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Intra-household bargaining in poor countries

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Abstract: This paper is intended to bridge the theoretical literature describing efficient intra-household behaviour and the development literature that collects empirical regularities pointing toward the existence of strategic decision-making among spouses. It examines the key elements of the collective model and discusses its relevance to analysing intra-household behaviour in poor countries. It explores the role that risk and uncertainty, information asymmetries, power imbalances, arranged marriages, strategic investment, gender norms, and extended households play in the attainment of efficiency.

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1   Introduction

The present survey assesses the relevance of the collective model for the analysis of households in poor countries. As an economic unit, a household creates the possibility of mutual gains for spouses thanks to the possibility of joint consumption of public good, risk sharing, and the exploitation of comparative advantages through specialization. The collective model, developed initially by Chiappori (1988), assumes that households behave efficiently, in the sense that there is no misallocation or waste of household resources, given the outside options of each spouse. These exogenous outside options determine the bargaining power of each spouse, and the resulting sharing of resources between spouses. The efficiency requirement is based on the idea that spouses interact repeatedly, know each other well, and care about each other.

In this survey, we describe the key features of the collective model and assess their relevance for developing economies. We first describe the collective model and its main implications in Section 2. In Section 3, we explore the role of uncertainty and risks. Welfare gains are made possible through the joint management of risks within the household. However, repeated shocks and uncertainty make it harder to satisfy the conditions of the collective model, as they lead to commitment problems. Section 4 focuses on the bargaining process itself, and describes how power imbalances, high adult mortality rates, and the prevalence of early or arranged marriages all undermine efficiency. In Section 5, we argue that outside options, which play a crucial role in the bargaining outcome, are themselves endogenous. They follow from decisions made by the parents or the future spouse in terms of health, education, or occupation and are subject to strategic manipulations before or during marriages. We then discuss the role of informational asymmetries and strategic behaviour between spouses in Section 6, particularly when it comes to income, savings, or fertility decisions.

Finally, the prevailing norms and institutions around inheritance, divorce, and occupation are essential determinants of the outside options. We argue in Section 7 that, in poor societies, they typically lead to imbalanced outcomes and conflictual situations. We also assess the relevance of the collective model for alternative family arrangements such as polygamous or multi-generational households. To conclude, we propose some promising research avenues.

2   Efficiency in the household: the collective model

The canonical model of collective household decisions was developed by Chiappori (1988, 1992) and Bourguignon et al. (1993).[1] It is based on the central assumption that household decisions are Pareto-efficient, in the sense that no other feasible choice would have been preferred by all household members. It also requires that the participation constraint of each spouse is satisfied, which implies that the utility of each spouse is greater than under their outside option. If efficient, household decisions can be described as resulting from the maximization of a simple weighted sum of the utilities of the two spouses. In its simplest formulation, a household chooses the amounts of private goods consumed by each spouse, C_1 and C_2, and the amount of public good, Q. An allocation is efficient if and only if it maximizes $U_1(C_1,Q)+(z)U_2(C_2,Q)$, under the usual budget constraint.

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[1] Chiappori and Mazocco (2016) provide an exhaustive survey of the collective model literature.

The key feature of the model is the Pareto weight $\mu(z)$, which measures the relative weight of spouse 2 with respect to spouse 1, and is a (unique) function of z, a vector which includes prices, household income, and the 'distribution factors' that are all the variables in the economic environment that do not affect the preferences or the budget but that influence the decision process, such as the relative income of each spouse, the legal environment, or the gender ratio in the population. The weight is a direct measure of the bargaining power of each spouse and is determined by the relative importance of their outside options. These outside options represent what each spouse would get if he or she were to exit the co-operative decision process. They determine the participation constraint of each member in the household.

The concept of distribution factors is specific to the collective household model (see Browning et al. 2014 for more detailed discussions) as it allows household decisions to vary with changes in the relative position of each spouse. This is the key difference from the predictions of the unitary model, which have been rejected by various tests (see for instance Thomas 1994 and Lundberg et al. 1997, for the US and the UK).[2] This is particularly true for the large literature on developing economies that shows that, for a given household income, a change in the relative income of one spouse affects the pattern of household expenditures or other household decisions (see e.g. Duflo 2003; Haddad and Hoddinot 1995; Thomas 1994). In the context of the collective model, this change is directly interpreted as a change in the outside option of the spouse, which directly affects his/her bargaining power, and therefore his/her Pareto weight. While the decisions described in these studies have sometimes been misinterpreted as a sign of inefficiency in the household (see Haddad et al. 1997), they simply indicate that the unitary model, which assumes that the household behaves as a single decision unit and therefore does not allow the Pareto weights to vary with changes in the environment, should be rejected. Relatedly, the fact that the outcomes of these decision processes can be very inequitably distributed between the spouses may be the consequence of the low Pareto weight of one of the two spouses, but is again perfectly compatible with efficiency.

