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Domestic Production as a Source of Marital Power: Theory and Evidence from Malawi

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Abstract

This paper argues that wives in developing countries use domestic labour as a tool to incentivise husbands, especially when they lack power and cannot credibly threaten divorce. In Malawi, husbands often supplement farm income with wage labour. In our model, this creates moral hazard: husbands may not make sufficient effort to bring home wages. Wives use different tools to incentivise husbands. They either threaten them with divorce or alter their domestic labour. Our theory predicts that wives who would be hurt badly by divorce resort to using domestic labour as a source of power. Others, having better "outside options", use a combination of the two or only divorce threat. We confirm this prediction using survey data from Malawi. Identification is based on the fact that Malawi's kinship traditions exogenously determine outside options. Wives in patrilineal cultures (with low outside options) react to good consumption outcomes by significantly increasing domestic labour and reducing leisure, whereas matrilineal wives do not. The effect is particularly strong for patrilineal wives with no natal land inheritance. This suggests that land inheritance is a crucial determinant of the accessibility of divorce to women in Malawi.

Keywords: Intra-household allocation, domestic production, divorce, moral hazard, matriliny, Malawi.

JEL Classification: D13, D82, J12, J22.

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1   Introduction

In developing countries, women continue to specialise in domestic production in households. This specialisation has traditionally been considered a burden for women, primarily because it reduces their earnings power, which is argued to reduce their power within marriage. The question we address in this paper is whether women use their monopoly in domestic production as leverage to influence their husbands' actions in their favour, and if so, whether its usage depends on the presence of another source of empowerment, namely easy and fair divorce. We structure our model on the family institutions of Malawi, where exogenous kinship traditions imply that wives can divorce easily in some areas but not others. A theoretical model of moral hazard in marriage is derived, which predicts that women with low outside options are more likely to increase their domestic labour in response to a good consumption outcome compared to women with high outside options. This prediction is confirmed in the data.

Marriage is a type of contract, with each spouse having expectations of a set of services that their partner will provide them with in the future (Cohen, 1987). There is an inherent lack of full information in marriage, as a result of which the effort or time spent generating marital goods, such as joint earnings, may be unobservable. A wife may not know whether her husband's low salary is due to lack of effort or poor luck; the husband may have an incentive to be lazy because he has to share the benefits of his labour. This suggests there is a moral hazard problem in marriage. This problem is exacerbated in developing countries, where women's low autonomy results in less influence within marriage. Divorce may be an empowering strategy (Cohen 1971, Reniers 2003). The threat of divorce forces husbands to involve their wives in decisions and to provide for them. However, divorce can be inaccessible to women if it strips them of their marital assets and social standing. If divorce is not a credible threat, a fundamental moral hazard problem in marriage remains.

We hypothesise that wives address this problem by using domestic production as an incentive device. England and Folbre (2002) emphasise the role that marriage-specific resources such as household work and affection can play as sources of bargaining power, if they can be credibly withheld. In cultures where men have official authority over women, these sources of power are particularly important as women may hold "unassigned" power through the ability to withhold food and sexual services (Lamphere 1974, p. 99). This official authority is particularly emphasised in patrilineal, polygamous societies: Cohen's (1971) study of the Kanuri in Bornu demonstrated that control of the household sphere was the main way in which women derived control in other spheres of marital life. The key to the effectiveness of this mechanism is specialisation, which implies that a woman's labour cannot be easily

replaced.

Kinship is a further important factor affecting women's position in developing countries because it often assigns authority and influences attitudes to gender. It affects the extent to which divorce is accessible to women, which in turn determines a woman's dependence on leverage devices such as domestic production.

In this paper, we model marriage in rural Malawi, where there are two distinct kinship traditions. Kinship is determined by birth and is thus exogenous, which allows us to neatly compare the effect that different kinship rules have on behaviour. Most of Malawi is matrilineal: inheritance passes through the mother's line and matrilocality is common, where a married couple reside in the wife's natal village. The remainder of Malawi is patrilineal, where inheritance moves from father to son and patrilocality is common. Under matriliny, women's outside options are high because they own land and have the support of their kin. As a result, divorce is a credible threat. In contrast, divorce is not a credible threat under patriliny where a woman who divorces is left with no assets. We expect more use of a within-marriage source of power, domestic labour, by patrilineal than matrilineal wives.

Existing intra-household models are inadequate for developing country households in several ways. First, bargaining and cooperative intra-household models (Manser and Brown 1980, Chiappori 1988) postulate that a woman's power within marriage is solely determined by her outside option. This does not provide an adequate explanation of how women with otherwise low autonomy are able to exert control within the household. For example, Ashraf (2009) demonstrates that women often rely on communication to elicit desirable outcomes within marriage. Second, Whitehead (1985) argues that existing unilateral models of the household (Becker 1973, 1974) are inappropriate for developing country households because they ignore underlying cultural institutions. We hope to remedy these two criticisms by explicitly including a within-marriage source of power and kinship in our model.

We propose a model in which wives use a combination of domestic production and divorce threat to incentivise husbands because of a moral hazard problem. Wives observe the amount of cash a husband brings home, which is a noisy signal of how much effort he has made to contribute to the household. They respond positively to a high amount and negatively otherwise. The model is tested on wives' time use in Malawi; the results show the use of domestic production incentives in marriages where wives have low outside options: patrilineal marriages and, in particular, those marriages where the wife has no inherited land from her natal kin.

Our model includes asymmetric information, explicit incentives and domestic production. Most of the current marriage economics literature focuses on Pareto efficient outcomes (Chiappori 1988, Lundberg and Pollak 1993), which are not supported by data on productive activities (Udry 1996). This motivates asymmetric information in marriage in our model, which has already received some attention in the literature (Peters 1986, Friedberg and Stern 2010). The use of incentive mechanisms in marriage is understudied, however; one exception

is Landes (1978), who models the role of alimony as an enforcement mechanism for optimal marital investment. Domestic production as a source of power has been addressed by Pollak (2005) through its effect on the outside option rather than its use as a leverage device.

There have been several empirical studies on female empowerment in developing countries (e.g. Anderson and Eswaran 2009); however, this is to the author's best knowledge the first paper to show empirically the use of domestic production as an active incentive device. Related to the present paper, Reniers (2003) shows that divorce can be an empowering strategy in Malawi while Alfano et al (2011) observe that household-level sources of power are more important for women living in Indian states with low rather than high institutional female autonomy.

This paper offers important policy implications relating to female empowerment. Domestic specialisation can be empowering for women, especially when their autonomy is otherwise low. Accessible divorce is also empowering and may reduce the need for sources of power internal to marriage. However, there is a trade-off. The data shows that households in those regions of Malawi where divorce is accessible are poorer. This suggests that this empowerment comes at a price: the inability of women to commit not to divorce husbands may result in reduced incentives to generate household wealth. This is because the husband does not retain marital assets upon divorce, which introduces uncertainty in land tenure (Place and Otsuka 2001).

The remainder of the paper is structured as follows. The next section gives some background on Malawi relevant to the paper. The theoretical model of marriage is presented in Section 3. The empirical analysis is in Section 4. Section 5 concludes.

2   Context: Women in Malawi

2.1   An Overview of Malawi

Malawi is a land-locked country in sub-Saharan Africa with a population of close to 15 million in 2010, 80% of which resided in rural areas.[1] It is a low income country; GDP per capita at constant prices was \$184 and it ranked 153rd out of 169 countries measured in the Human Development Index in 2010. Life expectancy at birth measured 53 years in 2009. Around 90% of all employees work in the agricultural sector (Bignami-Van Assche et al 2011). Most of these are involved in smallholder production with land plots under 3 hectares (Ellis et al 2003). Due to the importance of agriculture for most of the Malawi population, labour is a key asset for household production (Phiri 1984). Most households combine farming, waged labour and small business to earn their livelihoods (Kerr 2005a). HIV/AIDS is a large problem in Malawi, with 11% of the adult population infected in 2009.

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[1] All data is from the World Bank databank (http://data.worldbank.org/country/malawi) unless stated otherwise.

The empowerment of women in Malawi is low: the pervasiveness of early marriage, forced marriage, polygyny and societal attitudes putting the man at the head of the family frequently make women subject to domestic abuse, in both its physical and psychological forms (Malawi Human Rights Commission 2006).

2.2 Agricultural Production in Malawi

2.2.1 The agricultural year

The agricultural year in Malawi begins in October with the rainy season. The rainy season lasts roughly from October until March, during which period maize is grown as the primary subsistence crop (Takane 2008, Ellis et al). The dry season lasts from April until September. During the dry season, households consume the maize they have grown and engage in other, primarily non-agricultural, income-earning opportunities (Kerr 2005b).

Short-term, off-farm labour opportunities are usually termed ganyu. Most households are unable to grow enough food to last them until the end of the next rainy season, when their stock of maize will be repleted (Kerr 2005b). Ganyu in the rainy season or seasonal ganyu occurs when households run out of food. This type of ganyu can be paid for in cash or kind, but is usually paid for with maize. Both women and men engage in seasonal ganyu. Ganyu in the dry season usually involves short-term tasks such as brick-making or vegetable gardening (Kerr 2005b). These are not in conflict with own-farm agricultural production and are not normally an indicator of food insecurity. Instead, they are used to bring additional income to the household, which can be used to purchase fertiliser and other farm inputs for the next rainy season, for example (Kerr 2005a, 2005b).

The data used in the study is for the 2003-2004 and 2005-2006 agricultural seasons, with interviews taking place during the dry season. Agricultural production in these two seasons was normal (Takane 2008, Denning et al 2009).

2.2.2 Division of labour

The division of labour in Malawi is strongly regimented by culture and tradition. The primary use of households' labour is for subsistence production. The predominant crop grown is maize, although some households grow cassava and rice as food sources (Spring 1995). The labour for maize is either shared or predominantly carried out by women (Spring 1995, Kerr 2005a, Hirschmann and Vaughan 1983). The wife is usually responsible for harvesting, storage and seed selection. Men, in contrast, share the labour in land preparation, weeding, planting and the application of fertiliser. Good health is particularly important for the ability to carry out agricultural labour (Engberg et al 1987).

Women are responsible for the domestic sphere of the household. Spring (1995) documents that women spend an equal number of hours on the farm and in domestic activities, finishing

their domestic tasks before or after farm work. Activities include childcare, cooking, cleaning and fetching water and firewood. A comparison of men and women shows that men spent much less time on domestic labour (around a third or quarter of the wife's number of hours). In addition, their domestic activity appears to primarily consist of house building and repair. Many men interviewed by Kerr (2005a) admitted this unequal gender labour divide, which is testimony to the way it is culturally entrenched.

Men are responsible for generating cash income for non-food necessities. Bignami-Van Assche et al (2011) note that men are mainly responsible for generating income to purchase items not produced by the household such as clothing, salt and soap. This takes place during the dry season (Spring 1995, Bignami-Van Assche et al 2011). Women carry out a substantial amount of waged income only when they are unmarried or their husbands do not contribute to the household. The husband's cash-generating labour is off-farm and thus unobservable from the wife's perspective.

Husbands have more leisure time than their wives, particularly in the dry season when off-farm income earning is not immediately necessary for the survival of the household (Kerr 2005a). Wives' domestic duties continue throughout the dry season, so that wives have to rise earlier than husbands to tend to domestic chores (Kerr 2005a). On the whole, Kerr (2005a) finds that most of the wives' tasks are year-round whereas the only tasks that were to any extent year-round for the husband are ganyu, going to the market and ironing. These observations suggest that during the dry season, husbands have the capacity to work more hours than they do on average but choose not to. Indeed, wives in Kerr's (2005a) study frequently talked about low labour contributions of husbands towards own-farm or off-farm production. This suggests that husbands´ cost of effort is high.

