows: in the efficient setting, consumption should not depend on λ . If consumption depends on λ , the household is generating resources inefficiently. In the inefficient setting, a higher value of λ should be associated with lower consumption. These three Propositions can be tested by estimating the effect of kinship on consumption, which is explained here. This test is the subject of Section 4. In order to test the effect of kinship on consumption, I take advantage of the fact that kinship is predetermined for any individual in Malawi. There is an exogenous assignation of kinship across individuals. However, due to the way that tribes settled in Malawi, kinship is not independent of geography. As geography is likely to affect consumption both directly and through other factors such as prices, covariates that are correlated with geography ($\mathbf{G}$), kinship and consumption need to be controlled for. These variables capture the exogenous factors that enter the income generation function. I denote the vector of these covariates by $\mathbf{Z}$. Let D_i be an indicator variable equal to one if household i is patrilineal and zero otherwise. Then, a regression of consumption on kinship, geography and the covariates $\mathbf{Z}$ will give a causal effect of kinship on consumption as long as

$$\{C_{1i}, C_{0i}\} \perp D_i \mid \mathbf{G}_i, \mathbf{Z}_i \forall i,$$

where C_{1i} is the potential consumption outcome of household i if it were patrilineal and C_{0i} is its potential consumption outcome if it were matrilineal. In words, conditional on geography and other regional covariates, the potential consumption outcomes of households across the two kinship types are independent of their kinship (Angrist and Pischke 2008). Kinship may capture other factors too, such as the likelihood of divorce. If, further, I include in $\mathbf{Z}$ all variables relating to kinship that do not measure land rights, the regression will measure the causal effect of land rights on consumption. These land rights are then interpreted as capturing spouses' relative outside options (the parameter λ in the model). This framework suggests the following regression equation, which is estimated using Ordinary Least Squares:¹¹

$$\ln C_i = \gamma_c + \beta_c D_i + \kappa_c \mathbf{G}_i + \theta_c \mathbf{Z}_i + \omega_c \mathbf{H}_i + u_i, \quad (9)$$

where $\mathbf{H}_i$ is a vector of household characteristics that are not correlated with descent but may improve the precision of the estimates. The coefficient of interest is β_c .¹² The exclusion restriction (implied by Proposition 1) is that $\beta_c = 0$: land rights do not affect consumption and, thus, the outcome is efficient. Any $\beta_c \neq 0$ implies that the generation of resources is not efficient by some households in the sample. As this tests looks at the difference between consumption for two groups, it does not allow for the rejection of the null hypothesis that the better group is efficient. Put another way, Proposition 3 predicts that $\beta_c < 0$: consumption is lower in patrilineal than matrilineal households. Such a result would imply that patrilineal households are inefficient on average, but this test does not allow the rejection of the hypothesis that matrilineal households are efficient (which would be the case if $\frac{\lambda_M}{\alpha_M} = 1$). However, Corollary 1 may allow for the rejection of this hypothesis (this is explained below).

For robustness, I examine alternative measures of consumption, sample restrictions, alternative measures of wealth, savings, tribal fixed effects and other potential omitted variables such as colonial influence.

¹¹For details on clustering and weights used in these and subsequent regressions, see footnote 20.

¹²The key assumption is that conditional on included covariates, D_i is exogenous. If this is not the case, the estimate of β_c will be biased. The direction of the bias is ambiguous. This is because there is evidence to suggest that some economic conditions favour matrilineal households (for example, proximity to urban centres), while others favour patrilineal households (for example, lower population density). In the data, some geographic conditions are better in patrilineal areas (rainfall) while others are better in matrilineal areas (greenness). If an omitted variable that improves consumption outcomes is correlated with being patrilineal, an upward bias on β_c will result. An omitted variable that is positively correlated with consumption but negatively correlated with being patrilineal will cause a downward bias on β_c .

3.2 The Effect of Kinship on Labour Allocation

Propositions 1, 2 and 3 also imply that labour allocation should be independent of λ in the efficient setting, while a relationship between λ and labour allocation implies an inefficient allocation of household labour. In an inefficient setting, it is predicted that patrilineal husbands should engage in more agricultural labour and less wage labour than matrilineal husbands. To test these predictions, I use the same set of right-hand side variables as in (9) to estimate the effect of kinship on labour allocation in Section 5. I estimate the following set of equations with Ordinary Least Squares:¹³

$$h_i^w = \gamma_w + \beta_w D_i + \rho_w \ln m_i + \kappa_w \mathbf{G}_i + \theta_w \mathbf{Z}_i + \omega_w \mathbf{H}_i + u_i^w, \quad (10)$$

$$h_i^a = \gamma_a + \beta_a D_i + \rho_a \ln m_i + \kappa_a \mathbf{G}_i + \theta_a \mathbf{Z}_i + \omega_a \mathbf{H}_i + u_i^a, \quad (11)$$

$$h_i^{a-w} = \gamma_{a-w} + \beta_{a-w} D_i + \rho_{a-w} \ln m_i + \kappa_{a-w} \mathbf{G}_i + \theta_{a-w} \mathbf{Z}_i + \omega_{a-w} \mathbf{H}_i + u_i^{a-w}, \quad (12)$$

$$h_i^{a+w} = \gamma_{a+w} + \beta_{a+w} D_i + \rho_{a+w} \ln m_i + \kappa_{a+w} \mathbf{G}_i + \theta_{a+w} \mathbf{Z}_i + \omega_{a+w} \mathbf{H}_i + u_i^{a+w}, \quad (13)$$

where h^w denotes hours of wage labour by the husband, h^a denotes his hours of agricultural labour, h^{a-w} denotes the difference between the hours of agricultural and wage labour and h^{a+w} denotes the sum of the hours of agricultural and wage labour. I include the logarithm of the market wage (as well as the logarithm of the predicted wage from a Heckman selection model in an alternative specification), which is denoted by m_i . The exclusion restriction in Proposition 1 implies that $\beta_w = \beta_a = \beta_{a-w} = \beta_{a+w} = 0$, while Propositions 2 and 3 imply that an inefficient allocation would show up with $\beta_w < 0, \beta_a > 0, \beta_{a-w} > 0$ and $\beta_{a+w} = 0$. That is, patrilineal men spend less time on wage labour and more time on agricultural labour compared to matrilineal men if they are allocating their labour according to a Nash best response. In addition, the difference between the two types of labour is higher for patrilineal than matrilineal men, while the sum is no different between the two kinship groups, implying a substitution effect. As with consumption, this result would imply an inefficient labour allocation for patrilineal households but not necessarily for matrilineal households. For robustness, I examine income and husbands' wage earnings as well as sons' labour supply.

A comparison of the ratio of wages to agricultural productivity across matrilineal and patrilineal husbands in Section 5 provides a simple test of Corollary 1. Equation (4) implies that an efficient labour allocation requires the wage to be equal to the marginal product of agriculture. If this does not hold, an inefficient setting is implied. This allows for a test of the efficiency of matrilineal households: the ratio of wages to agricultural productivity should be equal to one for matrilineal husbands. If this does not hold, there is evidence that matrilineal households are inefficient.

¹³I estimate these equations independently with the same right-hand side variables in all specifications.

3.3 The Effect of Kinship on Intra-Household Allocation

Assumption (8) requires that the ratio of λ to α for patrilineal households is larger than the same ratio for matrilineal households. Although it is not possible to exactly calculate this ratio (due to the ambiguity of landholdings data and because most consumption is not assignable), it is possible to provide at least indicative evidence, first by calculating an approximation of λ using landholdings data (see Subsection 2.2.3 and Appendix A) and second by obtaining an indication of the variation in α across kinship by looking at consumption that is private by definition. In particular, one can compare the allocation of resources to clothing and education to examine whether variations exist in spouses' resource shares across patriliney and matriliney. A sufficient condition for Assumption (8) is that α is no different across patrilineal and matrilineal households (or at least does not vary by as much as λ). In order to test the effect of kinship on the intra-household allocation of private goods, I estimate a series of Working-Leser expenditure share regressions:

$$e_i^g = \gamma_g + \beta_g D_i + \rho_g E_i + \kappa_g \mathbf{G}_i + \theta_g \mathbf{Z}_i + \omega_g \mathbf{H}_i + \tau_g \mathbf{P}_i + u_i^g, \quad (14)$$

where $g = 1, \dots, n$ is a set of n categories of goods, e_i^g is the percentage share of total expenditure spent on good g , E_i is the per capita expenditure of household i , $\mathbf{P}_i$ is a vector of the log of prices of various goods and the remaining right-hand side variables are as in (9). As expenditure is likely to be endogenous, I use an instrumental variables approach. This is explained further in Section 6. The coefficients of interest are the $\beta_g, g = 1, \dots, n$. Although not a direct test of Assumption (8), it can provide some evidence of variation in α : the closer the value of β_g to zero, the more likely that Assumption (8) is satisfied.