In the simplified model presented above, efficiency is relevant because of the presence of a public good, which affects the utility of both spouses. In its absence, there would be no gains in the collective decision, and each spouse would spend his/her individual income on private consumption goods. The efficiency requirement can generally be applied to all *dimensions that involve mutual gains in the household*, the other externalities in the household, which include risk sharing, task specialization, and various coordination problems. The underlying idea is that, since household members have repeated interactions and a good knowledge of each other's preferences and resources, and care about their partner, one can reasonably expect that no surplus is wasted in the household. It should, however, be noted that the model does not provide an explicit mechanism that describes how decisions are made, or how efficiency is achieved. We return to this question in Section 4.

An important contribution of the collective model is that, with enough detailed observations such as the presence of assignable goods in the expenditures, it allows the estimation of the resource share, and therefore of the Pareto weight, of each spouse. It also provides testable implications for collective rationality, which allow for the assessment of its empirical relevance. The most direct test of collective rationality relies on the assumption that the distribution factors affect intra-household sharing only through the Pareto weights. (It implies in particular that the marginal rate of substitution between any two goods with respect to a change in distribution factors does not depend on the distribution factor considered. Another type of test relies on restrictions imposed

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[2] Under transferable utility, the logic of the Rotten Kid theorem applies and both models yield identical predictions.

on the Slutzky matrix, but requires household panel data with observable price changes.)[3] Empirically, however, it is critical that the distribution factors are exogenous to the household, such as the random participation in a welfare programme, aggregate gender ratios, changes in divorce laws, or market wages. It may thus seem reassuring that the collective model's restrictions are usually not rejected in the literature (see for instance Attanasio and Lechene 2014; Bobonis 2009; Chiappori et al. 2002).[4]

To our knowledge, these latter works directly assess necessary but not sufficient conditions for the validity of the collective model. This implies that other decision-making processes, with inefficient outcomes, may fail to be rejected by these tests. In particular, it is perfectly possible that a non-co-operative decision process generates various inefficient allocations that are compatible, given other preferences and sharing rules, with the collective model. The discriminatory power of the testable restrictions of the collective model is clearly an open issue for future research.

This question is all the more serious as there is now a large body of evidence that shows, using alternative testing procedures, that household decisions in developing economies are often inefficient. In his well-known paper, Udry (1996) documents large productive inefficiencies due to the misallocation of labour in family farms in Burkina Faso. Output losses due to inefficient allocations within the household were found to be of the order of 5 per cent. The big strength of this test is that it relies on production inefficiencies, which are easier to characterize and measure in a satisfactory way than less quantifiable contributions to household public goods, such as quality time with the children.

Several papers confirm the pervasiveness of household inefficiencies in developing economies. Apart from the misallocation of productive inputs, the literature highlights systematic under-contribution to public goods through the use of experimental games between spouses. For instance, Hoel (2015) runs a series of lab-in-the-field experiments in Kenya and finds that close to 100 per cent of households do not maximize their gains in a simple public good game, with an average loss of about 16 per cent. Other forms of inefficiency involve imperfect risk sharing (Dercon and Krishnan 2000), strategic appropriation of resources (Anderson and Baland 2002), lying and hiding (Ashraf 2009), or the strategic use of violence (Bloch and Rao 2002).

This set of evidence is troubling and calls into question the relevance of the collective model for actual decision making in developing economies. In the remainder of this paper, we discuss the various dimensions along which the collective model has to be extended to reflect more closely the actual context of these decisions, and to what extent these can be problematic in the context of a developing economy.

3   The collective model and the role of time and uncertainty

The collective model naturally extends to a dynamic environment (Chiappori and Mazzocco 2017). In this new setting, spouses are assumed to commit, at the time of marriage, to all future allocations of their resources. Efficiency is achieved by maximizing the weighted sum of the lifetime utility of each spouse, using all the future values of the relevant variables. Lifetime Pareto weights are

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[3] Donni and Chiappori (2011) discuss identification and provide an overview of the empirical applications of the non-unitary models.

[4] A more recent approach developed by Cherchye, De Rock, Vermeulen, and various co-authors relies on the imposition of the revealed preference axiom on observed choices, and estimates intervals of the sharing rules that are compatible with these decisions (see, in particular, Cherchye et al. 2015b).

determined, and depend on the distribution factors at the time of marriage as well as their future realizations. As a result, future changes in the outside options of spouses do not lead spouses to renegotiate their relative position in the household since all future events are correctly anticipated at the start. The resource share of each spouse is therefore given initially and remains constant throughout.

The collective model can be similarly generalized to accommodate risk and uncertainty. Collective rationality here implies that spouses fully share risks and pool their individual resources so as to smooth shocks among the household's members. Larger gains are generated when the correlation of income realizations between the spouses is low. As in the dynamic version of the collective model, the sharing rule is fixed ex ante and is independent of particular income realizations. Given a total level of income, the amount of resources assigned to each spouse remains the same and does not depend on their relative income (the *mutuality principle*). Moreover, in the absence of public goods and for constant prices, the ratio of the marginal utilities of income between the spouses remains constant across all states (Browning et al. 2014).