2.2.3   Cash income

The cash income that husbands earn for off-farm labour has become crucial for households. In addition to clothes and other consumption goods, wages are often used to purchase fertiliser and other farm inputs (Kerr 2005a). Cash needs to come from off-farm labour because households are usually unable to produce enough crop to meet both subsistence and sales needs. Hirschmann and Vaughan (1983) note that the most prosperous households in their study were those with sufficient land for food production but also with substantial income from husbands working for wages. Spring (1995) also notes that households are becoming increasingly reliant on husbands bringing in income from outside opportunities.

Husbands' earnings are uncertain from the perspective of wives. This may be because employers renegotiate agreed wages in the face of agricultural shocks such as low yields (Takane 2008) or because wives do not know the earnings of the husband, giving husbands scope to conceal the true amount. In 42% of households studied by Kerr (2005a), wives did not know their husband's income. Often, husbands would not contribute their cash and

would instead spend it on consumption goods such as alcohol, which was a growing problem in the region. There is a moral hazard problem: because husbands' cash-generating labour is unobservable to wives and husbands have to share their income, they have an incentive to put in less than the optimal level of effort from the perspective of the household.

2.3   Intra-Household Relations

2.3.1   Kinship: Patriliny and matriliny in Malawi

A crucial factor that affects the rules by which household members in Malawi act is kinship. This is determined by the tribe a person is born into and is thus exogenous to any behavioural decisions. Tribes are either patrilineal or matrilineal. The distinction is a function of many intricate rules that govern marriage, residence, custody over children and inheritance (Kerr 2005a). Traditionally, matrilineal systems of descent involve inheritance through the mother's side and the mother gains custody of children as well as assets in divorce. Matrilocality is common, where the husband moves to the wife's village after marriage. Matrilocality implies that a husband is removed from his primary source of power: his kin (Reniers 2003). Should the couple divorce, the husband leaves the wife's village with nothing: local narratives say that the man "leaves with [nothing but] his blanket" (Reniers 2003, p. 180). This puts a matrilocal husband in a very uncertain position.

Patrilineal systems are based on descent through the father's side and patrilocality is common, where the wife moves to the husband's village after marriage. The possible loss of child custody for the wife following a patrilineal divorce presents an emotional cost as well as the possible removal of old-age support (Reniers 2003). However, the rules of each kinship system are not always strictly upheld. Matrilineal couples may end up settling down patrilocally. It is less common for patrilineal couples to reside matrilocally. A wife may stand to inherit from her natal kin, regardless of her kinship. Generally, however, patrilineal couples are more likely to marry patrilocally and the wife is less likely to inherit land from her natal kin. The opposite is true for matrilineal couples.

Under patriliny, wives' outside options are low. As a result, the incentives to divorce are limited. The desperation of wives in the patrilineal regions of Malawi to assume any kind of control within marriage is well-documented by Kerr (2005a). The wives interviewed often claimed husbands were "harsh" and not ready to share more of their cash income with the household. Although the cash income was inadequate, they felt that they had no power to change the situation. Sometimes the husbands also took wives' cash income from the sale of crops. Excessive usage of alcohol was also observed in the community studied by Kerr (2005a), which affected the ability of husbands to provide labour and was a cost on scarce resources. Alcohol was the most frequently cited cause for marital conflict. The case of one husband is documented, whose wife stopped cooking for him due to his excessive drinking; this is an example of the type of behaviour we are exploring in this paper.

In contrast, women in matrilineal families in southern and central Malawi have high outside options, as a result of which husbands are often more supportive. Safilios-Rothschild (1982) describes the strong kinship support offered to women in matrilineal communities, which leads to strong female autonomy, frequently accompanied by a lack of marital stability. Anthropologists acknowledge that marital ties are weaker in matrilineal societies (Peters 1997), potentially because the bond between a matrilineal sister and her brother is stronger and more loyal than the bond between the sister and her husband. Indeed, district-level divorce rates were 7% in matrilineal communities in 2011 compared to 5% in patrilineal communities (Telalagić 2012). Husbands need to work hard to avoid divorce: while the matrilineal husband is seen by his wife's kin as a "work-horse," he may gain the respect of the family and community if he is hard-working (Phiri 1983, p. 260). Since divorced women lose any cash support from their husbands, they will only divorce if this support is inadequate.

There are nine main ethnic divisions or tribes (Spring 1995). The matrilineal tribes are the Chewa, Nyanja, Mang'anja, Lomwe, Tonga and Yao. The patrilineal tribes include the Ngonde, Ngoni, and Tumbuka. In addition, the less common Senga and Sena are patrilineal.

3   Model of Moral Hazard in Marriage

We model marriage in Malawi as a sequential investment game, where the husband and wife take turns in generating a marital good. The husband generates cash, which is synonymous with a rivalrous consumption good, while the wife produces a domestic good. In a general model of marriage, this would be repeated an indefinite number of times. However, we focus on the specific two-period interaction. We consider the role that domestic production may play as an incentive device, as well as the role of divorce threat. We show that the use of domestic production is more likely when the wife's outside option is low. We derive two solutions to the model: one where the wife relies on divorce threat in addition to domestic production and another where only domestic production is used because divorce is not desirable or accessible. These represent a matrilineal and patrilineal marriage respectively. Since the choice between the two mechanisms is primarily a function of the outside option represented by divorce, the optimal choice of mechanism may also be affected by marital residence and whether the wife has inherited any land from her natal kin. In the empirical section we explore the effect of these two additional channels on the usage of domestic production as leverage.

There are two periods, $t = 1, 2$. Each spouse is given a fixed amount of time that they allocate between labour and leisure. They move sequentially. In the first period, the husband works and generates income that is used to purchase a consumption good; the consumption good is shared between the two spouses according to an exogenous sharing rule. We assume that all of the husband's income is spent on the consumption good so that we can measure his contribution in terms of the amount of consumption good provided. The good can be clothing,

for example, or inputs needed for farming, both of which are purchased with husband's cash income in Malawi. In the second period, the wife supplies labour towards the provision of a domestic, public good. This labour includes tasks such as cleaning and cooking. Note that we exclude childcare and other domestic activities that may not be credibly withheld, such as fetching water. Following the wife's domestic production, the couple remain married or divorce. This is decided by the wife and determines a continuation payoff in addition to the payoffs derived from the stage game. Both domestic production and whether to divorce are determined optimally by the wife at the beginning of the marriage, prior to the realisation of any efforts or outcomes. The power to divorce is assumed to lie only with the wife; this is because we are focusing on the sources of power that a woman may rely on. Allowing husbands to divorce would not add significant insight into the wife's decision, since the wife's optimal mechanism always ensures the husband prefers to remain married.

In the first period the husband's effort (amount of time allocated to economic labour) is not observable. This is justified by the fact that it is off-farm labour. For simplicity we assume that the husband has two effort choices: low (e^L) and high (e^H). Provision of the consumption good is stochastic: it can either be good (C^G) or bad (C^B). This realisation can be influenced by the husband's effort with the following probabilities:

$$
\begin{aligned}
pr(C^G|e^H) &= q, \\
pr(C^G|e^L) &= p,
\end{aligned}
$$

where $q > p$. The husband can improve the chances of realising a good level of the consumption good by putting in high effort.

In the second period the wife chooses an effort level conditional on the outcome she observes: $l = l^G|C = C^G, l = l^B|C = C^B, l \in [0, T]$, where T is her available time, net of farm labour. The production function of the public good is $z(l)$. After she produces the domestic good, the couple may divorce. We assume that following a good outcome, the wife always wishes to remain married. Following a bad outcome, she may want to divorce. Both domestic labour and the marriage/divorce decision are chosen strategically to ensure the husband puts in the high level of effort.

The incentives are not simple. By reducing her effort, the wife punishes herself by reducing her own consumption of the public good. As a result, she may produce less of the public good than she would like to. We expect to observe situations where her marginal utility of labour supply is positive: she would like to work more but is prevented by the incentives of the contract. This is different to standard moral hazard models (Arrow 1970), where the principal's utility is strictly decreasing in his payment to the agent. In addition, the use of divorce threat can be detrimental to the wife because her continuation payoff under divorce

may be low. As a result, she may not always want to rely on divorce to generate incentives.

Note that we abstract away the issue of own-farm agricultural labour; we assume this is fixed and determined outside the model. The couple decide how to allocate the remainder of their time. Own-farm labour is assumed to be observable because both spouses engage in agricultural labour and have access to the household's plot of land. Weather shocks may occur but are observable to both spouses. Further, agricultural labour involves a fixed set of tasks that need to be performed each year; if they are not performed, insufficient food is produced and the household may starve. As a result, it seems plausible that individual preferences with regard to leisure will not be factored into the labour required for agriculture. We will verify empirically that agricultural labour decisions are made independently of outcomes.

Utility in the stage game is simply the sum of utility in each period, with no discounting. The wife's von-Neumann Morgenstern utility consists of her benefit from the consumption and public goods under outcome k, $\upsilon(C^k, z(l^k)) = u^k, k = G, B$ less her cost of effort $\gamma(l^k) = \Gamma^k$. The husband's benefit under outcome k is $\varpi(C^k, z(l^k)) = v^k$ and his cost of effort is $\psi(e^j) = \Psi^j, j = H, L$. The husband's pre-marital utility, namely if he did not marry in the first place, is denoted by V with a specific level $\hat{V}$. Lifetime utility is the sum of utility in the stage game and a continuation payoff that represents the expected utility from remaining married or being divorced. If the wife decides to remain married following a bad outcome, the respective continuation payoffs of the husband and wife are V^M and U^M. If the wife decides to divorce following a bad outcome, the continuation payoffs are V^D and U^D. We assume that $U^M > U^D$ and $V^M > V^D$: all other things equal, both spouses prefer to remain married rather than divorce. This is a reasonable assumption, as otherwise at least one spouse would always wish to dissolve the marriage.

3.1   The General Solution

In this section we derive the general solution. The wife maximises her expected utility conditional on high effort by the husband, subject to the incentive and participation constraints. This maximisation is carried out with respect to the two levels of domestic labour, l^G and l^B, that she will supply if she observes C^G or C^B respectively. In addition, she decides whether to remain married or divorce following a bad outcome. The wife solves the following program:

$$\max_{l^G, l^B, U^*, V^*} q(\upsilon(C^G, z(l^G)) - \gamma(l^G) + U^M) + (1-q)(\upsilon(C^B, z(l^B)) - \gamma(l^B) + U^*)$$

$$s.t. :$$

$$(q-p)(\varpi(C^G, z(l^G)) + V^M - \varpi(C^B, z(l^B)) - V^*) \geq \psi(e^H) - \psi(e^L),$$

$$q(\varpi(C^G, z(l^G)) + V^M) + (1-q)(\varpi(C^B, z(l^B)) + V^*) - \psi(e^H) \geq \hat{V},$$

$$U^* \in \{U^M, U^D\},$$

$$V^* \in \{V^M, V^D\}.$$

We solve the problem in two stages. First, we find the optimal labour supplies in two cases: one where $U^* = U^M$, which we denote the domestic production mechanism and one where $U^* = U^D$, which we denote the divorce threat mechanism. Second, we analyse the optimal choice of U^*, which is determined by the wife's expected utility from the consumption and public goods as well as her utility in the divorce state.