4 Consumption

4.1 The Data and Summary Statistics

The source of the data is the Malawi Living Standards Measurement Study (LSMS), conducted by the World Bank and the Malawi National Statistical Office (NSO). The data consists of 12271 households interviewed between March 2010 and March 2011, of which 10038 resided in rural areas.¹⁴ I restrict the sample to rural households where the household head is married, which yields a potential sample of 7203 households. The final sample consists of 7161 households, due to missing observations. Households omitted due to missing observations are no different on relevant characteristics than included households (results not reported). Aggregate real consumption expenditure, both at the household level and per capita, is provided in the data. I use the household-level measure for most of the analysis. The consumption aggregate includes food purchased, produced for own consumption and received as a gift, various household items, the rental value of durables, the rental value of accommodation and expenditure on health and schooling. Consumption expenditure is deflated by a temporal and spatial price index.¹⁵

Summary statistics are presented in Table 1. I disaggregate the data by descent.¹⁶ Details of variable definitions can be found in Appendix B. Matrilineal and patrilineal households are similar on basic characteristics. The average landholding size, household size and number of children are not significantly different across any of the descent types. The mean highest diploma achieved is similar for both husbands and wives across descent types. However, patrilineal husbands and wives in the sample are slightly older than matrilineal husbands and wives. The regional dispersion of descent is clear from the table: while there are close to no matrilineal households in the Northern sample, 53% of matrilineal households reside in the South, while 42% of patrilineal households reside in the North. Divorce rates are highest in matrilineal communities, on average.¹⁷

¹⁴Villages were selected based on probability proportional to size. Households within these villages were randomly selected. All summary statistics are weighted based on the probability of being sampled and clustered at the village level.

¹⁵The price index was calculated by the NSO. It consists of a spatial price index, calculated as a Laspeyres price index using prices for 29 food items and 13 non-food items with base period February/March 2010, and a temporal price index, calculated using the monthly CPI for the three regions.

¹⁶Descent is identified based on the following question, which was asked to village informants: "Do individuals in this community trace their descent through their father, their mother, or are both kinds of descent traced?" I label the category where both kinds of descent are possible as 'dual descent,' even though strictly speaking, each household will practise one or the other. I report the results for this category but focus on the distinction between matrilineal and patrilineal households. It needs to be acknowledged that there could be a small element of endogeneity to this variable, because it measures the descent traced in the village where the couple are resident, which may not be the descent traced by the couple's family. As a result, the choice of residence may affect this. However, I assume that this is not a problem, primarily because individuals are likely to reside in the village of one of the spouses' families. As inter-marriage between matrilineal and patrilineal individuals is uncommon, the household is likely to have the same descent pattern as the village.

¹⁷The divorce rate is measured at the district level. It is calculated from the entire LSMS sample and represents the proportion of household heads who report being separated or divorced. The figures are consistent with those in Reniers (2003), calculated from the 2001 Demographic and Health Survey of Malawi.

¹⁸The column "P-value P=M=D" reports the p-value on the test where the null hypothesis is that the value for all three groups is the same.

¹⁹The column "P-value P=M" reports the p-value on the test where the null hypothesis is that the value for

Table 1: Summary statistics by descent

	Patrilineal	Matrilineal	Dual descent	P-value P=M=D ¹⁸	P-value P=M ¹⁹
Land (rainy, acres)	2.04 (0.05)	1.95 (0.05)	2.26 (0.24)	0.27	0.23
Land (dry, acres)	0.09 (0.01)	0.12 (0.03)	0.08 (0.04)	0.73	0.50
HH size	5.08 (0.06)	5.03 (0.04)	5.36 (0.16)	0.13	0.48
# Children	2.97 (0.05)	2.93 (0.04)	3.15 (0.11)	0.14	0.52
Age (husb)	41.46 (0.38)	40.09 (0.25)	42.12 (1.20)	0.00	0.00
Age (wife)	35.24 (0.34)	34.31 (0.23)	36.67 (0.96)	0.01	0.02
Highest diploma (husb)	1.50 (0.03)	1.44 (0.02)	1.59 (0.18)	0.23	0.11
Highest diploma (wife)	1.19 (0.02)	1.18 (0.01)	1.30 (0.12)	0.51	0.45
North	0.42	0.00	0.11	0.00	0.00
Centre	0.34	0.47	0.47	0.03	0.01
South	0.24	0.53	0.42	0.00	0.00
Divorce rate	8.24 (0.22)	12.38 (0.18)	11.02 (0.77)	0.00	0.00
<i>N</i> (number of obs.)	2455	4425	281	7161	6880
This table reports mean (standard error). Standard errors are not reported for indicator variables.					

matrilineal and patrilineal households is the same. Households in dual descent villages are excluded from this test.

4.2 Expenditure Data

Summary statistics of real expenditure are in Table 2. The raw statistics in this table lie at the heart of this paper. Much of what has been discussed in the historical context can already be seen at this level. While the South is indeed the poorest region, as observed by the colonialists, the same cannot be said for matrilineal communities. In fact, matrilineal households consume more on average than patrilineal households in all regions, with a particularly significant difference in the Southern region. It appears that patriliney is driving the poverty in the South, quite contrary to the claims of the colonialists. The difference in mean expenditure between matrilineal and patrilineal households is a statistically significant 11%. In the regression results, I expect to observe lower consumption and more agricultural labour in the South. However, there should be a positive effect of matriliney on consumption and wage labour over and above this.

It is interesting to note that dual descent villages have the highest consumption of all village types. Although the precise nature of these villages is unclear, it may be that they include households that inter-marry between patriliney and matriliney. If both spouses bring land to the newly-formed household, the property rights regime may be more egalitarian than matriliney or patriliney. This is consistent with the idea from the theoretical framework that the efficient property rights regime, generating the highest household consumption, is when $\lambda = \alpha$, which is likely to be at a value of around $\frac{1}{2}$ in this context.

Table 2: Real household consumption expenditure ('000s MWK) by descent and region

	Patrilineal	Matrilineal	Dual Descent	All	P-value P=M=D	P-value P=M
North	197.41 (8.68)	209.43 (N/A)	263.17 (42.83)	199.37 (8.57)	0.18	N/A
<i>N</i>	1224	9	79	1312		
Centre	241.74 (9.34)	253.11 (8.74)	331.89 (81.77)	253.49 (7.58)	0.40	0.38
<i>N</i>	626	1887	111	2624		
South	141.48 (9.78)	198.43 (7.78)	177.71 (19.58)	187.84 (6.54)	0.00	0.00
<i>N</i>	605	2529	91	3225		
All	198.89 (5.94)	223.97 (5.95)	260.19 (44.77)	217.50 (4.65)	0.01	0.00
<i>N</i>	2455	4425	281	7161	7161	6880
This table reports mean (standard error).						

4.3 Regression Results

In this Subsection, I test whether the difference in mean expenditure observed in the summary statistics persists when relevant variables are controlled for. This is a test of Proposition 3: do patrilineal households have lower consumption than matrilineal households? For robustness, I examine per capita and equivalent expenditure, as well as consumption from purchases, which is likely to be particularly sensitive to wage income. I also use alternative measures of wealth, restrict the sample to the Southern and Central regions only, examine savings, include tribal fixed effects and consider other omitted variables such as colonial influence and population density.

I estimate Equation (9), where the primary coefficient of interest is that on the indicator variable capturing patrilineal descent; I also include an indicator variable for dual descent while matriliney is the base case.²⁰ The results are presented in Table 3. Each regression includes a vector of basic characteristics and further controls are added with each specification. Appendix C provides a list of variables included in each specification. The key result is that matrilineal households consume significantly more than patrilineal households, on average, in all specifications. I discuss each specification in turn.

The first specification only includes basic controls and no indicator variables for descent. Households in the South have 8.5% higher consumption than households in the North, while households in the Central region have 27.5% higher consumption than households in the North. An additional acre of land is associated with 5.9% higher consumption, on average. Specification (2) adds indicator variables for patriliney and dual descent: patrilineal households consume 14.2% less than matrilineal households on average. This is consistent with the mean gap observed in Table 2. In addition, the indicator variable for the Southern region loses significance and the coefficient on the Central region falls in magnitude, suggesting that descent explains part of the regional variation. Adding household composition variables in specification (3) does not change the coefficient on patriliney. Variables relating to the village economy are added in specification (4); these include the crop types farmed in the village, the presence of wage or business employment, the presence of immigrants and urban connectivity. The consumption gap between matrilineal and patrilineal households widens. Being further away from a road is associated with lower consumption, while the presence of immigrants (capturing a strong village economy) is associated with higher consumption. The presence of business employment has a significant positive effect on consumption while the presence of wage employment does not have a significant effect on consumption (although this coefficient becomes significant in later specifications).