The mutuality principle provides a direct test of full efficiency, even though such a test requires additional assumptions in order to compare household decisions under different levels of total income (such as constant absolute risk aversion or CARA, utility functions, and equal risk aversion among spouses). Almost all the tests carried out in the context of developing economies reject efficiency, over time and for all possible states of the world (see in particular Dercon and Krishnan 2000; Dubois and Ligon 2011; Duflo and Udry 2004). Recent experimental evidence supports these negative results. For instance, Robinson (2012) randomly assigns income shocks in different households in Kenya and observes consumption variations that cannot be reconciled with a model of full risk sharing.[5]

The limited commitment hypothesis and the resulting deviations from the first-best have been tested on US data in contexts where divorce laws have been changed. It has been shown that intra-household allocations do react to exogenous changes in the outside options (Mazocco 2007; Voena 2015). These findings suggest that the full commitment hypothesis, whereby each spouse ties himself or herself to an agreement that specifies a given sharing rule for all possible periods and states of the world, does not hold.[6]

An alternative, developed in Mazocco (2007) and Voena (2015), is to allow for a limited commitment set-up, in which spouses renegotiate the intra-household allocations whenever the outside option of one of them becomes relatively more attractive than the current arrangement. With limited commitment constraints:

> the allocation is renegotiated to make the spouse with a binding participation constraint indifferent between the outside option and staying in the household. This goal is achieved by increasing the weight assigned to the preferences of the spouse with a binding participation constraint or equivalently her decision power. The couple then consumes and saves according to the new allocation until one of

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[5] These tests are not definitive, however, as their significance hinges upon the relevance of the assumptions they are based upon. In principle, these negative results can be reconciled with ex ante efficiency if one assumes, for instance, different risk preferences across household members.

[6] Note also that if agents could perfectly anticipate and insure against all possible events, including changes in their outside options, on anonymous markets with enforceable contracts, the collective model would hold, with constant resource shares and no renegotiations. There are evidently a large number of practical reasons for which such markets with external enforcement do not exist, but the empirical evidence described above also indirectly indicates that they do not.

the participation constraints binds again and the process is repeated. All this implies that consumption and saving decisions at each point in time depend on the individual decision power prevailing in that period and on all the variables having an effect on it. (Mazocco 2007)

This limited commitment set-up allows for partial risk sharing and can be reconciled with a second-best efficient collective model.[7]

This modified version of the collective model implies that the Pareto weights of the spouses can change over time according to the various shocks that affect them. The resulting decisions are not first-best efficient over the whole time horizon, but remain (interim-)efficient between the renegotiations. This extension of the collective model closely parallels the literature on risk sharing in developing economies. The latter highlights the importance of limited commitment constraints in risk arrangements, which requires that future gains under the arrangement exceed the current cost of the income transfer. As discussed by Coate and Ravallion (1993), inter-household insurance is subject to an 'implementability constraint' which limits the amounts to be transferred. This constraint places a limit on the more fortunate party's liability in order to prevent him/her from reneging on his/her obligation through defection (see also Genicot and Ray 2003). Such constraints are also at play between spouses.

Thanks to the predominance of farming, self-employment, and informal sector occupations, individual incomes in developing countries are highly volatile, unpredictable, and subject to various health, weather, and macro-economic shocks.[8] These shocks should lead to frequent renegotiations between spouses—all the more so if the shock has long-lasting effects on future outside options. This occurs, for instance, when income shocks are positively correlated across time, as a particular positive income realization increases the chances of positive realizations in the future, which in turn increase one's future outside options. The presence of poverty traps also makes renegotiations more likely, if a particular income realization allows one member to exit poverty. As stressed above, uncertainty matters insofar as appropriate commitment devices are missing. This is an issue to which we shall return in the following section. Clearly, in the extreme case in which spouses cannot commit, Pareto weights are revised whenever a change in their outside option occurs, whether correctly anticipated or not. (This situation has not yet been discussed in the literature.)

As a result, a reasonable collective model approach to household behaviour in a developing economy is to assume that renegotiations between spouses are frequent. The collective model holds within states, for limited periods of time, but not across states over longer time periods. Its empirical relevance is therefore questionable: all the more so as most of the interesting variations for development policy involve changes in the outside options of the spouses. Full risk sharing should essentially be viewed as a theoretical benchmark against which observed decisions have to be compared.

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[7] Note that this discussion also applies to a dynamic decision model with certainty, as the incentive compatibility constraint reduces the feasibility of the optimal sharing rule for some future periods and leads to the adoption of a second-best sequence of sharing rules.

[8] There is a large literature illustrating the various strategies used by households to reduce co-movements of income or increase risk-sharing opportunities, such as the diversification in occupations, exogamy, migration (See Molina 2015 for evidence on migration and household insurance), polygamy (Fenske 2012), and the co-residence of extended families.

4 Commitment and household negotiations

The previous discussion highlighted the central importance of commitment in the collective model. However, the latter is essentially silent about the way commitment is implemented and co-operation is achieved. Two classes of mechanisms can conceivably underlie the ability of each spouse to commit to a long-term sharing rule, and thereby sustain a co-operative outcome in the household. The first is the standard repeated games argument; the other is based on love and other-regarding behaviour within the household.