3.1.1 The domestic production mechanism

In the domestic production mechanism, $U^* = U^M$ and consequently $V^* = V^M$. The solution is derived in Appendix A; the most important results are detailed here. The two first order conditions with respect to the wife's domestic labour levels can be rewritten as

$$\frac{\partial \upsilon(C^G, z(l^G))}{\partial z(l^G)} \frac{\partial z(l^G)}{\partial l^G} - \frac{\partial \gamma(l^G)}{\partial l^G} = (-\lambda \frac{(q-p)}{q} - \mu) \frac{\partial \varpi(C^G, z(l^G))}{\partial z(l^G)} \frac{\partial z(l^G)}{\partial l^G},$$

$$\frac{\partial \upsilon(C^B, z(l^B))}{\partial z(l^B)} \frac{\partial z(l^B)}{\partial l^B} - \frac{\partial \gamma(l^B)}{\partial l^B} = (\lambda \frac{(q-p)}{(1-q)} - \mu) \frac{\partial \varpi(C^B, z(l^B))}{\partial z(l^B)} \frac{\partial z(l^B)}{\partial l^B}.$$

In order to make predictions about l^{G*} and l^{B*}, we need to ascertain whether the constraints bind. In order to check the Kuhn-Tucker conditions determining whether the constraints are binding, we can solve the first-order conditions simultaneously for $\lambda^* = \lambda(l^{G*}, l^{B*})$ and $\mu^* = \mu(l^{G*}, l^{B*})$ (see Appendix A). These two equations in combination with the two inequality constraints and four Kuhn-Tucker conditions on λ^* and μ^* give us four equations and four inequalities, whose simultaneous solution determines four quantities: $l^{G*}, l^{B*}, \lambda^*, \mu^*$. The solution takes one of four possible cases. The cases represent the different permutations of which, if any, of the two inequality constraints bind. For the constraints to be binding, the multipliers must be positive at $l^G = l^{G*}, l^B = l^{B*}$.

We would expect the participation constraint to bind when the husband's outside option is high. The incentive constraint is expected to bind when the difference between the costs of

high and low effort is large or when the probability of the good outcome under high effort is substantially larger than the same probability under low effort. Heterogeneity across couples is likely to be driven by the size of the outside option $(\hat{V})$, as well as the extent of uncertainty (q, p), labour-leisure preferences that determine the benefit functions and heterogeneity in the costs of effort (Γ, Ψ). These are all exogenous to the model.

The first two cases that we will examine have a slack incentive constraint: they are the first best solutions to the problem. The husband definitely invests the high level of effort and the wife does not need to give him any rent to achieve this. This may be the case if there is complete information, for example. Under complete information, effort is both observable and verifiable. Alternatively, the husband's cost of effort is not high. As a result, the principal induces effort subject to a participation constraint only. These two cases can be considered as benchmark scenarios; they differ only in the size of the husband's outside option.

In the first case, the husband's outside option is low and the participation constraint does not bind; in the second case, it is high and the participation constraint binds. The reason why the participation constraint does not always bind is that when the husband's outside option is low, the wife's individually optimal effort yields the husband a higher utility than his outside option. As a result, bringing him down to his outside option by reducing her labour supply would be suboptimal from the wife's perspective.

We denote the first case, when the participation and incentive constraints do not bind, as the first best. Here, $\mu^* = \lambda^* = 0$: both constraints are slack. The optimality conditions for the first best are given below; we have two equations in two unknowns (l^G, l^B):

$$
\begin{align}
\frac{\partial u^G}{\partial l^G} &= \frac{\partial \Gamma^G}{\partial l^G}, \tag{1} \\
\frac{\partial u^B}{\partial l^B} &= \frac{\partial \Gamma^B}{\partial l^B}, \tag{2} \\
qv^G + (1-q)v^B &> \hat{V} - V^M + \Psi^H, \\
(q-p)(v^G - v^B) &> \Psi^H - \Psi^L.
\end{align}
$$

These conditions are intuitive: the wife's marginal utility of additional domestic labour must equal zero in both states. The husband receives $V > \hat{V}$. The second case, when the participation constraint does bind, is the constrained first best case. In this case, $\mu^* > 0$, $\lambda^* = 0$. The optimality conditions are

$$\frac{\partial u^G}{\partial l^G} - \frac{\partial \Gamma^G}{\partial l^G} \;=\; -\mu \frac{\partial v^G}{\partial l^G}, \tag{3}$$

$$\frac{\partial u^B}{\partial l^B} - \frac{\partial \Gamma^B}{\partial l^B} \;=\; -\mu \frac{\partial v^B}{\partial l^B}, \tag{4}$$

$$q v^G + (1-q) v^B \;=\; \hat{V} - V^M + \Psi^H, \tag{5}$$

$$(q-p)(v^G - v^B) \;>\; \Psi^H - \Psi^L.$$

In each state, the wife equates the difference between her marginal benefit and marginal cost from domestic labour with the husband's marginal benefit from her labour, normalised by the shadow price μ. Since the latter is always negative, it must be that the wife's marginal cost exceeds her marginal benefit: she works more than she would like to following both outcomes. The husband's preferences matter: she works proportional to the size of μ and to the husband's benefit from her labour. He receives $V = \hat{V}$.

The other two cases involve an incentive constraint that binds: the wife needs to give the husband some rent in order to induce a high effort level. They are necessarily second best because they involve the transfer of rent from wife to husband, which is inefficient. We denote the third case as the second best with low $\hat{V}$ while the fourth case is the second best with high $\hat{V}$.

The second best with low $\hat{V}$ requires $\mu^* = 0, \lambda^* > 0$. This case implies that while the wife needs to incentivise the husband to put in high effort, his utility at the high effort level exceeds his outside option. The first-order conditions are

$$q\left(\frac{\partial u^G}{\partial l^G} - \frac{\partial \Gamma^G}{\partial l^G}\right) \;=\; -\lambda(q-p)\frac{\partial v^G}{\partial l^G}, \tag{6}$$

$$(1-q)\left(\frac{\partial u^B}{\partial l^B} - \frac{\partial \Gamma^B}{\partial l^B}\right) \;=\; \lambda(q-p)\frac{\partial v^B}{\partial l^B}, \tag{7}$$

$$(q-p)(v^G - v^B) \;=\; \Psi^H - \Psi^L, \tag{8}$$

$$q v^G + (1-q) v^B \;>\; \hat{V} - V^M + \Psi^H.$$

The right-hand side of condition (6) is negative; this implies that in the good state, the wife's marginal cost exceeds her marginal benefit: she overworks. In the bad state, her marginal cost is lower than her marginal benefit: she underworks. This is relative to her individual optimum, where she would set her marginal benefit equal to her marginal cost.

The second best with high $\hat{V}$ is arguably the most interesting: it is when both constraints bind. This requires $\mu^* > 0$ and $\lambda^* > 0$. The first-order conditions are

$$q\left(\frac{\partial u^G}{\partial l^G} - \frac{\partial \Gamma^G}{\partial l^G}\right) = -(\lambda(q-p) + \mu q)\frac{\partial v^G}{\partial l^G}, \tag{9}$$

$$(1-q)\left(\frac{\partial u^B}{\partial l^B} - \frac{\partial \Gamma^B}{\partial l^B}\right) = (\lambda(q-p) - \mu(1-q))\frac{\partial v^B}{\partial l^B}, \tag{10}$$

$$qv^G + (1-q)v^B = \hat{V} - V^M + \Psi^H, \tag{11}$$

$$(q-p)(v^G - v^B) = \Psi^H - \Psi^L. \tag{12}$$

Condition (9) implies that at the optimum, the wife's marginal utility in the good state from domestic labour is negative: she overworks. In contrast, the marginal utility from domestic labour in the bad state is ambiguous: it can be positive, negative or zero. The "overwork" in the good state is proportional to μq and $\lambda(q-p)$. The former is the shadow price on the participation constraint, which is proportional to the husband's outside option. The latter measures the difficulty in incentives; λ is the shadow price on the incentive constraint. The higher are either of these, the more the wife has to overwork. In the bad state, the wife will work more if the husband's outside option is larger but less if stronger incentives are needed. Thus, a larger λ and $q-p$ increase l^G and reduce l^B. This is intuitive: the wife has to reward the husband more in the good state and punish him more severely in the bad state in order to satisfy the incentive requirements.

When both constraints bind, we have four equations in four unknowns $(l^{G*}, l^{B*}, \lambda^*, \mu^*)$. Solving the two constraints for v^G and v^B tells us that both utilities are proportional to the outside option and depend on the cost of both efforts:

$$v^G = \hat{V} - V^M + \frac{1-p}{q-p}\Psi^H - \frac{1-q}{q-p}\Psi^L,$$

$$v^B = \hat{V} - V^M - \frac{p}{q-p}\Psi^H + \frac{q}{q-p}\Psi^L.$$

Importantly, can we deduce from these equations the relative sizes of l^G and l^B? The following lemma shows that under a simple assumption, the wife's domestic labour will be larger following a good outcome.

Lemma 1 *If the consumption good and the public good enter utility independently, $l^{G*} > l^{B*}$ when the incentive constraint binds.*

Proof. In Appendix B. ■

We can obtain some idea of the comparative statics of the wife's optimal labour supply in the second best with high $\hat{V}$ by totally differentiating the two binding constraints with

Parameter	$\frac{\partial l^{G*}}{\partial \cdot}$	$\frac{\partial l^{B*}}{\partial \cdot}$
$\hat{V} - V^M$	$+$	$+$
κ	$+$	$-$
θ	$-$	$+$

Table 1: Comparative statics of general solution under the second best

respect to the outside option and other parameters. In particular, we derive the effects of the difference between Ψ^H and Ψ^L as well as q and p by defining κ such that $\Psi^H = \Psi^L(1 + \kappa)$ and θ such that $q = p(1 + \theta)$. The comparative statics are given in Table 1.

These effects are true at the general level whenever we are in the second best with high $\hat{V}$. If the mark-up of the high cost of effort over low cost of effort increases, the wife's labour supply in the good state increases while the labour supply in the bad state decreases. This increases risk and strengthens the incentives for the husband; this is necessary as he is more reluctant to invest the high effort. The husband's outside option increases both of the wife's efforts. She has to compensate him more in each state, otherwise he will leave the marriage. When the difference in the probability of a high outcome under high and low effort increases, the wife compensates the husband less. This is because the larger difference between probability of success in the two states helps to generate incentives of its own, so weaker labour incentives are needed.

3.1.2   The divorce threat mechanism

In this section we consider the optimal labour supplies of the wife when she chooses to divorce upon observing a bad outcome: $U^* = U^D$ and consequently $V^* = V^D$. Similar to the domestic production mechanism, the solution has four cases, depending on which constraints bind. Since the labour supplies are not dependent on the continuation payoffs, the marginal conditions will be the same for both mechanisms. However, the constraints are different. As a result, the solutions will be different for those cases where at least one constraint binds. This occurs in all but the first best. We report only the binding constraints here. In the constrained first best, the participation constraint is satisfied with equality:

$$qv^G + (1 - q)v^B = \hat{V} - qV^M - (1 - q)V^D + \Psi^H.$$

In the second best with low $\hat{V}$, the incentive constraint is satisfied with equality:

$$(q - p)(v^G - v^B) = \Psi^H - \Psi^L - (q - p)(V^M - V^D).$$

15

In the second best with high $\hat{V}$, both constraints bind:

$$
\begin{aligned}
qv^G + (1-q)v^B &= \hat{V} - qV^M - (1-q)V^D + \Psi^H, \\
(q-p)(v^G - v^B) &= \Psi^H - \Psi^L - (q-p)(V^M - V^D).
\end{aligned}
$$

Solving these two constraints for v^G and v^B gives us

$$
\begin{aligned}
v^G &= \hat{V} - V^M + \frac{1-p}{q-p}\Psi^H - \frac{1-q}{q-p}\Psi^L, \\
v^B &= \hat{V} - V^D - \frac{p}{q-p}\Psi^H + \frac{q}{q-p}\Psi^L.
\end{aligned}
$$

Similar to the domestic production mechanism, the husband's utilities in each state depend linearly on the outside option and the costs of effort. The comparative statics of the second best with high $\hat{V}$ are the same as in the domestic production mechanism, apart from the fact that V^M only affects l^G while V^D only affects l^B. This is because the utility in the bad state only depends on the continuation payoff of divorce, while the utility in the good state only depends on the continuation payoff of marriage.