In specification (5), I add geographical variables, further controlling for the spatial correlation

²⁰All standard errors are clustered at the village level. The regressions are weighted based on the sampling strategy, which selected villages based on probability proportional to size. There are arguments both for and against the use of weights; I follow the guidance in Deaton (1997, p. 72), which suggests the use of an ‘auxiliary’ regression to test whether slope parameters vary with weights. If slope parameters vary with weights, then both a weighted and non-weighted regression will give inconsistent estimates, but at least the weighted regression will give the population regression function. The auxiliary regression suggests that slope parameters vary with weights, so I use weights in all regressions (apart from the Two Stage Least Squares regressions in Section 6, which only have clustered standard errors).

Table 3: The effect of descent on consumption

	(1)	(2) +descent	(3) +HH comp.	(4) +econ.	(5) +geog.	(6) +gender
	Ln(real expenditure)					
Patrilineal		-0.142*** (0.037)	-0.142*** (0.036)	-0.159*** (0.035)	-0.080*** (0.029)	-0.096*** (0.030)
South	0.085** (0.035)	-0.030 (0.047)	-0.035 (0.047)	0.055 (0.048)	0.199** (0.084)	0.253*** (0.088)
Central	0.275*** (0.037)	0.171*** (0.044)	0.165*** (0.044)	0.198*** (0.043)	0.187** (0.073)	0.199*** (0.074)
Land (rainy, acres)	0.059*** (0.007)	0.059*** (0.007)	0.057*** (0.007)	0.067*** (0.008)	0.071*** (0.008)	0.071*** (0.008)
Dist. to road				-0.004*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)
Immigration				0.154*** (0.025)	0.107*** (0.023)	0.105*** (0.023)
Any business empl.				0.078*** (0.024)	0.055** (0.022)	0.046** (0.023)
Any wage empl.				0.031 (0.026)	0.060** (0.025)	0.071*** (0.025)
Women's group						0.045* (0.026)
Divorce rate						-0.010** (0.005)
Basic	Y	Y	Y	Y	Y	Y
HH Composition	N	N	Y	Y	Y	Y
Village economy	N	N	N	Y	Y	Y
Geography	N	N	N	N	Y	Y
N	7161	7161	7161	7161	7161	7161
R^2	0.311	0.318	0.330	0.357	0.392	0.394
Standard errors are reported in parentheses. *** denotes significance at 1% level, ** at 5% level and * at 10% level.						

Table 4: The geographical variables in specification (5)

Category	Variable	Coefficient
Temperature	Average daily range	-0.021^{***}
	Temperature seasonality	0.000^{**}
	Min. temp. of coldest month	-0.018^{***}
	Avg. temp. of wettest quarter	0.016^{***}
Rainfall	Avg. 12-month tot. rainfall 2001-2011	0.001^{***}
	Avg. tot. rainfall in wettest quarter 2001-2011	-0.002
	Avg. start of wettest quarter 2001-2011	0.007
Greenness	Total change in greenness in 2009,2010	$0.005^{**}, -0.004^{**}$
	Onset of greenness increase in 2009,2010	$0.004^*, 0.001$
	Onset of greenness decrease in 2009,2010	$-0.005^{**}, 0.001$
Soil quality	Nutrient availability	$F = 2.00^*$
	Rooting conditions	$F = 10.36^{***}$
	Excess salts	$F = 4.03^{**}$
Test of joint significance of all geographical variables: $F = 15.34^{***}$		
Greenness is the emergence of vegetation at the beginning of the growing season.		
*** denotes significance at 1% level, ** at 5% level and * at 10% level.		

of descent seen in Figure 1. The coefficient on patriliney halves, suggesting that half of the gap in specification (4) is explained by geographical conditions and that patrilineal households are located within the worst geographical areas in each region.

The effect of geography on expenditure is likely to work through agricultural productivity: geography affects the innate productivity of the land, which in turn affects income and thus expenditure. In regression (5), particularly significant effects are observed for variables relating to temperature, greenness (the onset of spring) and measures of soil quality, especially the rooting conditions of the soil (see Table 4 for these results). Note that soil quality data are available at the household level. The geographical variables are jointly significant with a p-value less than 0.001%.

When variables relating to gender are included in regression (6), the consumption gap widens to 9.6%. The divorce rate has a statistically significant negative effect on consumption: an increase in the divorce rate of 1% is associated with a 1% reduction in consumption. I choose regression (6) as the preferred specification. Having controlled for basic characteristics, geography, economic characteristics, household composition and gender, a highly significant consumption gap of 10% between matrilineal and patrilineal households persists. This gap is consistent with the 11% gap observed in means. There is strong evidence to support Proposition 3, namely that matrilineal households consume significantly more than patrilineal households. Together with Proposition 1, this also implies that patrilineal households are productively inefficient.

4.4 Robustness Checks

In this Subsection, I carry out several robustness checks. First, I verify that the consumption gap is observed in alternative measures of consumption. I replace the logarithm of real household expenditure in regression (6) with the logarithm of per capita real expenditure (pc exp) and equivalent real expenditure (eq exp). Equivalent expenditure is a more accurate measure of per capita expenditure: it gives children a lower weight than adults because the former consume less.²¹ These results are specifications (7) and (8) in Table 5. It is clear that the effect of kinship on expenditure holds across these alternative measures of expenditure and is not significantly different from the gap in regression (6). I also restrict consumption to purchases, omitting consumption from own production and gifts. According to the theoretical framework, matrilineal households' higher consumption is driven by their higher wage income. Regression (9) supports this premise: matrilineal households consume significantly more from purchases than patrilineal households, and this gap is larger than the gap for all consumption in regression (6).²² This is consistent with the idea that we should observe the most pronounced gap in that type of consumption that requires wage income.²³ These specifications confirm that the consumption gap between matrilineal and patrilineal households is robust to alternative measures of spending.

Table 5: Robustness checks: Alternative measures of consumption

	(7)	(8)	(9)
	Ln(pc exp)	Ln(eq exp)	Ln(purchases)
Patrilineal	-0.096*** (0.030)	-0.093*** (0.030)	-0.127*** (0.034)
N	7161	7161	7161
R^2	0.391	0.394	0.376
Controls included: Basic, Regions, HH Composition, Village economy, Geography and Gender. Standard errors are reported in parentheses.			
*** denotes significance at 1% level, ** at 5% level and * at 10% level.			

Second, I address the issue that land may be an inadequate measure of wealth, insofar as it is inaccurate or has an endogenous element. In regression (10) in Table 6, I replace land with two alternative measures of wealth: the number of livestock owned and the type of construction material

²¹The weights were chosen by NSO researchers and are as follows: 0.33 for children aged under 1, 0.47 for ages 1-2, 0.55 for ages 2-3, 0.63 for ages 3-5, 0.73 for ages 5-7, 0.79 for ages 7-10, 0.84 for ages 10-12, 0.91 for ages 12-14, 0.97 for ages 14-16 and 1 for ages 16 and up.

²²Consumption from purchases is comprehensive, including food and non-food items.

²³A regression of consumption from own production on the right-hand side variables in specification (6) shows no significant difference between matrilineal and patrilineal households. Given that matrilineal households spend fewer hours on agricultural work (shown in the next Section), this implies two reasons for their higher consumption: higher productivity in agriculture and more wage income. I focus on the latter mechanism, as agricultural productivity is not the topic of the present paper. However, future research may look into comparing the agricultural productivity of matrilineal and patrilineal households, which is likely to be affected by land rights and who makes decisions about plots.

used for the house, with the best type (permanent) as the base case. Although the consumption gap is slightly smaller in this specification, patrilineal households still consume significantly less on average than matrilineal households. The reduction in the coefficient on patriliney is not a concern: it says that matrilineal households consume more today partly because they have accumulated more wealth in the past, which is likely due to the same behaviours that allow them to consume 6.3% more today.

Third, there is the issue that only nine households in the Northern sample are matrilineal. As a result, there may be insufficient variation in kinship in the North to provide accurate results. In regression (11), I restrict the sample to the Southern and Central regions only. The coefficient of interest is a statistically significant 8.7%, suggesting that the inclusion of Northern households does not invalidate the results.