4.1 Repeated interactions and outside options

The conditions under which repeated interactions can sustain a co-operative agreement are well known.[9] The latter requires a non-finite horizon, since the standard backward induction argument otherwise applies. The discount factors cannot be too low, so that the current evaluation of future pay-offs from co-operation is sufficiently attractive (Abreu 1988). The mechanism relies on the ability of agents to punish 'deviating' behaviour: this ability should be sufficient to induce co-operation (for some discussion and experimental evidence, see Anderson and Putterman 2006; Fehr and Gaechter 2000; Boyd et al. 2010).

The household comes out as a natural environment within which these assumptions hold. The largest rational (i.e., sub-game perfect) punishment that can be imposed on the other spouse is often associated with the outside option. Two alternatives are proposed in the literature to define the latter. The first is divorce, by which each spouse compares his/her pay-offs in the marriage to those if he/she were to live alone or find a new partner, taking into account the direct costs associated with the separation.

The other alternative is to consider that, absent an agreement, both partners behave non-co-operatively while remaining as a couple. For instance, in the simple collective model of household decisions with public goods, the non-co-operative provision appears the most natural definition of the outside option, whereby the equilibrium allocations correspond to a Nash equilibrium.[10] Public goods are then typically under-provided, as each contributor does not internalize the marginal value of the goods to his partner.[11]

In the context of developing economies, various norms and constraints limit the capacity of a spouse to punish his/her partner, either because they reduce the value of his/her outside option, or because they limit his/her right to exercise it. For instance, many societies do not give women

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[9] The Folk theorem points to the possibility that the efficient equilibrium can be reached but does not exclude other, less efficient equilibria.

[10] As Browning (2000) points out, if spouses do not consume any private good, the household equilibrium is efficient even when spouses behave in a non-co-operative way.

[11] As long as both partners contribute to the public good in equilibrium, the neutrality result of Bergstrom et al. (1986) indicates that the total equilibrium amount of public good provided does not depend on the distribution of income between spouses (see also Lechene and Preston 2011). Income pooling occurs and, as a consequence, income shocks to one spouse are essentially mutualized and transmitted to the other spouse, who adjusts his/her own voluntary contribution. In this setting, the number of public goods consumed in the household is not relevant. Browning et al. (2010) show that, irrespective of the total number of public goods in the household, spouses simultaneously contribute to at most one of these goods and specialize in the household tasks they prefer. When market wages differ between spouses, intra-household specialization also naturally emerges, even if both spouses share identical preferences (Doepke and Tertilt 2014). In this setting, the spouse with a lower wage specializes in the provision of the time-intensive public good, such as household chores.

the right to divorce, their only option in terms of punishment being to adopt passive non-co-operative behaviour within the marriage (see Section 7 for further discussion).

Second, the prevalence of long term hazards (disease, conflict, epidemics, etc.) and low life expectancy in developing countries directly affects the time horizon of a married couple, and therefore its ability to punish, and to sustain the 'co-operative outcome'. Lower discount factors render the repeated games argument less relevant. For instance, adult mortality rates (probability of dying between the ages of 15 and 60) in Benin in 2014 were equal to 270 per 1000 for men and 223 per 1000 for women. This implies that a randomly matched couple in Benin has a 57 per cent chance of surviving as a couple till the age of 60. For India, the mortality rates are respectively 217 and 145, for Guatemala 236 and 129, and for Cote d'Ivoire 388 and 424, so that the corresponding probabilities of a couple surviving to 60 are respectively 67 per cent, 66 per cent, and 35 per cent (World Bank 2016). This probability is particularly low in the southern part of Africa, due to high adult mortality. The survival probability of a couple is about 31 per cent in South Africa and 17 per cent in Lesotho. For low-income countries in general, it is equal to 55 per cent. These figures suggest that punishment threats can be much less effective in developing countries.[12]

4.2   Other-regarding behaviour

Love, or other-regarding behaviour, should play a role in facilitating co-operation in the household, typically by increasing the size of the collective surplus under the collective model. This may not always be the case, as altruism can, under some circumstances, reduce the punishment capacity of one spouse and thereby undermine co-operation in the household. A possible (non-co-operative) mechanism is the Samaritan dilemma (Coate 1995): the more one spouse cares about the other, the more he/she will devote resources to the wellbeing of the partner, irrespective of the other's behaviour. Hwang and Bowles (2012) explore such interactions between altruism and reciprocal motives, whereby one player positively values the other's pay-offs. They show that, by weakening the punishment motive, a general increase in the level of unconditional altruism may reduce rather than increase contributions. The implication for the collective model is that love, when not fully reciprocal, may sometimes make the co-operative outcome less sustainable.