It may be that divorce threat is a strong enough mechanism such that no labour incentives are required. As a result, we are in the first best and both constraints are slack. The wife sets her marginal benefit of labour equal to the marginal cost and divorces the husband if a low outcome is observed. If Lemma 1 holds, this implies $l^{G*} = l^{B*}$. This can occur if V^M is very high and V^D and $\hat{V}$ are very low, which implies a situation where the husband's utility under divorce is much lower than his utility under marriage. In addition, he always prefers to be married, such that any labour supply exceeds his pre-marital outside option $\hat{V}$. This is intuitive: the threat of divorce is enough to make him work hard in marriage, without the need for the wife to use any domestic production incentives. Such a situation sounds extreme but it may not be far from the truth of matrilineal marriages. As the anthropological evidence shows, matrilineal husbands need to work hard or they are quickly replaced. This suggests that divorce threat may be a strong enough mechanism to induce high effort.

3.1.3 A comparison of the two mechanisms

In the divorce threat mechanism, the wife has to provide less stringent incentives via labour because threat of divorce acts as an additional incentive device. However, the participation constraint is more difficult to satisfy because the husband's expected continuation payoff is lower. As a result, when examined purely from the domestic labour perspective, the choice

of the wife between the divorce threat and domestic production mechanisms is ambiguous. The most transparent way of seeing this is to compare the two constraints under the two mechanisms. In the divorce threat mechanism, the constraints are

$$
\begin{aligned}
qv^G + (1-q)v^B &\geq \hat{V} - qV^M - (1-q)V^D + \Psi^H, \\
(q-p)(v^G - v^B) &\geq \Psi^H - \Psi^L - (q-p)(V^M - V^D).
\end{aligned}
$$

In constrast, in the domestic production mechanism the constraints are

$$
\begin{aligned}
qv^G + (1-q)v^B &\geq \hat{V} - V^M + \Psi^H, \\
(q-p)(v^G - v^B) &\geq \Psi^H - \Psi^L.
\end{aligned}
$$

The right-hand side of the incentive constraint is smaller under the divorce threat mechanism. The incentive constraint is increasing in v^G and decreasing in v^B. A more lenient incentive constraint implies a smaller difference between these two, which implies a smaller difference between l^{G*} and l^{B*}. With no constraints, the wife's first best choice is to set $l^{G*} = l^{B*}$. Based on this criterion, the wife prefers the divorce threat mechanism to the domestic production mechanism.

However, the right-hand side of the participation constraint is larger under the divorce threat mechanism. The participation constraint is increasing in v^G and v^B, which are in turn increasing in l^G and l^B respectively. Since a more stringent participation constraint implies higher v^G and v^B, we conclude that the l^{G*} and l^{B*} required to satisfy the participation constraint in the divorce threat mechanism are higher. This makes the wife worse off because a binding participation constraint implies l^{G*} and l^{B*} that are larger than her first best.

In addition to this analysis, we can compare the four solutions. Ceteris paribus, a given set of parameters would imply that while an incentive constraint may bind under domestic production, it would not bind under divorce threat. In contrast, a non-binding participation constraint under domestic production is likely to bind when divorce threat is used. This implies that we are more likely to have a binding participation constraint under the divorce threat mechanism, while the incentive constraint is more likely to bind under the domestic production mechanism. This reinforces the idea that the *difference* between l^{G*} and l^{B*} is likely to be larger under the domestic production mechanism, while the levels of l^{G*} and l^{B*} are likely to be larger under the divorce threat mechanism. We make this point more clearly in Section 3.2.

These comparisons ignore the effect of the continuation payoffs: although the labour supplies may be closer to the wife's first best under the divorce threat mechanism, there is

17

the negative effect of the continuation payoff under divorce, which is worse than remaining married. The trade-off between domestic production levels and expected continuation payoff determines the optimal choice of U^*.

3.1.4 The optimal choice of U^*

Having derived optimality conditions for l^{G*} and l^{B*} in each case under each mechanism, we can determine the optimal choice of U^*, which is effectively an optimal choice between the two mechanisms. U^* is chosen by evaluating the wife's expected utility. Assuming all parameters are constant, she will choose to rely on the divorce threat mechanism rather than the domestic production mechanism when

$$
\begin{aligned}
\bar{U}^D &= q(v(C^G, z(l^{G*,D})) - \gamma(l^{G*,D}) + U^M) + (1-q)(v(C^B, z(l^{B*,D})) - \gamma(l^{B*,D}) + U^D) \\
&> q(v(C^G, z(l^{G*,M})) - \gamma(l^{G*,M}) + U^M) + (1-q)(v(C^B, z(l^{B*,M})) - \gamma(l^B) + U^M) = \bar{U}^M \\
&\Leftrightarrow U^D > U^M - \frac{1}{1-q}(q(u^{G,D} - u^{G,M}) + (1-q)(u^{B,D} - u^{B,M})),
\end{aligned}
\tag{13}
$$

where $\bar{U}^D$ is her expected utility under the divorce threat mechanism and $\bar{U}^M$ is her expected utility under the domestic production mechanism. This inequality is clearly increasing in the continuation payoff from divorce: the better is a wife's outside option, the more likely she is to incentivise via a combination of domestic production and divorce, rather than only domestic production. This is because in the divorce threat mechanism, there is a positive probability that she will end up divorced. As a result, her payoff in this state must be high enough. This inequality is also more likely to be satisfied when the domestic production levels are more to the liking of the wife in the divorce threat mechanism. However, the relative sizes of $u^{G,D}$ compared to $u^{G,M}$ and $u^{B,D}$ compared to $u^{B,M}$ are ambiguous.

3.1.5 Commitment

It is important to explain why we expect the wife to commit to any contracted action, whether it is divorce or a certain labour level. After all, within-marriage contracts are not binding. After the husband invests high effort and the outcome is realised, the wife has an incentive to deviate and choose her individually-optimal action. We believe that the repeated game argument justifies the wife's commitment in the domestic production mechanism. In particular, the game we have analysed above happens repeatedly. In Malawi we believe it happens every agricultural year, for example. The wife commits to her actions because a loss of reputation from deviation would be too costly. This is especially the case for women with low outside options as the expected length of marriage is long. As a result, the benefit from

Case	l^{G*}	l^{B*}	$\Delta l^M - \Delta l^D$
First best	$l^{G*,M} = l^{G*,D}$	$l^{B*,M} = l^{B*,D}$	$= 0$
Constrained first best	$l^{G*,M} < l^{G*,D}$	$l^{B*,M} < l^{B*,D}$	$= 0$
Second best with low $\hat{V}$	$l^{G*,M} > l^{G*,D}$	$l^{B*,M} < l^{B*,D}$	> 0
Second best with high $\hat{V}$	$l^{G*,M} = l^{G*,D}$	$l^{B*,M} < l^{B*,D}$	> 0

Table 2: A comparison of the wife's labour supplies under the two mechanisms

deviation is likely to be less than its lifetime cost. In the case of commitment to divorce, we call upon a "more fish in the sea" argument. Upon the realisation of a bad outcome, the wife interprets this as a signal of the husband's ability. She knows that because her outside option is high, she can remarry easily. She evaluates that it is better to remarry and take her chances on a new spouse, rather than remain with her current spouse. This is in line with the anthropological evidence on Malawi, where remarriage rates are high, especially in matrilineal areas.

3.2 The Mechanisms with Quasi-Linear Utility

Although testable implications can be drawn from the general case, we present the solution to the problem when utility is quasi-linear for clarity. In particular, we assume that utility is linear in the two goods but the cost of effort is convex. The full solution can be found in Appendix C. We summarise the relationships between labour supplies in the two mechanisms in Table 2.

The important observation to note from this table is that while the sizes of the labour supplies vary in both directions across the four cases, the difference between the labour supplies in the two states in the second best is strictly lower in the divorce threat mechanism (D) compared to the domestic production mechanism (M).

Using the first-order conditions and the fact that certain constraints must bind in each solution, we derive inequalities on the size of each labour supply relative to the first best, l^{FB}, as well as the difference between labour supply under the low and high outcomes; they are shown in Table 3. These hold for both mechanisms. In the constrained first best, both labour supplies rise proportionally to the husband's outside option. In the second best with low $\hat{V}$, the labour supplies in each state are no longer equal. They are distributed around the first best labour supply, with the labour in the bad state lower than the first best and the labour in the good state higher than the first best. The predictions in the second best with high $\hat{V}$ are less conclusive. It could be that both labour supplies are higher than the first best; all we know is that their expected value is higher. This is because of the binding participation constraint: on average, the husband needs to get more than in the first best because his outside option is higher than his utility under the first best labour supplies.

Case	$l^{G*} \sim l^{FB}$	$l^{B*} \sim l^{FB}$	$l^G - l^B$
First best	l^{FB}	l^{FB}	$= 0$
Constrained first best	$> l^{FB}$	$> l^{FB}$	$= 0$
Second best with low $\hat{V}$	$> l^{FB}$	$< l^{FB}$	> 0
Second best with high $\hat{V}$	$ql^{G*} + (1-q)l^{B*} > l^{FB}$		> 0

Table 3: Properties of the wife's optimal labour supply with quasi-linear utility

Finally, we note that just as in the general case, the inequality that determines the optimal choice of U^* becomes more likely to be satisfied as U^D increases. The effect of domestic production levels is ambiguous.

4   Empirical Analysis

4.1   Identification

The question we aim to answer is whether wives use domestic production as an incentive mechanism. Inequality (13) suggests that wives use this mechanism when their outside option is low. Otherwise, they rely on divorce threat to induce high effort by the husband. To represent the wife's outside option, we rely on the distinction between matriliny and patriliny in Malawi. Evidence suggests that matrilineal wives have higher outside options than patrilineal wives. As a result, we expect to observe the use of the domestic production mechanism in patrilineal marriages and the divorce threat mechanism in matrilineal marriages. We also examine two related characteristics that are particularly likely to influence a wife's outside option: residence upon marriage, which determines asset division on divorce, and whether the wife has inherited any land from her natal kin. Marital residence and inheritance are effectively subsets of lineage: within all matrilineal marriages, for example, there are some that are patrilocal with no inheritance, some that are matrilocal with no inheritance, and so on. We examine whether marital location or inheritance is a more important determinant of the use of domestic labour.

We observed that under either mechanism, a binding incentive constraint implies that $l^{G*} > l^{B*}$, as long as Lemma 1 holds. We will assume that this is the case and justify it with our chosen variables in the next section. The distinction between patriliny and matriliny implies, from the results of our model, that the difference between l^{G*} and l^{B*} will be larger for patrilineal wives.[2] This observation gives us two key hypotheses that we will test. First, that $l^{G*} > l^{B*}$ for patrilineal wives, and second, that $l^{G*} - l^{B*}$ is larger for patrilineal than

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[2]It is reasonable to assume a binding incentive constraint since the anthropological evidence on Malawi suggests that husband's spend fewer hours working than their wives would like them to. Therefore, we assume that couples are in the second best. The testable implications of the second best with low $\hat{V}$ and high $\hat{V}$ are qualitatively the same.

matrilineal wives. In words, the labour supply response to a change in outcome is nonzero for patrilineal wives and larger than for matrilineal wives.