Fourth, I discuss savings. It may be that matrilineal households are impatient, in which case they exhibit higher consumption today at the expense of future consumption. As a result, it would be misleading to conclude that matrilineal households are more productive. Rural households in Malawi have limited savings; their low income is associated with a high marginal propensity to consume. Direct data on the amount of savings are not available but less than 1% of households report non-zero values of interest earned on savings and pension income. Alternative measures of savings are the use value of durables and the number of livestock, which 85% and 53% of households report having non-zero values of, respectively. Estimating specification (6) but replacing consumption with the use value of durables or the number of livestock does not yield a significant coefficient on patriliney in either estimate (results not reported). This implies that these measures of savings are not significantly different across matrilineal and patrilineal households. The survey also includes a question on the household head's subjective assessment of whether household income is sufficient for building household savings. Matrilineal households report that they are significantly better able to build their savings than patrilineal households, with a p-value of 0.00. The evidence suggests that either savings are no different between matrilineal and patrilineal households or the former have higher savings. Therefore, matrilineal households are likely to have higher consumption in the future, not just at present.

Fifth, a possible criticism of the results of the previous Subsection is that the geographical controls are inadequate. As an alternative to the geographical variables in regression (6), I use the GPS coordinates of the village.²⁴ This is a reliable method of taking into account geographical factors and I follow Becker and Woessmann (2009) and include the latitude, longitude and their interaction in the regression. I also include the squares of the latitude and longitude. This is regression (13) in Table 6. The effect of patriliney is still negative and significant, and is in fact larger in magnitude than that in specification (6). All GPS variables are highly significant, suggesting that this method captures geographical variation well.²⁵

²⁴The GPS coordinates of each village are provided in the dataset and are calculated as the average of household GPS coordinates in each village, with a random offset (within a pre-specified range) applied to maintain confidentiality. The units for latitude and longitude are radians.

²⁵An alternative way of capturing geography and other economic variables is to include village-level fixed effects.

Sixth, I consider the possibility of tribal fixed effects. There may be characteristics of tribes that correlate with descent and consumption but that do not affect outside options, such as work ethic. These characteristics would have to be true of all matrilineal tribes or all patrilineal tribes: for example, all matrilineal tribes are harder working than all patrilineal tribes and this is not due to their being matrilineal but due to an unobserved factor. This can be tested by including tribal fixed effects in the main regression. In regression (13), I add a series of indicator variables measuring the most spoken language in the community to regression (6). As language is highly correlated with tribe, this is a good measure of tribal fixed effects. The coefficient on patriliney is still significant and negative, while two languages have a significantly negative effect on consumption over and above the negative effect of patriliney (the Ngoni and the Sena, results not reported). The persistence of the negative effect of patriliney despite the inclusion of a proxy for tribal fixed effects suggests that tribal characteristics are not the cause of the consumption gap.

Seventh, I consider a number of other possible omitted variables that may be driving the results. One consideration is the role of religion, as religion is correlated with kinship. However, when religion indicator variables are included in the main regression, they are not significant and do not affect the estimates of the parameters of interest (results not reported). Another possible omitted variable is population density: matrilineal areas tend to be more populated than patrilineal areas. If more density increases productivity through channels such as wider networks, then the negative coefficient on patriliney may actually be capturing a negative effect of low population density. However, when I include district population density figures based on the 2008 Malawi census in the main regression, they are not significant and nor are the log of population density and the square of population density (results not reported).

Eighth, there are two potential concerns with the sample choice. One concern is that the sample includes polygamous households and the analysis does not treat them any differently from monogamous households. However, the results are robust to removing polygamous households as well as to including an indicator variable for polygamy. Another concern is a potential selection bias from including current marriages. As divorce rates are higher in matrilineal communities, an average currently married matrilineal household may be better functioning in some way than an average currently married patrilineal household, as the former has survived a larger likelihood of separation. In order to test this premise, I restrict the sample to recently formed marriages to create a level playing field across patrilineal and matrilineal households.²⁶ The consumption gap between young matrilineal and patrilineal households is larger than the consumption gap for all households (results not reported). Thus, there does not appear to be a selection bias due to the use of current marriages.

Finally, another alternative explanation is colonial influence. Colonialists did not settle evenly across Malawi and if their settlement pattern is correlated with descent, this may affect the results.

However, since kinship is also measured at the village level, it is not possible to estimate this regression due to multicollinearity.

²⁶ As the duration of marriage is not provided in the data, I use the age of the oldest child as a proxy for the length of marriage (households in Malawi tend to have children as soon as they marry).

For example, colonialists may have encouraged the formation of industry, making their settlement areas wealthier today. Alternatively, the slave trade may have hampered the development of regions where the colonialists settled. I use the variables constructed by Nunn and Wantchekon (2011) as measures of European colonial influence to attempt to capture these effects. In particular, I include their indicator variable which is equal to one if any component of the railway network built by colonialists was on land inhabited by a particular ethnic group and zero otherwise. Exposure to the railway network suggests colonial influence. This variable is at the ethnic group-region level. However, this variable is not significant in the main regression and does not change the coefficient on patriliney, suggesting that colonial influence is not the underlying reason behind the positive effect of matriliney on consumption.

Thus, the consumption results are robust to a wide variety of alternative explanations and specifications. Next, I test the labour allocation mechanism predicted by the theoretical framework.

Table 6: Robustness checks: Wealth, geography and tribal effects

	(10) +wealth	(11) S&C only	(12) +GPS	(13) +language
	Ln(real expenditure)			
Patrilineal	-0.063** (0.030)	-0.087*** (0.032)	-0.133*** (0.033)	-0.083*** (0.031)
Semi-perm.	-0.244*** (0.023)			
Traditional	-0.360*** (0.021)			
# Livestock	0.012*** (0.002)			
Latitude			2.669*** (0.855)	
Longitude			4.865*** (1.831)	
Latitude ²			-0.034*** (0.007)	
Longitude ²			-0.090*** (0.030)	
Latitude*Longitude			-0.103*** (0.029)	
<i>N</i>	7161	5849	7161	7161
<i>R</i> ²	0.439	0.354	0.369	0.395
Controls included: Basic (land excluded in (10)), Regions, HH Composition, Village economy, Geography (excluded in (12)) and Gender. Standard errors are reported in parentheses.				
*** denotes significance at 1% level, ** at 5% level and * at 10% level.				

5 Labour

The driving force behind the predicted effect of land rights on consumption in Section 2 is the men’s labour decision, which I analyse in this Section. Thus far, the results have shown that matrilineal households have higher consumption. According to the theoretical framework, this is because matrilineal men allocate a greater share of their labour to wage work.²⁷ In the first instance, I estimate equations (10)-(13) from Section 3. In the second instance, I provide evidence for Corollary 1 by calculating the ratio of wages to agricultural productivity. Finally, for robustness I examine income and sons’ labour supply.

5.1 Labour Allocation

I first present summary statistics of labour allocation in Table 7. Definitions of labour-related variables can be found in Appendix B.²⁸ This table shows the number of hours each spouse spends per week on each type of activity, disaggregated by lineage.²⁹ Women tend to work harder when they are patrilineal, while men tend to work harder when they are matrilineal, which is consistent with the idea that women have more bargaining power in the household in matrilineal than patrilineal communities. Men tend to split their time between different types of economic labour, while women tend to engage in agricultural labour and domestic work, devoting less than an hour per week on wage labour. This is in line with the division of labour assumed in the theoretical framework. Both spouses tend to allocate more labour to agricultural work when they are patrilineal, while both spouses tend to allocate more labour to wage work when they are matrilineal. Patrilineal spouses allocate more time to ganyu labour than matrilineal spouses. This makes sense, as ganyu labour is typically carried out by the poorest households.

In order to estimate equations (10)-(13) from Section 3, wage information on husbands is required. Respondents engaged in wage work reported the amount of their last salary and the period of time it covered. The first specification I estimate (regressions (I)-(V) in Table 8) includes a market wage. This is calculated as the median hourly village wage, based on husbands’ reports (see Appendix B for details). The second specification I estimate uses a predicted wage for husbands. This is because an important assumption for husbands’ wage reports to have a valid interpretation is that the wage is constant. If husbands only accept wage work when the wage is high enough then the observed wage will over-estimate the underlying distribution of wage offers. One way to overcome this selection problem is to use a Heckman selection model (Heckman 1979). I implement the Heckman selection model for observed wages, using kinship and geographical variables such

²⁷A caveat on this is that if labour and consumption are codetermined, the former will not explain the latter. However, in the theoretical framework, the assumption is that the husband makes a labour allocation decision, which determines consumption.

²⁸Domestic labour is time spent fetching water and firewood. The questionnaire did not ask about more typical domestic tasks like cooking and cleaning. In addition, there is no data on leisure, which is why the total number of hours is not equal to the number of hours in a week.