In Baland and Ziparo (2017), we develop a new behavioural rationale for altruism or love to run counter to efficiency: because of empathy, the physical presence of the partner changes the level of altruism that one normally experiences. This may lead him/her to take decisions, in particular income transfers or irreversible expenditures, which he/she regrets afterwards or would not agree upon ex ante, and which are therefore time-inconsistent. Anticipating this, he/she may want to undertake precautionary actions through long-term savings plans or excessive current expenditures that would not be necessary with a constant level of altruism.

In the non-co-operative literature, altruism usually increases resource sharing and contributions to public goods, and reduces opportunistic behaviour in 'prisoner's dilemma' situations (see in particular Foster and Rosenzweig 2001, and the survey by Durlauf and Fafchamps 2005).[13] Cherchye et al. (2015a) similarly show that an increase in caring between spouses brings allocations closer to efficiency. Moreover, love is associated with other feelings such as guiltiness and betrayal. Even when decisions are not repeated, the incentives to free-ride are reduced because each spouse

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[12] While accurate information is harder to collect, divorce rates are not small either, even in African countries, for which the current estimated divorce rate (after more than 15 years of marriage) is about 25 per cent on average, and above 40 per cent in countries such as Gabon, Central African Republic, or Liberia (see Clark and Brauner-Otto 2015).

[13] Under perfect altruism, both the non-co-operative and the collective models become indistinguishable from the unitary approach.

may be afraid of losing the love of a partner if the latter were to observe their non-co-operative deviation. Similarly, using psychological games, Geanakopoulos et al. (1989) assume that spouses' pay-offs depend on the expectation the partner has about their actions. Because of guilt, pay-offs are lower when the actions taken differ from these expectations. Free-riding in the game is systematically reduced.

Even though this is admittedly a controversial issue and convincing evidence is harder to provide, the traditions of early marriage, arranged marriages, or forced marriages in the case of unplanned pregnancy are pervasive in some developing countries. Such practices should reduce other-regarding behaviour in the resulting couples. For instance, according to the UNICEF global database (UNICEF 2016), early marriage is pervasive throughout the developing world. The proportion of women getting married before 18 is equal to 41 per cent in the least developed countries, and exceeds 50 per cent in South Asia and Sahelian Africa. Child marriage (marrying before 15) affects on average 13 per cent of females in the least developed countries and more than 15 per cent in countries such as India (18 per cent), Chad (29 per cent), Niger (28 per cent), Somalia (45 per cent), Nigeria (17 per cent), and Bangladesh (18 per cent).[14] This, as well as related traditions, affects not only altruism in the household but also the relative position of women in marriages, as well as the future education and human capital of their children.

4.3 Bargaining frictions

Finally, the collective model also assumes away frictions in the bargaining process. However, a large amount of evidence about household conflict, marital violence, and female suicide suggests that agreements are costly to reach and brutal force can be exercised in the negotiation process. According to the Demographic and Health surveys (DHS Program n.d.), and in spite of the inherent problems associated with this type of measure, it was estimated in 2005 that 33.5 per cent of married women in India and 22 per cent in Nepal had experienced some form of domestic violence during their lifetime. The proportion of women reporting spousal physical or sexual violence over the past 12 months can be as high as 44 per cent in Rwanda or 37 per cent in Colombia.

This issue also affects developed economies. According to a large-scale survey carried out by the EU Agency for Fundamental Rights (FRA 2014), 22 per cent of women in a stable relationship in Europe reported partner abuse in 2012. A 2012 United Nations' report (Manjoo 2012) labelled domestic abuse in Italy the 'most pervasive form of violence' in the country, affecting over 30 per cent of Italian women. According to the National Intimate Partner and Sexual Violence Survey of 2010 (Black et al. 2011), 35.6 per cent of women and 28.5 per cent of men in the US have been victims of their partner's violence during their lifetime. From this evidence, we can infer that inefficient bargaining within households does take place and, while falling outside the collective model approach, is worth a more systematic analysis. Furthermore, these 'frictions' are apparently more prevalent in developing countries: the proportion of adult women who find it justified for a husband or partner to beat his wife exceeds 75 per cent in countries such as Guinea, Mali, and Somalia.[15]

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[14] This proportion has been measured on the current cohort of women aged between 20 and 24. The proportion is evidently much higher for older cohorts.

[15] Of course, wife-beating can be interpreted as a punishment strategy, and could thus fall under the purview of the collective model. There is, however, clear evidence of physical oppression which falls outside a smooth, fair, and efficient negotiation process.

A limited number of papers investigate the role of domestic violence in the household bargaining process, particularly when preferences are not known and households may have to devote resources to reaching an agreement. For instance, Bloch and Rao (2002) propose a model of domestic violence in which, because spouses do not know with certainty the preference of the other spouse, household bargaining is more complex and leads to conflict. Along the same lines, Anderson and Genicot (2015) provide a bargaining framework in which both spouses have private information about the value of the union to themselves. A change in the value of the outside option value, brought about by some legal reform, leads to renegotiation and bargaining within the household. However, because of the presence of private information, this bargaining process is costly, and leads to distrust and violence within the couple.