We formulate a linear regression equation based on the results of the model with quasi-linear utility. Although the testable implications of the quasi-linear model are the same as those of the general model, the quasi-linear model suggests a linear form for the wife's labour supply. The model is static but hypothesised to repeat several times over the course of marriage. We carry out a first-difference analysis over two periods. This allows us to examine the *change* in labour in response to a *change* in outcome, which removes the need to measure time-invariant factors that affect time use. It also ties in more readily with our hypotheses. We rely on the size of the wife's consumption good (denoted W) to identify the domestic production mechanism. By deriving the change in labour supply (Δl), we can derive the direction of the effect of $\Delta W = W_t - W_{t-1}$. This effect is positive under the domestic production mechanism and larger than the effect under the divorce threat mechanism, which may be zero if divorce threat is strong enough. We effectively estimate two separate regressions for matrilineal and patrilineal couples within the same equation using interaction dummies. The following equation gives the precise form. We estimate the regression for patrilineal couples as the baseline case; M is a dummy variable that is equal to one if the couple is matrilineal[3] and zero otherwise. $\mathbf{X}$ is a vector of control variables:

$$\Delta l = \alpha + \alpha_M M + \beta \Delta W + \beta_M M^* \Delta W + \theta \Delta \mathbf{X} + \theta_M M^* \Delta \mathbf{X} + \varepsilon. \tag{14}$$

The key implications of the model we wish to test are

$$\beta > 0, \tag{15}$$
$$\beta + \beta_M < \beta. \tag{16}$$

The first inequality implies that patrilineal wives respond positively with their domestic labour to increased spending. The second inequality implies that this effect is smaller for matrilineal wives than patrilineal wives.

In order to properly identify the divorce threat mechanism, we would need to examine those couples who divorce in matrilineal marriages. We would expect to observe divorce to be negatively correlated with W. However, the data does not allow us to do this because most of the couples who divorce leave the sample and the data does not separate divorce as a cause of attrition from other factors such as migration and death. As a result, we interpret the matrilineal marriage as the baseline scenario, with the patrilineal marriage a special case of that, namely when divorce is not accessible.

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[3]Most of the married couples in our sample are of the same lineage. A small proportion are mixed lineage; for those, we use the lineage of the wife.

The variables we use are as follows. For the wife's domestic labour, we use the number of hours the wife spent on domestic activities (cooking, cleaning and doing laundry) during the previous regular working day. For W, we use the amount of money spent on the wife's clothing, fabric for clothing and shoes in the past three months. We use W rather than the proportion of total clothes spending because evidence suggests that wives do not know the husband's realised income. As a result, the wife is likely to respond to how much she receives rather than what proportion of total income she speculates she received. Clothes are clearly a private, assignable good. Cooking and cleaning almost certainly enter the utility function separately from clothes spending so that Lemma 1 holds; however, some interaction may result between laundry and clothes purchases. Robustness regressions (not reported), however, show that there is no relationship between clothes spending and laundry. As a result, we keep doing laundry in the domestic labour category.

Possible endogeneity of clothes spending is partly remedied by the first difference approach; any omitted variables that might affect clothes spending and domestic labour, such as bargaining power, are not a problem provided they do not vary across time. Bargaining power is unlikely to vary in this context because spouses receive land from their families when they marry and are unlikely to receive any more assets in their lifetimes. Households largely consume what they earn, being at the subsistence level of consumption, so that we do not expect any changes in savings, which is typically a source of bargaining power.

The control variables include husband's clothes spending, land, which represents $\hat{V}$, the average clothes spending of wives in the village (to control for income-earning opportunities) and other controls including health, household size and total number of hours reported in the survey. Note that the cost of effort is an unobservable, omitted variable that affects Δl. Since it is an inherent characteristic of the husband, we assume it is uncorrelated with our explanatory variables.

The husband's outside option is represented by total land owned by the household; however, this is only accurate for marriages where the husband keeps the land upon divorce, which is the case in most patrilineal marriages. However, it has been difficult to find an appropriate variable for the husband's outside option in a matrilineal marriage, as divorce only leaves him with his innate ability to earn or re-marry, which is difficult to measure. Further details of all variables are given in Appendix D.

There may be plausible alternative stories that explain our results; in order to show their robustness and fit with the model, we carry out three alternative robsutness checks: we examine the impact of clothes spending on leisure and other time use categories, we look at an alternative measure of cash income (spending on seeds) and we examine respondents' viewpoints on divorce and domestic violence.

4.2 Data

The data comes from The Malawi Diffusion and Ideational Change Project, conducted by the University of Pennsylvania in partnership with the College of Medicine and Kamuzu College of Nursing in Malawi. The project seeks to examine the role of social interaction under changing personal conditions, with a focus on HIV/AIDS and family planning. Although not constructed to represent the national population, characteristics of the sample are close to those observed in the rural sample of the Malawi Demographic and Health Survey. A roughly equal number of people were interviewed in the three regions of Rumphi (patrilineal), Balaka (matrilineal) and Mchinji (patrilineal and matrilineal). The sample consists of ever-married women between the ages of 15-49 in each district and their husbands. The surveys include questions on members of the household, economic status, time use and marriage and divorce, among other topics. We use the 2004 and 2006 survey waves; after reducing the sample to those households interviewed in both years and with responses to our variables of interest, we end up with 338 households.

Sample attrition between the two waves does not exhibit strong patterns. When comparing those who leave the sample after 2004 with those who do not, few differences in basic characteristics are found. Attrition is more likely in southern Balaka compared to northern Rumphi, which implies that we have more patrilineal, patrilocal and no-inheritance marriages in our panel. This is not a problem, however, because we estimate separate regressions for the different groups.

Those who remain in the sample but report being divorced, separated or having a new spouse are small in number but similar on basic characteristics. Men who divorce or remarry tend to be poorer. We do observe differences in lineage and spending among those who divorce or remarry, however, which lends support to our hypothesis of divorce threat. Divorce or remarriage are more likely to be observed in matrilineal marriages (71% are matrilineal as opposed to 63% of those who remain married), matrilocal marriages (65% of divorced are matrilocal marriages as opposed to 32% of those who are still married) and inheritance marriages (63% of those divorced have inheritance from their natal kin, as opposed to 41% in the married sample). These observations lend support to the idea that divorce is significantly more common in matrilineal marriages. In addition, clothes and seeds spending are lower on average in 2004 for those who divorced or remarried after. This provides evidence of poor marital outcomes being correlated with higher divorce rates.

Once we restrict our sample to those individuals interereviewed in both years, we further restrict the data to those wives that were interviewed in roughly the same month in both years, to avoid confounding factors due to the change in labour usage across the agricultural year. We exclude two groups of marriages: polygamous marriages and marriages where the husband is not permanently resident in the village. This is because both of these are likely to have non-standard family interactions.

4.3 Results

4.3.1 Descriptive statistics

Some characteristics of our sample are shown in Table 4. We focus on differences across lineage, as this is an exogenous variable. In terms of basic characteristics, education is higher in patrilineal marriages, both for wife and husband. This is because the patrilineal north has a more developed education system, the legacy of Protestant missionaries in colonial times (Reniers 2003). The regional differences are obvious; while 57% of matrilineal marriages are in Balaka, only 1% are in Rumphi. Land ownership also exhibits differences we expect: women own more land in matrilineal than patrilineal marriages, which confirms that their outside options are higher. In contrast, men own more land in patrilineal marriages. Matrilineal marriages tend to be poorer on average, with lower average spending for nearly all categories. This observation is in keeping with the literature, which suggests that matriliny may be to the detriment of families, where the weak nature of the marriage results in poverty because husbands, as the primary cash-earners, are not in control of household decisions (Place and Otsuka 2001).

Patrilocality and inheritance show clear patters by lineage. While 88% of all patrilineal marriages are patrilocal, only 50% of matrilineal marriages are. This suggests that matrilineal couples have some flexibility in location upon marriage, whereas patrilineal couples do not. Only 14% of women in patrilineal marriages have inherited land from their natal kin, in contrast to 61% of women in matrilineal unions. There is a strong correlation between patriliny, patrilocality and lack of inheritance. This suggests that we will observe similar results for marriages with these characteristics. Clothes spending increases slightly from 2004 to 2006. marriages.

Next, we analyse the division of labour[4] (see Table 5). There are clear differences between husbands and wives in both years. We confirm that wives specialise in domestic labour: they spend around 4 hours per day on it while husbands spend around 10 minutes. In contrast, husbands spend more time on economic labour. The leisure time is about the same on average. This division of labour is similar across all marriage types, although matrilineal wives spend more time on economic activities than their patrilineal counterparts.

4.3.2 Regression results

We now turn to the main results of the paper. We regress the change in domestic labour on the change in clothes spending, initially only using lineage to measure outside option. We then control for marital residence and inheritance separately to examine the effect of these two additional channels. One possible alternative explanation of our results is that greater clothes spending is correlated with being better off, which results in a reduced need for farm labour

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[4]See Appendix D for the activities included in each category.

	Matrilineal		Patrilineal		All	
	Women	Men	Women	Men	Women	Men
Age	36.66	44.31	35.59	42.47	36.23	43.57
	(10.14)	(12.39)	(9.75)	(11.41)	(9.99)	(12.02)
Secondary School Educated (%)	0.01	0.09	0.10	0.27	0.04	0.16
	(0.07)	(0.28)	(0.30)	(0.44)	(0.21)	(0.37)
Rumphi (%)	0.01		0.83		0.34	
	(0.07)		(0.38)		(0.47)	
Mchinji (%)	0.42		0.12		0.30	
	(0.49)		(0.32)		(0.46)	
Balaka (%)	0.57		0.06		0.36	
	(0.50)		(0.23)		(0.48)	
Land (acres)	1.71	3.27	0.81	5.49	1.34	4.18
	(2.50)	(5.39)	(1.47)	(18.33)	(2.18)	(12.46)
Poor (2004,%)	0.17		0.09		0.14	
	(0.38)		(0.28)		(0.35)	
Poor (2006,%)	0.06		0.01		0.04	
	(0.24)		(0.12)		(0.20)	
Patrilocal (%)	0.50		0.88		0.65	
	(0.50)		(0.33)		(0.48)	
No inheritance (%)	0.39		0.86		0.58	
	(0.49)		(0.35)		(0.49)	
Clothes '04 ('000 MWK)	0.31	0.91	0.73	1.13	0.48	1.00
	(0.56)	(5.51)	(1.61)	(2.32)	(1.13)	(4.49)
Clothes '06 ('000 MWK)	0.80	1.15	0.79	1.07	0.80	1.11
	(1.20)	(1.55)	(1.46)	(1.75)	(1.31)	(1.63)
Seeds '04 ('000 MWK)	0.02		0.08		0.05	
	(0.08)		(0.55)		(0.36)	
Seeds '06 ('000 MWK)	0.07		0.11		0.09	
	(0.34)		(0.36)		(0.35)	
N	200		138		338	

Table 4: Sample characteristics by lineage

	Matrilineal		Patrilineal		All	
	Women	Men	Women	Men	Women	Men
2004						
Domestic	3.83	0.19	3.93	0.11	3.87	0.16
	(1.90)	(0.61)	(1.63)	(0.46)	(1.79)	(0.55)
Leisure	12.16	13.03	12.08	14.55	12.13	13.65
	(3.37)	(3.88)	(2.77)	(3.88)	(3.13)	(3.95)
Economic	2.46	6.59	1.99	4.62	2.27	5.79
	(2.99)	(4.35)	(2.66)	(4.07)	(2.86)	(4.34)
Other	5.05	3.83	5.78	4.62	5.35	4.15
	(2.58)	(3.41)	(2.88)	(3.52)	(2.73)	(3.47)
2006						
Domestic	4.28	0.29	3.48	0.10	3.95	0.21
	(1.92)	(0.81)	(1.77)	(0.39)	(1.90)	(0.68)
Leisure	11.56	12.73	11.04	11.93	11.35	12.40
	(2.75)	(2.84)	(1.95)	(2.78)	(2.46)	(2.84)
Economic	2.67	6.04	3.88	6.54	3.17	6.25
	(2.98)	(3.87)	(3.45)	(4.05)	(3.23)	(3.94)
Other	5.47	4.70	5.07	4.34	5.30	4.55
	(2.63)	(3.30)	(2.90)	(3.60)	(2.74)	(3.43)
N	200		138		338	