²⁹See Telalagić (2013) for a detailed analysis of how husbands and wives in Malawi allocate their time.

Table 7: Labour hours per week

Labour		Matrilineal	Patrilineal	Dual descent	P=M=D	P=M
Total economic	Husb.	22.58 (0.61)	21.18 (0.77)	18.93 (2.29)	0.15	0.16
	Wife	13.70 (0.44)	15.40 (0.69)	11.81 (1.93)	0.06	0.04
Agricultural (own-farm)	H	11.72 (0.42)	12.22 (0.57)	10.60 (1.62)	0.57	0.48
	W	10.93 (0.40)	11.81 (0.58)	9.66 (1.73)	0.32	0.22
Wage	H	5.26 (0.48)	3.76 (0.36)	4.94 (2.05)	0.04	0.01
	W	0.47 (0.09)	0.26 (0.07)	0.39 (0.32)	0.17	0.06
Ganyu	H	2.65 (0.17)	2.87 (0.26)	1.63 (0.38)	0.02	0.46
	W	0.93 (0.08)	1.58 (0.16)	0.54 (0.16)	0.00	0.00
Domestic	H	0.83 (0.07)	0.62 (0.08)	0.60 (0.22)	0.11	0.05
	W	8.33 (0.18)	8.55 (0.21)	7.46 (0.57)	0.19	0.42
<i>N</i>		4425	2455	281	7161	6880
This table reports mean (standard error). Columns 4 and 5 report p-values for the rejection of the null hypothesis.						

Table 8: The effect of descent on labour allocation

	(I)	(II)	(III)	(IV)	(V)
Husband's Labour	Total	Agric	Wage	Agric - Wage	Agric + Wage
Patrilineal	0.075 (1.057)	1.470** (0.686)	-1.454* (0.815)	2.924*** (1.131)	0.015 (0.995)
Log(market wage)	-2.268*** (0.647)	-0.855* (0.463)	-1.369*** (0.515)	0.514 (0.800)	-2.223*** (0.566)
<i>N</i>	7161	7161	7161	7161	7161
<i>R</i> ²	0.146	0.176	0.189	0.201	0.157

	(VI)	(VII)	(VIII)	(IX)	(X)
Husband's Labour	Total	Agric	Wage	Agric - Wage	Agric + Wage
Patrilineal	0.176 (1.064)	1.507** (0.683)	-1.393* (0.826)	2.900** (1.133)	0.113 (1.008)
Log(predicted wage)	7.886*** (1.562)	4.673*** (1.122)	4.425*** (1.183)	0.248 (1.807)	9.098*** (1.432)
<i>N</i>	7161	7161	7161	7161	7161
<i>R</i> ²	0.145	0.178	0.188	0.201	0.158

Controls included: Basic, Region, HH Composition, Village economy, Geography and Gender.
Standard errors are reported in parentheses. *** denotes significance at 1% level, ** at 5% level
and * at 10% level.

as temperature and soil quality as instruments for participation in wage labour. These variables should not affect the wage an individual receives but do affect the return to agricultural labour, which in turn affects participation in agricultural labour and thus participation in wage labour. Thus, these variables are valid exclusion restrictions. The results yield an estimate of $\rho = 0.46^{***}$, suggesting the presence of selection bias. Using the Heckman estimates, I calculate the predicted wage for each husband in the sample. The logarithm of this is then used as an explanatory variable in regressions (VI)-(X). As the model only offers predictions on husbands' labour supply, I estimate labour supply regressions for husbands only.

Husbands' labour allocation is in line with the theoretical predictions. While there is no significant difference between the total labour time of patrilineal and matrilineal men, the former spend approximately one hour and 30 minutes more on agriculture and a similar amount of time less on wage work per week, on average. This substitution effect is confirmed in regressions (IV) and (V), as patrilineal men spend three more hours on agriculture than wage work per week, while the sum of these two labour types is not significantly different between matrilineal and patrilineal men.³⁰

³⁰ Although the regressions control for employment opportunities, a more careful analysis of employers supports the idea that the observed difference in wage work hours is an active choice made by husbands rather than a result of employment opportunities. When examining the share of individuals working for different types of employers, no difference between matrilineal and patrilineal husbands is observed apart from in the share working for government employers. However, this is significant at the 9% level and the government only employs 4% of the whole sample. This suggests that there is little difference in the employment opportunities available to matrilineal and patrilineal

Higher market wages are associated with lower agricultural and wage work for men in regressions (II) and (III). When the individual predicted wage, corrected for selection bias, is used in place of the market wage, the effect of patriliney on labour allocation is no different to that in regressions (I) to (V). However, a higher individual wage is associated with more agricultural and wage labour. This may be because the predicted wage measures individual productivity or a lower cost of effort, causing these men to be more hard-working. In contrast, market wages may be measuring the wealth of the village, with individuals in more wealthy villages having to work less hard.

The results suggest that the observed labour allocation is consistent with the consumption gap observed in Section 4 and the predictions in Section 2. Matrilineal households consume more than patrilineal households. At the same time, matrilineal men spend more time on wage labour and less time on agricultural labour. This provides support for Propositions 2 and 3: patrilineal husbands are over-investing in agriculture relative to the efficient labour allocation. According to the framework, this is the cause of the consumption gap evidenced in the previous Section.

5.2 Wages and agricultural productivity

In order to provide evidence for Corollary 1, I calculate the wage and the return to agricultural work for husbands in the sample. Wage work includes jobs such as cleaning, caretaking, teaching, carpentry, bricklaying or being a shop assistant. It does not include ganyu labour. I use the predicted wage for husbands, described in the previous Subsection.

Agricultural work includes all farming activities on the household's land. The agricultural product is calculated as the estimated value of consumption from own production plus agricultural sales revenue in the last year divided by a measure of the number of hours of own-farm agricultural labour by all household members in the last year.³¹ A simple approach would be to use the total number of hours of own-farm work by all household members. However, this figure is not available in the data. Instead, each individual in the household reports the amount of agricultural labour in the past week, giving total household agricultural labour in the past week. This is likely to be affected by seasonality. To overcome this problem, I calculate the median agricultural hours across households in each Traditional Authority (TA) for each month, on the condition that there are at least four households observed in every month of the year in that TA. I then calculate the annual agricultural hours for each TA as the total of the median hours in each month. Where there are less than four observations for certain months of the year, I calculate the district-TA-level median agricultural hours, again conditioning on there being at least four households observed in every month in every group. Where this is not satisfied, I take the region-level median monthly agricultural hours.

I also calculate the median hourly wage for men paid by the Malawi Social Action Fund households.

³¹I assume that the average agricultural product is the same for all household members. This is a simplifying assumption that ensures the identification of the agricultural product, because it is not possible to identify how much of consumption from own production came from the labour of each individual household member.

(MASAF) public works programme for comparison, as reported by villages that have an operational MASAF programme. The MASAF programme offers a social safety net in particularly poor villages, with the wage purposefully set below the market wage (Dzimadzi and Chinsinga 2004).³² This figure serves as a lower bound on the wage in the more formal wage sector. The MASAF programme operates differently to employment guarantee schemes elsewhere (such as the National Rural Employment Guarantee of India, which sets wages above the market clearing wage).

Finally, I calculate the ratio of wages to the average agricultural product. This is an approximation of the wedge driven by land rights (and divorce rates and the sharing rule) in equation (6) in Section 2. Assuming that agricultural production exhibits diminishing marginal returns and that patrilineal and matrilineal households can be described by the same production function, then the average agricultural product can be used instead of the marginal agricultural product to compare this ratio across the two kinship types. Although the difference in magnitude may not be the same, the sign of the difference will be. These figures are in Table 9. I report both means and medians for comparison because the distributions of wages and the agricultural product are heavily skewed to the right.

There are four key observations in Table 9. First, the ratio of the predicted wage to the average product of agricultural labour (APAL) is larger, on average, in patrilineal than matrilineal households. The median ratio is also higher in patrilineal households. This supports Corollary 1. Second, although the mean predicted wage does not differ across the two kinship types (and neither does the APAL), columns 3 and 4 show that the median wage is higher in patrilineal than matrilineal households, while the median agricultural product is lower. This implies that the median difference between the wage and the APAL is higher in patrilineal than matrilineal households, providing more support for Corollary 1 and being in line with the idea that patrilineal households spend more time on agriculture than matrilineal households, lowering their average product. Third, the average ratio for matrilineal households is significantly different from one (test not reported). The median ratio is also greater than one. This is the only test the data allows for the efficiency of matrilineal households, and the result suggest that matrilineal households are inefficient, on average. Finally, the MASAF wage shows that the estimates of the predicted wage are sensible: the mean MASAF wage is slightly under the mean predicted wage, while the median MASAF wage is about the same as the median predicted wage. This is consistent with the idea that the MASAF program is set up as a social safety net. Together, these observations provide evidence for Corollary 1 and for the inefficiency of matrilineal households in addition to patrilineal households.