> Conflict is an integral part of the bargaining process. When an offer (regarding the division of resources) is rejected, conflict ensues. Threatening separation does create an atmosphere of discord within the household that comes at a cost, and separation cannot be achieved instantaneously. At any point, though, individuals may instead choose the ultimate exit and commit suicide. (Anderson and Genicot 2015: 2)

An empirical application to property reforms in India is proposed, in which it is shown that suicide rates and domestic violence increased as a consequence of a land property reform in favour of women.[16]

5   Endogenous outside options

We now examine more carefully the determinants of the outside options. First, as argued above, they depend partly on previous household decisions, essentially when the latter are irreversible, such as fertility, specialization, choice of residence, or labour market decisions. These decisions may also reinforce gender roles and specialization in the household. As discussed in Chiappori and Mazzocco (2017), the fact that some decisions affect the future outside options of the spouses should not undermine the relevance of the collective model. As long as those decisions are taken co-operatively after the marriage, they should be efficient.[17] According to the collective model, irreversible changes in the outside options of one spouse should be fully compensated by appropriate transfers or consumption choices by the other spouse.[18]

This argument relies on the ability of each spouse to commit to a well-defined pattern of future allocations. However, these irreversible decisions also affect the spouses' capacity to punish,

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[16] See also Angelucci (2008); Bhattacharyya et al. (2011); Bobonis et al. (2013); Pollak (2004).

[17] Note that irreversibility as such can also promote efficiency in a non-co-operative setting. In a recent paper, Battaglini et al. (2014) show that, when goods are durable and accumulate irreversibly, the Pareto-dominating Markov equilibrium converges to the efficient steady state as the agents' discount factor converges to one. When 'the discount factor is high and depreciation is low, all equilibrium steady states are close to efficient.'

[18] For instance, the spouse withdrawing from the labour market could be compensated by a legal agreement granting him/her a larger share of the household property in case of divorce (see, for instance, Browning et al. 2014). In a limited commitment set-up, Bayot and Voena (2015) show that prenuptial agreements can be used to increase welfare when one of the spouses may have to undertake an action that reduces his/her outside option afterwards. In particular, these agreements are Pareto-improving in households where divorce is a plausible threat and the wife decides not to enter the labour market.

particularly when they do not affect them in a symmetric way.[19] For instance, if a spouse decides irreversibly to exit the labour market, he/she cannot use the threat of not sharing his/her income to punish non-co-operative behaviour.[20] Lower punishment capacities may induce the partner to renege on her/his promises of future transfers and compensations. As a result, the collective agreement may fail to be self-enforcing, in the absence of legally binding constraints.

In developing countries, very little research is being done on the implications of strategic behaviour during marriage for large irreversible decisions, such as child education, land accumulation, migration, or residential choice. In the context of fertility choices, Ashraf et al. (2014) experimentally vary the observability of women's contraceptive use and show how use among Zambian women increases when the husband cannot detect it.

Interestingly, many irreversible decisions are taken before marriage, such as education or early career choices. These choices determine the future outside options of the spouse and can be strategically manipulated in order to strengthen one's own bargaining position, once married. For instance, later marriages should be observed in economies in which divorce restrictions are relaxed, as future brides strive to accumulate enough assets before entering into a stable relationship (see Ziparo 2017 for an analysis of the impact of French marital laws on women's education). In Chile, Kaufmann et al. (2013) find that young women entering an elite education programme tend to marry more successful spouses, with various implications in terms of income and fertility.[21] In Indonesia and Zambia, Ashraf et al. (2016) show how female education is used by parents as a strategy to increase the bride price on the marriage market. Higher levels of education should therefore be viewed as the result of a strategic decision to strengthen one's position on the marriage market and in future household decisions.

Marital payments are also dependent on highly strategic decisions. Gaspart and Platteau (2010)[22] argue that parents set the bride price at not-too-high levels (lower than the marriage market-clearing prices) so as to avoid future harassment of their daughters by their husbands. In a recent paper, Anderson and Bidner (2015) show how these payments are manipulated by parents in order to strengthen the intra-household bargaining weight of their own children.

These examples suggest that most pre-marital decisions are fundamentally non-co-operative, even when the collective model describes correctly the decisions taken after marriage. The strategic nature of irreversible pre-marital decisions has not yet been fully explored by the literature.

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[19] As shown by Basu (2006), the interaction between current choices and bargaining power leads in general to multiple equilibria, some of which are sub-optimal.

[20] Del Boca and Flinn (2009) provide an insightful model of labour household decisions with varying degrees of (second-best) efficiency depending on the household capacity to sustain co-operation.

[21] Chiappori et al. (2009) theoretically describe how mariage market considerations may affect human capital investment.

[22] A similar argument is made by Bloch and Rao (2002).