Table 5: Time use by gender and lineage

Group[5]	(1) Domestic	(2) Leisure	(3) Economic	(4) Other
Patrilineal $= \hat{\beta}$	0.159**	−0.292**	−0.162	0.296*
Matrilineal $= \hat{\beta} + \hat{\beta}_M$	0.053*	−0.004*	0.081	−0.130

Table 6: Total coefficients on clothes spending, controlling for lineage

Group[5]	(5) Domestic	(6) Leisure	(7) Economic	(8) Other
Patrilineal-Patrilocal	0.195***	−0.288**	−0.200	0.292*
Matrilineal-Patrilocal	0.090**	0.185*	−0.314	0.038
Matrilineal-Matrilocal	0.007***	−0.345*	0.617**	−0.278
Patrilineal-Matrilocal	−0.910***	−0.393**	0.933	0.370

Table 7: Total coefficients on clothes spending, controlling for lineage and marital residence

and thus an increase in domestic labour. We falsify this hypothesis by regressing leisure and economic labour on our outcome variables and showing that the increase in domestic labour in response to more clothes spending comes from leisure, rather than economic labour. Since leisure is also a good, this indicates a conscious decision to increase domestic production. Tables 6, 7 and 8 report the coefficients on the main wife's clothes spending variable for the categories of lineage, residence and inheritance. However, full regression results can be found in Appendix E.

Regression (1) shows the results for domestic labour when we only differentiate by lineage. We confirm our hypothesis that patrilineal wives use domestic labour as an incentive device: an additional 1000 MWK ($3.71) spent on their clothing results in about ten more minutes of housework per day. The hypothesis that matrilineal wives respond less strongly is also confirmed: their marginal increase per 1000 MWK is only 3 minutes. Regressions (2) and (3) show that there is a clear substitution for both groups from leisure into domestic production, with the coefficients on spending similar but of opposite sign for domestic production and leisure. There is no effect on economic labour and only a slight effect on the Other category for patrilineal wives. This confirms that what we are observing is an incentive device, rather than an income effect.

The effect of land is interesting. Land is highly significant: an increase in total land owned results in an increase in public labour and a reduction in leisure. This effect is not differentiated by lineage. For patrilineal couples, this suggests that an increase in the husband's outside option reduces a wife's leisure due to her reduced bargaining power. For matrilineal couples, the effect may be that increased land often implies increased household size, as a result of which wives may have to spend more time on domestic tasks.

Next, we disaggregate these results by marital residence and inheritance. Regressions

---

[5]For those effects involving a sum of the coefficients on several variables, significance corresponds to an F-statistic on the joint significance of all summed coefficients.

Group[5]	(9) Domestic	(10) Leisure	(11) Economic	(12) Other
Patrilineal-No inheritance	0.209***	−0.286**	−0.214	0.290
Matrilineal-No inheritance	0.104***	−0.085	−0.233	0.214
Matrilineal-Inheritance	0.024**	0.037	0.297	−0.358
Patrilineal-Inheritance	−0.408***	−0.246*	0.398	0.257

Table 8: Total coefficients on clothes spending, controlling for lineage and land inheritance of wife

(5)-(8) demonstrate the results when we control for marital residence. The marriage types are ordered in terms of the ability of a woman to divorce: women are least able to divorce in patrilineal-patrilocal marriages and most able to divorce in matrilineal-matrilocal marriages, with matrilineal-patrilocal marriages falling somewhere inbetween. Patrilineal-matrilocal marriages are rare and unusual in Malawi; we report the result but do not discuss it. The results confirm our hypothesis that patrilineal-patrilocal wives respond to spending in a positive and highly significant way: for an additional 1000 MWK of spending, they increase their dometic labour by slightly under 12 minutes. The coefficient is larger than for the whole group of patrilineal wives in Regression (1), which suggests that patrilocality reduces the accessibility of divorce for patrilineal wives even further. In contrast, for matrilineal-matrilocal wives who are the most empowered group with the most accessible divorce, this effect is almost zero and considerably smaller than the effect for the whole matrilineal category in Regression (1). The strength of the incentive mechanism for matrilineal-patrilocal marriages lies between patrilineal-patrilocal and matrilineal-matrilocal marriages. This is in line with our theory, as this is also the way we would order these marriages in terms of accessibility of divorce.

Turning to Regressions (6) and (7), we confirm the robustness of our results for patrilineal-patrilocal and matrilineal-matrilocal wives. For the former, there is a clear substitution from leisure in domestic production. For the latter, there is a strong negative effect on leisure and a strong positive effect on economic labour, suggesting the presence of an income rather than substitution effect: their own spending is highly correlated with their own hours of income-earning labour. We conclude that patrilineal-patrilocal wives respond more strongly than all patrilineal wives, while matrilineal-matrilocal wives respond less strongly than all matrilineal wives. This confirms that patrilocality reduces a wife's outside option and, conversely, that matrilocality increases it.

We also examine the implications of women owning land that they have inherited from their natal kin. The reason why this is important is because if divorce were to occur, the woman would keep this land. This makes divorce more accessible for these women and is arguably a more important determinant of outside option than marital residence. Table 8 orders the marriages in terms of accessibility of divorce, with divorce being least accessible to patrilineal-no inheritance wives and most accessible to matrilineal-inheritance wives. The

results confirm that the extent to which women increase their domestic labour in response to spending is correlated with the accessibility of divorce. Regression (9) demonstrates a highly significant, positive response of domestic labour to spending for patrilineal-no inheritance wives, who work an additional 12 minutes more per day in the home when they receive an additional 1000 MWK of clothes spending. This is larger than the effect for all patrilineal wives in Regression (1) and larger than the effect for patrilineal-patrilocal wives, suggesting that no inheritance makes divorce even less accessible than patrilocality. The effect for matrilineal-no inheritance wives is also positive and significant, although slightly smaller. The effect for matrilineal-inheritance wives is smaller still. This confirms that land inheritance is a crucial determinant of a wife's outside option.

The robustness of these results is confirmed by regressions (10) and (11). Again, we observe a clear substitution from leisure into domestic production for patrilineal-no inheritance wives. We observe a similar substitution for matrilineal-no inheritance wives, although the coefficient is not significant. For matrilineal-inheritance wives, the most empowered group, the effect is close to zero for all categories.

These results confirm both of the hypotheses of our model: first, that the domestic production mechanism exists, and second, that there is more reliance on it in marriages where wives have a low outside option. The latter hypothesis is confirmed in a very apparent way, with highly significant and positive coefficients on spending for low outside option marriages and coefficients close to zero or negative for high outside option marriages. A more detailed analysis of further determinants of a woman's outside option demonstrates that land inheritance is the crucial factor that increases a woman's outside option in Malawi. For women with no inheritance, the effect of spending on domestic labour is positive and significant, regardless of lineage. A slightly smaller effect is observed for patrilineal-patrilocal marriages, with the smallest but still positive and significant effect for all patrilineal marriages. The regressions on other time use categories show a clear substitution away from leisure into domestic production for women with low outside options.

Our results have several implications. Matriliny and its various components are sources of empowerment for women. They do not have to rely on inefficient sources of power within marriage, such as domestic production, to encourage their husbands to work hard. In contrast, women in non-empowered marriages are not able to divorce if their husband does not provide them with what they need. Instead, they are faced with little leverage power aside from their role in the domestic sphere. This echoes what has been heavily discussed in the policy world, namely that making divorce easy and fair is a key pathway towards improving female autonomy. However, as we observed in our descriptive statistics, this comes at a price. The unstable marriages of the south are poorer than the stable marriages of the north, which has been attributed to the lack of security of husbands in that region as well as the role of the wife as the decision-maker but not the cash-earner. Therefore, empowerment via divorce should proceed with caution: women need to be provided with income-earning opportunities

Group[5]	(13) Domestic	(14) Domestic	(15) Domestic
Patrilineal	0.300**		
Matrilineal	−0.230*		
Patrilineal-Patrilocal		0.293**	
Matrilineal-Patrilocal		−0.170*	
Matrilineal-Matrilocal		−1.552	
Patrilineal-Matrilocal		8.393**	
Patrilineal-No inheritance			−1.378
Matrilineal-No inheritance			−2.069
Matrilineal-Inheritance			1.535
Patrilineal-Inheritance			0.311*

Table 9: Total coefficients on seeds spending, controlling for lineage, marital residence and land inheritance of wife

in addition to decision-making power, as our data shows that decision-making power when the husband is the income earner is more likely to result in lower wealth than when the husband is in charge of both aspects of the household.

4.4 Additional Robustness Analysis

4.4.1 Alternative measure of spending

To provide further support for our model, we use an alternative measure of the size of the consumption good, namely seeds spending. Table 9 reports the coefficients on the main spending variable; the full regression results are in Appendix E. They are qualitatively similar to the results observed for clothes spending. Regression (13) shows the effect of seeds spending on the domestic labour of patrilineal and matrilineal wives. The effect on patrilineal wives is statistically significant and large: an additional 1000 MWK spent on seeds results in 20 minutes of additional domestic labour per day. The effect for matrilineal wives is slightly negative, again suggesting an income rather than substitution effect. Both coefficients confirm our two hypotheses: patrilineal wives use domestic production as an incentive device while matrilineal wives less so. When we control for marital residence in Regression (14), we observe that the effect is still strong for patrilineal-patrilocal wives. However, the coefficient is roughly the same as in Regression (13), suggesting that marital residence does not have an additional effect on outside option and thus domestic labour when we consider farm inputs. Interestingly, the effect of inheritance in Regression (15) is not significant. This suggests that for farm spending, it is lineage and residence of marriage that are the crucial determinants of the response of domestic labour. A likely reason why the results are not entirely in line with

Is it acceptable for a woman to leave her husband if he...				
	Doesn't Provide?		Is Violent?	
	Men	Women	Men	Women
Patrilineal-Patrilocal	22.5%***	15.8%***	73.3%**	81.7%
Matrilineal-Patrilocal	53.5%***	48.5%***	81.6%	82.8%
Matrilineal-Matrilocal	55.4%***	57.0%***	82.2%	90.0%*
Patrilineal-Matrilocal	29.4%	29.4%	88.2%	88.2%

Answers from 2006 survey. * denotes significantly different from other groups at 10% level, ** at 5% level and *** at 1% level.

Table 10: Attitudes to divorce relating to a husband's financial provision and violence

the previous results is that seeds spending has a production component, which may result in an additional channel through which spending and labour are linked.

4.4.2 Attitudes to divorce and violence

An examination of attitudes towards divorce can help substantiate some of the assumptions that drive our results. In particular, we assumed that matrilineal-matrilocal women are more able to divorce than patrilineal-patrilocal women. This is the reason why the former do not need to rely on within-marriage sources of power as much as the latter. We can substantiate this by examining attitudes to divorce in the face of husbands who do not provide financial support for women and their children. In particular, husbands and wives were asked whether it is acceptable for a woman to divorce her husband if he does not provide for her or her children financially. The mean values of responses by lineage and marital residence are given in columns 1 and 2 of Table 10. Two observations can be made from this data. First, both men and women agree that, across the descent groups, there is a varying degree of acceptance of women divorcing men who do not provide. Second, this justification for divorce is most acceptable among matrilineal-matrilocal women, is lower for matrilineal-patrilocal women and is lowest for patrilineal-patrilocal women. This supports the assumption that the threat of divorce by women is more credible in matrilineal-matrilocal marriages than in patrilineal-patrilocal marriages.