³²Note that in the survey, the MASAF wage is only reported by those villages that have a MASAF program, which are likely to be particularly poor.

Table 9: Measures of wages and agricultural productivity

Labour type	Return (MWK per hour)			
	Means		Medians	
	Patrilineal	Matrilineal	Patrilineal	Matrilineal
Predicted Wage, husbands	68.02	68.36	50.27	45.66
<i>N</i>	2455	4425	2455	4425
Average Product of Agricultural Labour [†]	60.45	60.77	36.15	39.81
<i>N</i>	2369	4277	2369	4277
MASAF Wage, males ^{††}	49.06	48.82	50	50
<i>N</i>	2455	4425	2455	4425
Ratio: Predicted Wage / APAL	8.51	5.06	1.24	1.11
<i>N</i>	2369	4277	2369	4277

[†]of household member. ^{††}Hourly rates are calculated by dividing the daily rate by four as tasks typically take four hours (Chirwa, Mvula and Dulani 2004).

5.3 Robustness Checks

To verify the robustness of the labour allocation results, I carry out two additional tests. First, I examine the effect of kinship on income: patrilineal households should earn less income and, in particular, less wage income by the husband than matrilineal households. Table 10 supports this prediction.³³ Patrilineal households earn less income than matrilineal households and patrilineal husbands earn less wage income than matrilineal husbands, on average. The income gap represents approximately 32% of mean income for the entire sample. The wage earnings gap is 11% of mean income, which is consistent with the 10% gap observed for total expenditure in regression (6).

Second, I provide further evidence of the investment channel by looking at children's labour. In particular, an alternative explanation for why patrilineal men engage in more agricultural labour and less wage labour than matrilineal men is skill acquisition: they are encouraged to work on family land as children because they are expected to inherit this land when older. In contrast, there is no incentive for matrilineal boys to learn agricultural skills. According to this hypothesis, patrilineal men should have more agricultural skills and consequently a higher return to agricultural labour than matrilineal men. If this hypothesis is correct, then two effects may be observed in the

³³Both income and wages are deflated by the same price index used to deflate the consumption aggregates in the previous Section. The construction of the income aggregate follows the method of Hoddinott and Haddad (1995); see Appendix B for details. The share of wage earnings in income is lower for patrilineal than matrilineal households, while the share of ganyu earnings in income is higher for patrilineal than matrilineal households. This is consistent with the labour patterns observed in Subsection 5.1.

Table 10: Income and sons' labour supply

	(XI) Income	(XII) Wage earnings (H)	(XIII) Sons' agric. hrs.	(XIV) Sons' wage hrs.
Patrilineal	-27.830** (11.441)	-9.942*** (3.848)	0.442 (0.340)	-0.001 (0.201)
N	7161	7161	3486	3486
R^2	0.173	0.387	0.177	0.043
Mean of dependent variable	90.02	24.11	2.58	0.06
Both income and wage earnings are expressed in real terms. Controls included: Basic, Region, HH Composition, Village economy, Geography and Gender. Standard errors are reported in parentheses. ***denotes significance at 1% level, ** at 5% level and * at 10% level.				

data: first, patrilineal sons should be spending more time on agricultural work than matrilineal sons. Second, patrilineal households may be investing less in their sons' education than matrilineal households, since education is less beneficial for improving the return to agricultural work than to wage work.³⁴

To test the first effect, I estimate regressions (II) and (III) using sons' labour hours, education and age in place of husbands'. These two regressions are in Table 10; no significant effects are observed. Patrilineal sons spend no more hours than matrilineal sons on agricultural work. This provides evidence against the skill acquisition theory. The second testable implication of the skill acquisition theory, expenditure on sons' education, is tested in the next Section.

The evidence shows that matrilineal households consume significantly more than patrilineal households; at the same time, patrilineal men dedicate more of their labour to agriculture than wage work and earn less wage income. I also show that wages are higher than agricultural productivity for both types of households, on average. This suggests that while matrilineal men are deterred from investing in land, this is beneficial to the household. This is an example of 'positive' hold-up. The husband's weaker outside option increases the productivity of the household. Thus, there is evidence to support the testable implications of the theoretical framework.

6 Intra-Household Allocation

The purpose of analysing intra-household allocation is twofold: first, this can shed some light on the sharing rule in marriage, which relates to Assumption (8) in Section 2; second, an analysis of household-level consumption may not reflect consumption at the individual level, as the benefits and costs of differences in household productivity may accrue asymmetrically. If this is the case, a welfare comparison of matriliney and patriliney is not clear-cut, particularly in the case of children, whose intra-household allocation of resources may be affected by kinship.

³⁴ A caveat on this is that there is an alternative explanation for any observed effect of kinship on children's labour. Children may expect to benefit from land following divorce: for example, patrilineal sons may expect to live with fathers if divorce occurs, in which case they may have a vested interest in the value of their father's land following divorce. In this case, they may be driven by the same incentives as their fathers.

Inferring individual consumption from household consumption data is difficult; however, one can look at goods that are private by definition. Two such goods are clothing and education. The former is important for adults whereas both are important for children. I examine spending on men's, women's, boys' and girls' clothing and sons' and daughters' education, as well as total food spending. First, I present mean expenditure shares of these goods, disaggregated by kinship (Table 11). Patrilineal households allocate a significantly higher expenditure share to food and sons' education. However, from summary statistics alone, it is not possible to ascertain whether this is due to the difference in total expenditure by kinship or whether kinship has an effect on intra-household allocation over and above its effect through total expenditure.

I estimate a series of Working-Leser expenditure functions as in Equation (14) in Section 3, examining the effect of kinship on the share of expenditure devoted to the various categories of goods discussed.³⁵ Although the literature tends to use income as an instrumental variable for expenditure (e.g. Attanasio and Lechene 2010), I do not do this because of the typically low savings of households in Malawi, which imply that income and expenditure are highly correlated. As a result, income is just as endogenous as expenditure. Instead, I use the number of livestock owned and the construction material of the dwelling, which capture wealth, as instrumental variables for the logarithm of per capita real expenditure. The right-hand side variables are as in specification (6); I also include the log of household size and the log of prices of various goods as additional controls.³⁶ The results of these Two Stage Least Squares regressions are in Table 12.

The key result is that patriliney has a significant, positive effect on the expenditure share devoted to sons' education and a significant, negative effect on the share allocated to girls' clothing and women's clothing. Patrilineal households allocate an additional 0.18% of their expenditure to sons' education compared to matrilineal households. This is approximately 30% higher than the average expenditure share devoted to sons' education by matrilineal households and this result negates skills acquisition as an alternative explanation for the labour allocation results. Patrilineal households also allocate 0.15% less of their expenditure to women's clothing than matrilineal households, which is approximately 15% lower than the expenditure share of women's clothing spent by matrilineal households. Spending on girls clothing' is 0.09% lower in patrilineal households than matrilineal households. These results suggest the presence of gender bias: females are more empowered in matrilineal households and hence enjoy a larger share of household expenditure. There is no significant effect of kinship on daughters' education and sons' and men's clothing, which may be because traditions encourage spending on females in the form of clothing and spending on males in the form of other goods, such as education.

Although this analysis only focuses on a narrow group of goods, the results show that the intra-

³⁵This analysis could be improved on by estimating a full demand system, such as an Almost Ideal Demand System. However, the lack of sufficiently detailed price data prevents this (see footnote 36).

³⁶The regressions include the log of the cost of milling maize and the cost of milling rice and the log of the prices of maize grain, maize flour, rice, bread, scones, beans, cabbage, tomatoes, banana, milk, egg, chicken, fish, beef, tea, salt, sugar, oil, chips, soap, a toothbrush, toothpaste, clothes soap, vaseline, chitenje cloth, trousers, coca cola, beer, cigarettes, a watch, firewood, charcoal, paraffin, a bicycle, a mattress and a mosquito net. On average, the goods for which prices are available represent over half of total expenditure.