6   The role of asymmetric information

In risky and volatile environments, the observation of the income realization of others, including the spouse, is not frictionless, which naturally gives rise to asymmetric information problems.[23] In an experimental setting in the Philippines, Ashraf (2009) provides evidence that individual consumption is substantially affected by changes in the information given to one spouse about the other's individual savings account. These asymmetries allow spouses to manipulate their savings or finance hidden consumption. For instance, Boozer et al. (2009) analyse spousal cross-reports of food expenditure in Ghana and find evidence of hidden consumption unknown to the other spouse. Ziparo (2016) reports findings in Cameroon from separate interviews of each spouse about the income and expenditures of the other spouse. She shows that spouses systematically under-estimate the income of their partner by about 30 per cent, and interprets this finding as evidence of hidden behaviour. Recent field experiments on transnational migrants shows that they tend to send smaller remittances to their spouses when they can better hide their incomes (Ambler 2013), and that they tend to save more when they can better control the use of their savings in their home country (Ashraf et al. 2015). However, as yet there has been no systematic analysis of the prevalence of misinformation among spouses in developing economies, and some more evidence on this issue would be welcome.

A number of careful case studies document the various costly strategies used by the spouses to conceal their income or their savings from one another, or to force household decisions to their advantage. Anderson and Baland (2002), for instance, provide evidence of strategic savings in Kenyan households, pointing out that women's participation in saving groups (Roscas) did help them to protect their saving from immediate consumption by their partner. Household members are willing to invest resources to hide their own income or to acquire information about their spouse. Baland et al. (2011) describe how, in Cameroon, individuals take out formal loans to appear in need and thereby hide their own accumulated savings from their spouse and their families. De Laat (2014) finds that individuals in split migrant couples in Kenya are willing to expend considerable resources to acquire information about one another.

A number of field experiments support these observations. For instance, Jakiela and Ozier (2016), in an experimental setting in Kenya, show that women were ready to incur significant losses for their gains in an investment game to remain private information. A similar finding is made by Boltz et al. (2015), who randomly varied the presence of the partner in an investment experiment in Senegal.[24] Castilla and Walker (2012, 2013) provide a direct test of the collective model by investigating the impact of income observability on income pooling within the household. They carried out a field experiment in Ghana where spouses in rural villages were randomly allocated prizes, either in cash or in kind, with half of them awarded in the presence of the other spouse and the other half in private. They show that the pattern of expenditures by each spouse varied substantially according to the information treatment.

Finally, it is worth noting that, for information problems to arise, the observed behaviour of the spouse should not indirectly reveal information on income. This implies in particular that

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[23] Informational asymmetries also tend to weaken the sustainability of the co-operative agreement. Punishment requires the detection of non-co-operative behaviours, which are harder to detect and process under such information incompleteness.

[24] Similar behaviour is also observed with respect to the extended family. For instance, Hadness et al. (2013) investigate how the effort exerted by a small sample of tailors in Burkina Faso varied depending on whether knowledge of a lucrative contract was made public to their extended family network or not. Observability implies a significant reduction in productivity (see also Beekman et al. 2015).

consumption or savings remain also partly hidden. Drawing from a case study in Cameroon, Ziparo (2016) investigates how resource transfers between spouses can be manipulated by the donating spouse so as not to reveal information on his or her actual income.

Another strand of the literature documents the importance of moral hazard in productive labour within the family, when labour efforts are not easily observable. Jones (1983, 1986) claims that, in African societies, women systematically exert effort on their own fields, at the expense of their husband's crops. Fafchamps (2001) justifies the allocation of exclusive plots to different members of the household in African villages on the basis of limited commitment and ex post moral hazard. When the household head cannot commit to directly remunerating his wife for her effort on the collective plot, he may choose to grant her exclusive rights on a particular plot as a substitute for a direct payment. On the basis of field observations, Guirkinger and Platteau (2015) also underline the major role played by moral hazard on collective fields to explain the structure of family farms in Mali. While the extended family is their primary focus, their argument easily extends to moral hazard within the household (see also Guirkinger and Platteau 2016 for a recent overview). The efficiency losses accompanying these various arrangements suggest that informational asymmetries are of critical importance for the productive efficiency of the household.

These findings suggest that unilateral deviations from optimal sharing of household resources are widespread, even if they involve some costs and are therefore inefficient from the household point of view. They follow from the fact that, unlike in more regulated developed economies, individual incomes, savings, and private expenditures are not easily observed. For instance, an ILO study shows that, in 2000, over 60 per cent of all employed persons in Europe had remained in their jobs for more than five years, and over 40 per cent for more than ten years (Auer and Cazes 2003). In the US in 1987, characterized by a much more mobile labour market, the corresponding numbers were 39 and 21 per cent. In contrast, in Columbia in 1988, only 24 per cent of the wage employees in the private sector had had their jobs for more than five years, and 12 per cent for more than ten years (Schaffner 2001). These high levels of labour mobility in developing economies allow for imperfect information sharing and strategic communication between spouses.

Information problems can also concern the partner's preferences (present and future).[25] The prevalence of arranged or juvenile marriages makes this issue even more salient in various developing countries (see above).[26] This allows spouses to use various strategies to hide their true preferences and turn the collective decisions in their favour. Additionally, arranged marriages may create initial distrust between the spouses, which makes truthful revelation of one's preferences even more problematic.