The second concern that may arise from our assumptions is the possibility of domestic violence by men as retaliation to women who underprovide domestic labour. This would be manifested in more accepting attitudes towards violence in marriages where we observe the use of domestic labour as a source of power. Respondents were asked whether it was acceptable for a woman to leave her husband if he beats her often. If a woman can leave her husband in the face of beating, he would be unable to resort to domestic violence to counteract her use of the domestic labour mechanism. The responses are shown in columns 3 and 4 of Table 10. There are only small differences in attitudes towards violence across descent

groups. Although patrilineal-patrilocal men have a more accepting attitude towards domestic violence, this attitude is not shared by their wives, who feel just as able to divorce their violent husbands as women in other groups. The difference between them and matrilineal-matrilocal women is only significant at the 10% level. This indicates that women have similar attitudes to husbands' violence across the descent groups and would respond similarly. Therefore, it is unlikely that men can counteract the use of the domestic production mechanism with violence.

5   Conclusion

The objective of this paper has been to explore how and whether domestic production is used by wives as a source of power within marriage. We have presented a two-stage, sequential moral hazard model of marriage in Malawi where the husband provides a rivalrous consumption good and the wife provides a public good. The wife may divorce the husband following a bad level of the consumption good. The existence of divorce threat acts as an additional source of incentives to encourage the husband to invest high effort. We have shown that when a wife's utility under divorce is low and she never wants to divorce, the use of domestic production incentives is more stringent than when divorce is accessible. This has led us to hypothesise that in Malawi, patrilineal wives' domestic labour supply exhibits a positive response to spending on their own clothes and that this response is stronger than that of matrilineal wives.

By examining the effect of wives' clothes and shoes spending on their domestic time use, the two hypotheses of our model have been confirmed in all regressions. It has been shown that wives use domestic labour as an incentive device more stringently in those marriages where their outside option is low. Patrilineal wives increase their domestic labour by 10 minutes per day when they received an additional 1000 MWK on clothes spending. Patrilineal wives who are also patrilocal exhibit an even stronger effect, with the strongest effect for patrilineal wives with no land inheritance (12 minutes). The effect is always stronger for patrilineal compared to matrilineal wives, indicating that matrilineal wives do not need to incentivise husbands as much. We explain this by the existence of credible divorce threat in matrilineal communities. The robustness of the results is confirmed by regressions on other time use variables which show a clear substitution between leisure and domestic production for patrilineal wives. In addition, we show similar results for an alternative spending category, seeds. We also show through questions on attitudes to divorce that divorce is more accessible to women in matrilineal communities and that the acceptability of domestic violence is similar across descent groups, suggesting that domestic violence is unlikely to be used by patrilineal men to counteract the domestic production mechanism.

The results imply that when divorce is not accessible, women rely on domestic production as leverage within marriage. On the other hand, when divorce is accessible, this leverage de-

vice is less needed. Since using domestic production as leverage results in second best levels of domestic labour, we conclude that the accessibility of divorce should be encouraged in policy. By "accessible", we mean both easy but also fair in the sense that the woman is financially secure following divorce. However, there is a trade-off to this empowerment. Since the expected proportion of assets the husband keeps upon divorce falls and the divorce probability rises, he has reduced incentives to generate household wealth. This may, counterintuitively, make women worse off on balance.

A   General Solution to the Problem

The Lagrange function for the wife's maximisation problem is

$$
\begin{aligned}
L \; = \; & q(v(C^G, z(l^G)) - \gamma(l^G) + U^M) + (1 - q)(v(C^B, z(l^B)) - \gamma(l^B) + U^*) \\
& + \lambda((q - p)(\varpi(C^G, z(l^G)) + V^M - \varpi(C^B, z(l^B)) - V^*) - \psi(e^H) + \psi(e^L)) \\
& + \mu(q(\varpi(C^G, z(l^G)) + V^M) + (1 - q)(\varpi(C^B, z(l^B)) + V^*) - \psi(e^H) - \hat{V})
\end{aligned}
$$

The Kuhn-Tucker conditions of this program are

$$
\begin{aligned}
q\left(\frac{\partial u^G}{\partial l^G} - \frac{\partial \Gamma^G}{\partial l^G}\right) + (\lambda(q - p) + \mu q)\frac{\partial v^G}{\partial l^G} &= 0, \\
(1 - q)\left(\frac{\partial u^B}{\partial l^B} - \frac{\partial \Gamma^B}{\partial l^B}\right) + (\lambda(p - q) + \mu(1 - q))\frac{\partial v^B}{\partial l^B} &= 0, \\
(q - p)(v^G + V^M - v^B - V^*) + \Psi^L - \Psi^H &\geq 0, \\
q(v^G + V^M) + (1 - q)(v^B + V^*) - \Psi^H - \hat{V} &\geq 0, \\
\lambda, \mu &\geq 0, \\
\lambda\frac{\partial L}{\partial \lambda}, \mu\frac{\partial L}{\partial \mu} &= 0.
\end{aligned}
$$

The validity of these first-order conditions depends on whether they satisfy the conditions of the Kuhn-Tucker approach. Assuming these conditions are satisfied, the Kuhn-Tucker conditions are necessary and sufficient for a maximum. This implies that as long as we find an allocation that satisfies *all* of the above conditions, it is the optimal allocation of the maximisation program. The optimal values of the multipliers are

$$\mu(l^G, l^B) = -\left(q\frac{\frac{\partial u^G}{\partial l^G} - \frac{\partial \Gamma^G}{\partial l^G}}{\frac{\partial v^G}{\partial l^G}} + (1-q)\frac{\frac{\partial u^B}{\partial l^B} - \frac{\partial \Gamma^B}{\partial l^B}}{\frac{\partial v^B}{\partial l^B}}\right),$$

$$\lambda(l^G, l^B) = \frac{q(1-q)}{q-p}\left(\frac{\frac{\partial u^B}{\partial l^B} - \frac{\partial \Gamma^B}{\partial l^B}}{\frac{\partial v^B}{\partial l^B}} - \frac{\frac{\partial u^G}{\partial l^G} - \frac{\partial \Gamma^G}{\partial l^G}}{\frac{\partial v^G}{\partial l^G}}\right).$$

For a constraint to bind, the optimal value of the multiplier on that constraint must be positive at the optimal choice of l^{G*} and l^{B*}. There are four possible scenarios: where both constraints bind, where only the participation constraint or incentive constraint binds and where neither constraint binds. These cases are discussed in the main body of the text.

B   Proof of Lemma 1

Lemma 1 states that:

> If the consumption good and the public good enter utility independently, $l^{G*} > l^{B*}$ when the incentive constraint binds.

Proof. We know that the incentive constraint will bind if the wife's first best levels of labour supply lead the incentive constraint not to be satisfied: $\varpi(C^G, z(\tilde{l}^G)) - \varpi(C^B, z(\tilde{l}^B)) < \frac{1}{q-p}(\Psi^H - \Psi^L)$, where $(\tilde{l}^G, \tilde{l}^B)$ are the first best labour supply levels. As long as $\tilde{l}^G = \tilde{l}^B$, it must be the case that $l^{G*} > l^{B*}$ is required to satisfy the incentive constraint. The wife's first best labour supplies solve the following first-order conditions:

$$\frac{\partial v(C^G, z(\tilde{l}^G))}{\partial z(\tilde{l}^G)}\frac{\partial z(\tilde{l}^G)}{\partial \tilde{l}^G} = \frac{\partial \gamma(\tilde{l}^G)}{\partial \tilde{l}^G},$$

$$\frac{\partial v(C^B, z(\tilde{l}^B))}{\partial z(\tilde{l}^B)}\frac{\partial z(\tilde{l}^B)}{\partial \tilde{l}^B} = \frac{\partial \gamma(\tilde{l}^B)}{\partial \tilde{l}^B}.$$

It is clear that $\tilde{l}^G = \tilde{l}^B$ as long as $\frac{\partial v(C^G, z(\tilde{l}^G))}{\partial z(\tilde{l}^G)} = \frac{\partial v(C^B, z(\tilde{l}^B))}{\partial z(\tilde{l}^B)}$. This, in turn, will be true as long as

$$\frac{\partial v(C, z(\tilde{l}))}{\partial z(\tilde{l})\partial C} = 0.$$

This will be the case if the consumption good and domestic good enter the wife's utility independently. Intuitively, this implies that the consumption good should not affect the productivity of domestic labour or the utility derived from the domestic good. If this is the case, $\tilde{l}^G = \tilde{l}^B$, which implies that a binding incentive constraint will require $l^{G*} > l^{B*}$.

34

Note that in the constrained first best, we require this condition to hold for both the husband and the wife. The wife's optimality conditions are

$$
\begin{aligned}
\frac{\partial \upsilon(C^G, z(l^G))}{\partial z(l^G)} \frac{\partial z(l^G)}{\partial l^G} - \frac{\partial \gamma(l^G)}{\partial l^G} &= -\mu \frac{\partial \varpi(C^G, z(l^G))}{\partial z(l^G)} \frac{\partial z(l^G)}{\partial l^G}, \\
\frac{\partial \upsilon(C^B, z(l^B))}{\partial z(l^B)} \frac{\partial z(l^B)}{\partial l^B} - \frac{\partial \gamma(l^B)}{\partial l^B} &= -\mu \frac{\partial \varpi(C^B, z(l^B))}{\partial z(l^B)} \frac{\partial z(l^B)}{\partial l^B}.
\end{aligned}
$$

Here, domestic production in the two states will be equal if the consumption and public goods are independent in both $\upsilon(\cdot)$ and $\varpi(\cdot)$. ∎

C The Model with Quasi-Linear Utility

The consumption good is shared according to an exogenous sharing rule, such that $W^j + H^j = C^j, j = G, B, W^G > W^B, H^G > H^B$, where W^j is the amount the wife receives and H^j is the amount the husband receives. The utilities and costs of effort are

$$
\begin{aligned}
\upsilon(C^j, z(l^j)) &= \alpha_w W^j + \beta_w l^j, \\
\gamma(l^j) &= \frac{l^{j2}}{2}, \\
\varpi(C^j, z(l^j)) &= \alpha_h H^j + \beta_h l^j, \\
\psi(e^k) &= \frac{e^{k2}}{2}.
\end{aligned}
$$

In the first best under both mechanisms, the wife sets her marginal benefit equal to her marginal cost:

$$
l^{G*} = l^{B*} = \beta_w.
$$

In the constrained first best, optimal labour supplies in the domestic production mechanism are

$$
l^{G*,M} = l^{B*,M} = \frac{1}{\beta_h}(\Psi^H + \hat{V} - V^M - q\alpha_h H^G - (1-q)\alpha_h H^B),
$$

while the same labour supplies in the divorce threat mechanism are

$$l^{G*,D} = l^{B*,D} = \frac{1}{\beta_h}(\Psi^H + \hat{V} - qV^M - (1-q)V^D - q\alpha_h H^G - (1-q)\alpha_h H^B)$$

$$> l^{G*,M} = l^{B*,M}.$$

As discussed in the general case, the wife's labour supplies in the constrained first best of the divorce threat mechanism are higher because the participation constraint is more difficult to satisfy. In the second best with low $\hat{V}$, the labour supplies of the domestic production mechanism are

$$l^{G*,M} = \frac{1}{\beta_h}(1 + \frac{\alpha_h}{2}(H^B - H^G) + \frac{1}{2(q-p)}(\Psi^H - \Psi^L)),$$

$$l^{B*,M} = \frac{1}{\beta_h}(1 + \frac{\alpha_h}{2}(H^G - H^B) - \frac{1}{2(q-p)}(\Psi^H - \Psi^L).$$