Table 11: Summary statistics of expenditure shares

% share	Patrilineal	Matrilineal	Dual Descent	P=M=D	P=M
Food	66.65 (0.46)	63.65 (0.36)	62.53 (1.62)	0.00	0.00
Daughters' education [†]	0.61 (0.04)	0.57 (0.04)	0.71 (0.20)	0.64	0.47
Sons' education [†]	0.78 (0.05)	0.60 (0.03)	0.69 (0.16)	0.02	0.01
Women's clothing	0.93 (0.05)	1.02 (0.04)	0.89 (0.12)	0.24	0.14
Men's clothing	0.62 (0.04)	0.60 (0.03)	0.55 (0.10)	0.80	0.71
Girls' clothing ^{††}	0.41 (0.03)	0.48 (0.03)	0.51 (0.08)	0.15	0.07
Boys' clothing ^{††}	0.47 (0.04)	0.51 (0.02)	0.52 (0.08)	0.58	0.31
<i>N</i>	2455	4425	281	7161	6880

This table reports mean (standard error). Columns 4 and 5 report p-values for the rejection of the null hypothesis. [†]Only includes households with school-age children: sample size is 1879 for patriliney, 3332 for matriliney and 227 for dual descent. ^{††}Only includes households with at least one child: sample size is 2238 for patriliney, 4076 for matriliney and 258 for dual descent.

household allocation of resources to husband and wife responds only in a small way to kinship. The resource share devoted to men’s clothing is not affected by kinship, while women enjoy slightly more consumption in matrilineal households. As durables are public goods, the only other possible sources of asymmetries in household consumption are tobacco, alcohol and food. Patriliney does not have a significant effect on the intra-household allocation of resources to alcohol and tobacco (results not reported). Therefore, any difference in consumption across spouses would have to occur through food. As this cannot be tested, the results on intra-household allocation remain indicative of the sharing rule, which does not appear to vary significantly across kinship.

These calculations can be used to estimate the impact of kinship on children, as the second motivation for conducting an analysis of intra-household allocation is to ascertain whether everyone benefits equally in matriliney. A simple way to do this is to estimate the expenditure share of a particular good that an average patrilineal household would have with an average matrilineal household’s expenditure. Denoting an average matrilineal household’s total expenditure to be X , then the amount spent on sons’ education in matrilineal households is $0.0060X$ (from Table 11). Patrilineal households have 10% lower total expenditure, on average, than matrilineal households (from regression (6)), which can be written as $0.90X$. However, sons enjoy a 0.18% higher expenditure share on their education compared to matrilineal sons, which gives a total spending on sons’ education of $(0.0060 + 0.0018) * 0.90X$. This gives a total of $0.0070X$, which is greater than the total amount spent on sons in matrilineal households. Therefore, sons lose out in matrilineal households compared to patrilineal households, on average. The increase in total expenditure is not enough to compensate them for their loss in the share of that expenditure. For girls’ clothing, both effects go in the same direction: girls benefit from both higher total expenditure and a higher share of this expenditure. Therefore, they are unambiguously better off in matrilineal households compared to patrilineal households.

The coefficients on other variables of interest indicate that the regressions in Table 11 are well-specified. For example, the share of expenditure allocated to food in regression (a) declines significantly with per capita expenditure, which is in line with Engel’s law. In contrast, the shares of expenditure accruing to clothing and education in regressions (c), (d), (e) and (g) are significantly increasing with per capita real expenditure. The effect of household composition also indicates that the regressions are well-specified. All groups but one increase food expenditure. Regressions (f) and (g) show that there is some effect of household composition on men’s and women’s clothing. The more adult and elderly women there are, the higher the share of expenditure spent on women’s clothing. There is evidence of increasing and decreasing economies of scale to household size: while there are increasing economies of scale to the purchase of food, there are decreasing economies of scale to the education and clothing of children.

Regressions (b) to (e) demonstrate that there is gender bias in how expenditure is allocated to children, beyond the impact of kinship. In regressions (b) and (c), an additional male adult reduces the percentage share of expenditure devoted to daughters’ education by 0.3% and increases the share devoted to sons’ education by 0.6%. Similarly, an additional female adult increases the

share spent on daughters' education by 0.7% and reduces the share spent on sons' education by 0.3%. These effects are almost symmetric. This pattern is also seen in the effect of elderly male and female members of the household, where additional elderly male members reduce the expenditure share on daughters' education and additional elderly female members reduce the expenditure share on sons' education. Together, these results suggest that there is a strong preference by adults for educating children of the same sex as themselves in households in Malawi. A similar result is observed in regressions (d) and (e). An additional male (female) adult is associated with 0.2% lower expenditure on girls' (boys') clothing. Thus, the gender composition of the household matters for the share of household resources that children receive.

The results demonstrate that patrilineal households spend a greater share of their expenditure on sons' education and a lower share on girls' and women's clothing. However, these goods represent only a small fraction of total expenditure, so that the actual resource share of spouses is unlikely to vary by a large amount. Men's clothing is insensitive to kinship. Sons are better off in patrilineal households, in terms of their education spending, while girls benefit from more private expenditure (clothing) in matrilineal households. Despite the benefit of matriliney in terms of productivity, sons are worse off overall, on average. The results also show that the intra-household allocation of expenditure to children is sensitive to the gender composition of the household.

Table 12: The effect of descent on intra-household allocation

	(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Food (%)	Daughters' educ (%)	Sons' educ (%)	Girls' clo (%)	Boys' clo (%)	Women's clo (%)	Men's clo (%)
Ln(pc real expend)	-13.838*** (1.118)	-0.065 (0.162)	0.384** (0.151)	0.275*** (0.094)	0.240** (0.100)	0.101 (0.128)	0.286** (0.128)
Patrilineal	-0.778 (0.755)	-0.016 (0.056)	0.178** (0.088)	-0.088* (0.047)	-0.058 (0.050)	-0.151** (0.068)	0.035 (0.054)
Ln(HH size)	-14.046*** (1.877)	1.327*** (0.334)	1.772*** (0.491)	0.972*** (0.150)	0.950*** (0.167)	-0.669*** (0.228)	-0.095 (0.204)
# dep.children (m)	0.875** (0.360)	-0.299*** (0.072)	-0.158* (0.089)	-0.205*** (0.028)	0.023 (0.032)	0.038 (0.039)	-0.001 (0.034)
# dep.children (f)	1.226*** (0.358)	-0.129* (0.067)	-0.310*** (0.092)	0.007 (0.026)	-0.213*** (0.031)	0.057 (0.041)	-0.016 (0.035)
# adults (m)	0.677* (0.387)	-0.305*** (0.061)	0.582*** (0.118)	-0.197*** (0.030)	-0.051* (0.030)	0.035 (0.044)	0.000 (0.035)
# adults (f)	1.234*** (0.443)	0.651*** (0.093)	-0.341*** (0.090)	0.009 (0.040)	-0.242*** (0.032)	0.160*** (0.049)	-0.009 (0.041)
# elderly (m)	1.990** (0.861)	-0.553*** (0.145)	0.140 (0.142)	-0.280*** (0.064)	-0.251*** (0.067)	0.206** (0.094)	0.058 (0.072)
# elderly (f)	-1.804** (0.889)	0.128 (0.117)	-0.393*** (0.138)	-0.023 (0.082)	-0.202*** (0.067)	0.126 (0.095)	0.095 (0.078)
N	7161	5438	5438	6572	6572	7161	7161

Ln(pc real expend) instrumented with number of livestock and construction material of dwelling. F-stat on excluded instrument is 163.2 in regressions (b) and (c), 186.4 in regressions (d) and (e) and 195.0 in all other regressions, with a partial R^2 of over 9% in all first-stage regressions. Regressions (b) and (c) only include households with school-age children. Regressions (d) and (e) only include households with at least one child. Controls included: Basic, Region, Village economy, Geography, Gender, # uncategorised HH members, Ln(various prices) (see footnote 36). Standard errors are reported in parentheses.

*** denotes significance at 1% level, ** at 5% level and * at 10% level.

7 Conclusion

The aim of this paper has been to estimate the impact of spouses’ outside options on productive efficiency in the household. I present an infinite-horizon theoretical model of spouses’ labour allocation decisions, which demonstrates that in an efficient setting, labour allocation and resources are independent of outside options. However, when spouses make noncooperative decisions, labour allocation and resources are sensitive to outside options as individuals invest in these outside options due to threat of divorce. Where labour opportunities are not symmetric, more inequality in outside options moves households further away from efficiency.

I provide support for the key propositions of this model using data on descent in Malawi, which is an exogenous determinant of outside options. First, I show that matrilineal households, where women have stronger rights to land, have 10% higher consumption than patrilineal households, where women have weaker rights to land. I also show that patrilineal husbands spend more time on agricultural labour and less time on wage labour than matrilineal husbands. Together with the model, these two results suggest that spouses in Malawi make noncooperative decisions and that productivity is sensitive to land rights. More generally, this result demonstrates that the size of the household ‘pie’ may not be invariant to spouses’ outside options.