Under the divorce threat mechanism, the labour supplies are

$$l^{G*,D} = \frac{1}{\beta_h}(1 + \frac{\alpha_h}{2}(H^B - H^G) + \frac{1}{2(q-p)}(\Psi^H - \Psi^L) - \frac{1}{2}(V^M - V^D)) < l^{G*,M},$$

$$l^{B*,D} = \frac{1}{\beta_h}(1 + \frac{\alpha_h}{2}(H^G - H^B) - \frac{1}{2(q-p)}(\Psi^H - \Psi^L) + \frac{1}{2}(V^M - V^D)) > l^{B*,M}.$$

The difference between the labour supplies is *smaller* under divorce threat. Last, the second best case with high $\hat{V}$ has the following optimal labour supplies when the wife uses the domestic production mechanism:

$$l^{G*,M} = \frac{1}{\beta_h}(\hat{V} - V^M - \alpha_h H^G + \frac{1-p}{q-p}\Psi^H - \frac{1-q}{q-p}\Psi^L),$$

$$l^{B*,M} = \frac{1}{\beta_h}(\hat{V} - V^M - \alpha_h H^B - \frac{p}{q-p}\Psi^H + \frac{q}{q-p}\Psi^L).$$

Under divorce threat, the difference between the labour supplies is also smaller:

$$l^{G*,D} = \frac{1}{\beta_h}(\hat{V} - V^M - \alpha_h H^G + \frac{1-p}{q-p}\Psi^H - \frac{1-q}{q-p}\Psi^L) = l^{G*,M},$$

$$l^{B*,D} = \frac{1}{\beta_h}(\hat{V} - V^D - \alpha_h H^B - \frac{p}{q-p}\Psi^H + \frac{q}{q-p}\Psi^L) > l^{B*,M}.$$

D   Variables and Data

Variable	Data
Domestic	Number of hours spent on domestic tasks[5] during the previous regular working day
Leisure	Number of hours spent on leisure[6] during the previous regular working day
Economic	Number of hours spent on economic tasks[7] during the previous regular working day
Other	Number of hours spent on other activities[8] during the previous regular working day
Clothes	Amount of money self (wife) spent on clothes, fabric for clothes or shoes in past 3 months
Clothes_villmean	The mean of the variable Clothes in the village
Seeds	Amount of money household spent on seeds in past 3 months
Land	The total amount of land the household owns in acres
Husbclothes	Amount of money self (husband) spent on clothes, fabric for clothes or shoes in past 3 months
Poor	Whether the household is poor compared to other households in the village, according to the interviewer ($= 1$ if yes, $= 0$ otherwise)
HHsize	The number of regular members of the household

---

[5] Cooking, cleaning and washing clothes.

[6] Sleeping, community and village work, political meetings, religious activities and other leisure activities.

[7] Field preparation, ridging, planting, transplanting, fertilising, weeding, harvesting, animal care, gathering vegetables and other operations, wage-labour, group field labour, salaried employment, sales, handicraft and alcohol production, transporting goods, metal work, basket weaving, carpentry, charcoal preparation, water collection for sale and other cash activities.

[8] School attendance, eating, childcare, visiting friends, collecting water and firewood, repairing the house and farm, attending funerals, caring for the ill (2006) and sex (2006).

E Regression Results

All regressions include variables controlling for wife's and husband's illness, as well as the total number of hours reported. M is a dummy variable for matrilineal, Lm a dummy variable for matrilocal and Inh a dummy variable indicating the wife has inherited land from her natal kin.

	(1) ΔDomestic	(2) ΔLeisure	(3) ΔEconomic	(4) ΔOther
ΔClothes	0.159**	-0.292**	-0.162	0.296*
	(0.065)	(0.130)	(0.149)	(0.170)
ΔClothes*M	-0.105	0.288	0.243	-0.426
	(0.154)	(0.309)	(0.271)	(0.297)
M	0.733**	-0.255	-1.355**	0.877
	(0.350)	(0.508)	(0.621)	(0.566)
ΔHusbclothes	-0.046	-0.021	-0.060	0.127
	(0.075)	(0.084)	(0.115)	(0.139)
ΔHusbclothes*M	0.002	0.104	0.113	-0.218
	(0.076)	(0.086)	(0.117)	(0.140)
ΔClothes_villmean	0.084*	-0.018	-0.213**	0.148*
	(0.043)	(0.064)	(0.107)	(0.086)
ΔClothes_villmean*M	0.434	0.654	-1.087	-0.001
	(0.484)	(0.788)	(0.878)	(0.787)
ΔLand	0.008**	-0.0300***	-0.008	0.030***
	(0.004)	(0.007)	(0.008)	(0.008)
ΔLand*M	0.045	-0.011	-0.005	-0.029
	(0.029)	(0.037)	(0.053)	(0.048)
ΔPoor	-0.472	0.025	-1.529	1.975*
	(0.520)	(0.847)	(1.187)	(1.178)
ΔPoor*M	-0.405	0.482	2.132	-2.210*
	(0.648)	(1.145)	(1.373)	(1.319)
ΔHHsize	-0.159	0.470***	-0.142	-0.169
	(0.131)	(0.158)	(0.210)	(0.200)
ΔHHsize*M	0.139	-0.382*	0.110	0.133
	(0.159)	(0.231)	(0.268)	(0.246)
N	338	338	338	338
R^2	0.137	0.148	0.085	0.102

	(5) ΔDomestic	(6) ΔLeisure	(7) ΔEconomic	(8) ΔOther
ΔClothes	0.195***	-0.288**	-0.200	0.292*
	(0.065)	(0.133)	(0.156)	(0.173)
ΔClothes*M	-0.105	0.473	-0.114	-0.254
	(0.179)	(0.338)	(0.330)	(0.347)
ΔClothes*Lm	-1.106***	-0.106	1.133	0.078
	(0.354)	(0.345)	(0.780)	(0.745)
ΔClothes*M*Lm	1.022**	-0.425	-0.203	-0.394
	(0.437)	(0.656)	(0.855)	(0.874)
M	0.770**	-0.792	-1.389**	1.411**
	(0.373)	(0.533)	(0.677)	(0.587)
Lm	-0.021	1.369***	-0.284	-1.065**
	(0.315)	(0.471)	(0.548)	(0.476)
ΔHusbclothes	-0.011	-0.008	-0.098	0.118
	(0.074)	(0.088)	(0.120)	(0.150)
ΔHusbclothes*M	-0.032	0.087	0.148	-0.202
	(0.076)	(0.091)	(0.122)	(0.151)
ΔClothes_villmean	0.087**	-0.003	-0.222**	0.138
	(0.043)	(0.065)	(0.108)	(0.088)
ΔClothes_villmean*M	0.398	0.842	-0.843	-0.396
	(0.509)	(0.767)	(0.928)	(0.796)
ΔLand	0.010***	-0.031***	-0.009	0.031***
	(0.003)	(0.007)	(0.008)	(0.008)
ΔLand*M	0.041	-0.018	0.017	-0.040
	(0.028)	(0.043)	(0.052)	(0.053)
ΔPoor	-0.363	-0.132	-1.594	2.089*
	(0.532)	(0.849)	(1.230)	(1.178)
ΔPoor*M	-0.519	0.838	2.180	-2.499*
	(0.658)	(1.150)	(1.415)	(1.322)
ΔHHsize	-0.155	0.461***	-0.144	-0.161
	(0.132)	(0.158)	(0.208)	(0.205)
ΔHHsize*M	0.129	-0.366	0.169	0.068
	(0.163)	(0.239)	(0.267)	(0.255)
N	337	337	337	337
R^2	0.147	0.168	0.100	0.118

	(9) ΔDomestic	(10) ΔLeisure	(11) ΔEconomic	(12) ΔOther
ΔClothes	0.209***	-0.286**	-0.214	0.290
	(0.069)	(0.142)	(0.171)	(0.184)
ΔClothes*M	-0.105	0.201	-0.019	-0.077
	(0.225)	(0.429)	(0.399)	(0.369)
ΔClothes*Inh	-0.618	0.040	0.612	-0.034
	(0.386)	(0.422)	(0.532)	(0.453)
ΔClothes*M*Inh	0.537	0.082	-0.082	-0.538
	(0.450)	(0.632)	(0.696)	(0.632)
M	0.935**	-0.687	-1.508**	1.260*
	(0.381)	(0.546)	(0.746)	(0.658)
Inh	-0.282	0.732	0.171	-0.621
	(0.319)	(0.482)	(0.601)	(0.530)
ΔHusbclothes	-0.034	-0.011	-0.074	0.118
	(0.073)	(0.086)	(0.115)	(0.142)
ΔHusbclothes*M	-0.012	0.098	0.131	-0.217
	(0.075)	(0.088)	(0.117)	(0.143)
ΔClothes_villmean	0.061	-0.016	-0.191*	0.146
	(0.048)	(0.071)	(0.115)	(0.093)
ΔClothes_villmean*M	0.365	0.876	-0.973	-0.268
	(0.491)	(0.795)	(0.906)	(0.781)
ΔLand	0.009***	-0.030***	-0.009	0.030***
	(0.003)	(0.008)	(0.008)	(0.008)
ΔLand*M	0.044	-0.012	-0.007	-0.026
	(0.029)	(0.039)	(0.058)	(0.052)
ΔPoor	-0.582	0.119	-1.433	1.895
	(0.522)	(0.890)	(1.187)	(1.202)
ΔPoor*M	-0.326	0.469	2.061	-2.205*
	(0.653)	(1.175)	(1.371)	(1.335)
ΔHHsize	-0.142	0.489***	-0.162	-0.185
	(0.129)	(0.157)	(0.216)	(0.206)
ΔHHsize*M	0.116	-0.387*	0.141	0.131
	(0.158)	(0.231)	(0.274)	(0.254)
N	338	338	338	338
R^2	0.145	0.155	0.093	0.115

	(13) ΔDomestic	(14) ΔDomestic	(15) ΔDomestic
ΔSeeds	0.300**	0.293**	-1.378
	(0.132)	(0.132)	(3.511)
ΔSeeds*M	-0.530	-0.464	-0.690
	(0.354)	(0.347)	(1.723)
ΔSeeds*Lm		8.100	
		(7.315)	
ΔSeeds*Lm*M		-9.482	
		(7.424)	
ΔSeeds*Inh			1.689
			(3.518)
ΔSeeds*Inh*M			1.914
			(3.930)
M	0.821***	0.968***	0.978***
	(0.302)	(0.332)	(0.331)
Lm		-0.215	
		(0.323)	
Inh			-0.318
			(0.311)
ΔSeeds_villmean	0.119**	0.115**	0.121**
	(0.051)	(0.054)	(0.052)
ΔSeeds_villmean*M	0.380	0.382	0.249
	(1.251)	(1.266)	(1.282)
ΔLand	0.009**	0.009**	0.010**
	(0.004)	(0.004)	(0.004)
ΔLand*M	0.044	0.046*	0.044
	(0.027)	(0.027)	(0.027)
ΔPoor	-0.403	-0.399	-0.430
	(0.516)	(0.519)	(0.520)
ΔPoor*M	-0.565	-0.580	-0.570
	(0.652)	(0.660)	(0.661)
ΔHHsize	-0.144	-0.150	-0.140
	(0.127)	(0.127)	(0.128)
ΔHHsize*M	0.132	0.123	0.118
	(0.161)	(0.162)	(0.162)
N	337	336	337
R^2	0.111	0.115	0.114

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