The empirical results are robust to a wide variety of specifications and robustness checks. I show that the consumption results hold in alternative measures of consumption and are not explained by tribal fixed effects, colonial influence, sample choices or savings. The labour allocation results are supported in an analysis of income and sons’ labour allocation. An analysis of intra-household resource allocation shows that the benefits of greater productivity in matrilineal households may not accrue to everyone symmetrically: in particular, sons may lose out on education expenditure.

Apart from helping to empower women, improving their outside options can have positive side effects, as these results demonstrate. When spouses make noncooperative labour allocation decisions, relative outside options can determine how close households come to productive efficiency.

8 Appendices

A Land Ownership

It is important to provide evidence for the idea that men and women have different rights to land in patrilineal and matrilineal communities. This can be demonstrated using the LSMS data. I examine the plots of land that households use for farming, combining plots used for rainy and dry season cultivation. I calculate the total area of land owned solely by the husband or wife, as well as land owned jointly by the spouses and land owned by other members of the household. The means of these figures are weighted based on the sampling strategy. Table 13 shows mean landholdings disaggregated by kinship and owner. The figures show that women own significantly more land and men own significantly less land on average in matrilineal compared to patrilineal

communities. Since the total amount of land owned by households is not significantly different across these communities, this implies that women own a greater share of household land on average in matrilineal compared to patrilineal communities, while the opposite is true for men. Therefore, there is significant evidence that women have stronger rights to land following divorce when they are matrilineal, while men have stronger rights to land following divorce when they are patrilineal.

This data can be used to calculate an approximate value for λ , the share of land accruing to the husband on divorce in the model in Section 2. I calculate the share of husband's land in that land which is owned by husband or wife (excluding jointly owned land and others' land). This leads to a mean value of 0.73 ($N = 1281$) for patrilineal households and 0.52 ($N = 2867$) for matrilineal households.³⁷ This suggests that matrilineal households have a fairer distribution of land across spouses than patrilineal households, on average. Kinship provides exogenous variation in women's access to land.

Table 13: Land ownership, disaggregated by owner and kinship

	Matrilineal	Patrilineal	Dual descent	P-value P=M=D	P-value P=M
Husband's land	0.78 (0.04)	1.06 (0.07)	1.18 (0.21)	0.00	0.00
Wife's land	0.56 (0.03)	0.32 (0.04)	0.37 (0.09)	0.00	0.00
Jointly owned land	0.34 (0.04)	0.29 (0.03)	0.35 (0.07)	0.46	0.27
Others' land	0.38 (0.02)	0.46 (0.04)	0.45 (0.12)	0.19	0.07
Total land	2.06 (0.07)	2.13 (0.06)	2.34 (0.24)	0.45	0.43
N	4425	2455	281	7161	6880

This table reports mean (standard error). The unit of measurement is acres.

³⁷The reason why this value cannot be calculated for all households is because some households only report jointly owned land or land that belongs to others (often other family members) - for these types of land, it is not possible to determine whether it would accrue to the husband or wife on divorce (except through the household's kinship type).

B Variable Definitions

Tables 14 and 15 below provide details of the variables used in this paper. Geographical variables are explained in Table 16.

Table 14: Variables

Variable name	Variable type	Level	Description
Land (rainy/dry)	Continuous	Household	Amount of land owned by household (HH) in acres, separated by season of cultivation (dry/rainy)
Age	Continuous	Household	Individual's age
Highest diploma	Continuous	Household	Individual's highest achieved diploma (1=none, 2=primary,...,7=postgrad)
HH Size	Continuous	Household	Number of members of HH
South/Centre/North	Indicator	Household	= 1 if HH is in the Southern/Central/Northern region, = 0 otherwise
Patrilineal	Indicator	Village	= 1 if HH resides in a patrilineal community, = 0 otherwise
Matrilineal	Indicator	Village	= 1 if HH resides in a matrilineal community, = 0 otherwise
Dual descent	Indicator	Village	= 1 if HH resides in a community with both patrilineal and matrilineal descent, = 0 otherwise
Divorce rate	Continuous	District	% of household heads who report being divorced or separated in district
Any business/wage empl.	Indicator	Village	= 1 if any type of business/wage employment is listed as one of three main sources of village employment, = 0 otherwise
Immigration	Indicator	Village	= 1 if individuals come to village at certain times of the year to work, = 0 otherwise
Dist. to road	Continuous	Household	Household distance to nearest major road (km)
# Children/Dep.children	Continuous	Household	Number of children of any age/Dependent children aged 0-14 years, that are members of the HH
# Adults	Continuous	Household	Number of adults, aged between 15-59 years, that are members of the HH
# Elderly	Continuous	Household	Number of elderly, aged 60 years or over, that are members of the HH
Pc/eq real exp	Continuous	Household	Per capita/equivalent real expenditure

Table 15: Variables cont.

Variable name	Variable type	Level	Description
Purchased exp	Continuous	Household	Total consumption from purchases. This is a subset of total expenditure, with the value of gifts and consumption from own production omitted
Women's group exists	Indicator	Village	= 1 if a women's group in the village exists, = 0 otherwise
Semi-permanent/Traditional	Indicator	Household	= 1 if house is made of semi-permanent/traditional material, = 0 otherwise. Excluded group: permanent
Total labour (economic)	Continuous	Household	Total number of hours spent last week on agricultural, wage, ganyu, business and unpaid work
Wage labour	Continuous	Household	Total number of hours spent on wage work (not ganyu) last week
Agricultural labour	Continuous	Household	Total number of hours spent on agricultural work last week
Ganyu labour	Continuous	Household	Total number of hours spent on ganyu (agricultural work on others' farms) last week
Domestic labour	Continuous	Household	Total number of hours spent fetching water and firewood last week
Income	Continuous	Household	Total earnings of HH in past 12 months, consisting of salaries, income from crop sales, profit from business and remittances from children and others
Wage earnings	Continuous	Household	Total earnings of husband from all wage work (not ganyu) in past 12 months
Market wage	Continuous	Household	Median village wages of husbands, where at least six husbands report working. If there are fewer than six, the TA-level wage is used. Where the TA has less than six with wage information, the region-level median is used
Food/Education/Clothing (%)	Continuous	Household	Share of total HH expenditure spent on food/education/clothing

Table 16: Geographical variables

Category	Variable type	Level	Reference period	Description
Temperature	Continuous	Village	1960-1990	Average daily range: mean of max. temp.- min. temp.
Temperature	Continuous	Village	1960-1990	Temperature seasonality: standard deviation of monthly climatology
Temperature	Continuous	Village	1960-1990	Minimum temperature of coldest month
Temperature	Continuous	Village	1960-1990	Average temperature of wettest quarter
Rainfall	Continuous	Village	2008-2009, 2009-2010	Average 12-month total rainfall
Rainfall	Continuous	Village	2008-2009, 2009-2010	Average total rainfall in wettest quarter
Rainfall	Continuous	Village	2008-2009, 2009-2010	Average start of wettest quarter in dekads, from July onwards
Greenness	Continuous	District	2008-2009, 2009-2010	Total change in greenness within primary growing season,
Greenness	Continuous	District	2008-2009, 2009-2010	Onset of greenness increase in day of year, starting July 1st
Greenness	Continuous	District	2008-2009, 2009-2010	Onset of greenness decrease in day of year, starting July 1st
Soil quality	Indicator	Household	N/A	Nutrient availability: 7 categories defining extent of constraint
Soil quality	Indicator	Household	N/A	Rooting conditions: 7 categories defining extent of constraint
Soil quality	Indicator	Household	N/A	Excess salts: 7 categories defining extent of constraint

C Variable Lists

The ‘Basic’ category (included in all regressions) consists of the following variables: Land (rainy); Land (dry); Age (husband,wife); Highest diploma (husband,wife); Whether they can read English (husband,wife); Whether they can read Chichewa (husband,wife); Household size; South; Central; Year of consumption interview refers to; Year of agricultural rainy season cultivation interview refers to; Year of agricultural dry season cultivation interview refers to; Month of interview.

The ‘Household Composition’ category (added in regression (3)) includes the following variables: Whether the husband is the household head; # Children (male); # Children (female); # Adults (male); # Adults (female); # Elderly (male); # Elderly (female); # Uncategorised household members (age or gender missing).

The ‘Village Economy’ category (added in regression (4)) includes the following variables: Dist. to road; Immigration; Any business employment; Any wage employment; The proportion of HHs in village farming maize/tobacco/groundnut/cassava/mango/rice.

The ‘Geography’ category (added in regression (5)) includes all the variables in Table 16.

The ‘Gender’ category (added in regression (6)) includes the following variables: Divorce rate; Existence of women’s group.

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