Co-operative models, even when asymmetries of information are included, cannot explain why hiding or lying may arise.[27] The collective model can in principle be extended to allow information revelation between spouses. Since Pareto efficiency is defined as the absence of resource wasting, whenever resource pooling increases household surplus Pareto efficiency requires information sharing. With incomplete information, the collective model needs to be reformulated by adding the appropriate incentive compatibility constraints to ensure that, in all possible states of the world, the spouses truthfully report the correct information. Adding these constraints modifies the Pareto

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[25] Note also that knowledge about one's own future preferences is also needed, which, though convenient, does not a priori seem the most attractive assumption.

[26] Even more problematic for the collective model is the possibility that household members do not correctly anticipate their welfare or preferences under the outside option, which, by assumption, they never experience.

[27] One possible exception arises when one of the spouses suffers from inconsistent preferences, and might prefer his/her partner to hide his/her own income to avoid short-run temptations.

weights in the maximization problem of the household, and yields a second-best efficient outcome. In particular, if individual incomes are imperfectly observed by the spouses, incentive compatibility requires that the sharing rule assign more resources to private consumption than to public goods (relative to the public information case) and that private consumption be more sensitive than the public good to particular income realizations. Intuitively, this reduces the incentive for the spouses to hide part of their income for their private consumption (Doepke and Tertilt 2016).

The existence of allocations satisfying constraints of incentive compatibility, participation, and budget balance is not guaranteed, in particular when incomes are highly volatile. When such allocations do not exist, it is a priori not entirely clear which model is the most appropriate, even though a fully non-co-operative approach appears the most plausible alternative.[28]

7   The role of norms and traditions

In their seminal paper, Lundberg and Pollak (1993) develop the idea of separate spheres in the marriage, whereby social norms determine separate sets of goods—that is, the 'spheres'—to which each partner contributes on his/her own.

> Gender casting, for instance, is common in many societies whereby certain tasks are reserved for women while others are reserved for men. Social roles may also be assigned to children, or to daughters-in-law, etc. By making men and women complementary in the tasks reserved to them, societies may seek not only to reduce haggling but also to make men and women necessary to each other and thus to reduce the risk of divorce. (Fafchamps and Quisumbing 2007)

Attributing separate spheres to spouses in the household creates complementarities between them that facilitate co-operation and reduce the scope for marriage dissolution.[29] In a similar spirit, restrictive practices in religious and social groups have been shown to support co-operation by making interaction with external parties less attractive (Iannaccone 1992; Potomos and Truyts 2016).

In patriarchal societies, social norms or legal constraints allocate most of the decision power in the husband's favour.[30] In such situations, the household can be viewed as a single economic agent, whose decisions are efficient. The unitary model applies, and the resulting distribution of resources

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[28] Truthful revelation can be achieved by a revelation mechanism à la Groves-Clarke which requires full commitment and is not budget-balanced.

[29] As argued by Francois (1998), even if both spouses have identical characteristics ex ante and there is no ex ante discrimination, norms of gender roles can spontaneously emerge as a result of market forces. In a model where some effort must be spent in household tasks, he shows that gender can be used by employers as an indicator of the expected amount of effort a worker will devote to his/her workplace. By allocating more effort in the household at the expense of the workplace, a spouse of a particular gender gets lower return on the labour market, and the market adjusts by systematically offering higher wages to workers of the other gender. The equilibrium is characterized by ex post gender discrimination, based on employers' expectations, which themselves result from decentralized decisions taken by the workers.

[30] Patriarchal societies are still a dominant feature of most developing countries today, not only in Africa and the Middle East but also in Asia and Latin America. Moreover, they have been a hallmark too of developed countries such as those of Western Europe, in their past and even most recent histories. Patriarchal norms and attitudes persist even in supposedly 'non-gendered' societies, such as the US. They result in higher divorce rates for couples in which the woman is the main income earner. They also lead to worse marriage prospects among highly educated women (Bertrand et al. 2015, 2016).

in the household is highly unequal. However, it is not clear that, by drastically reducing the within-marriage utility of the wife, such norms will necessarily lead to an efficient and non-conflictual outcome. By being close to her reservation utility, the wife may be tempted to engage in non-co-operative behaviour during marriage, since she has very little to lose anyway.[31]

These unbalanced outcomes could in principle lead to more frequent divorces or separations, the other 'non-co-operative' option. It is, however, evident that it is precisely in these societies that access to divorce, or remarriage, is hardly an attractive option for women, because of the legal restrictions and the social stigma they involve. Thus, the institution of the bride price is often re-interpreted as a tool limiting the outside option of women, as families are expected to reimburse the price in the case of divorce.[32] In the terms of the collective model, these constraints simply reduce the outside options of the wife, thereby reducing her share in the collective surplus. In this way, the unequal distribution of resources within marriages is simply the result of an unequal social or legal determination of the outside options.

Besides divorce laws, the norms defining inheritance practices, occupations, or land rights are particularly relevant, as they typically vary by gender. While these variations are usually to women's disadvantage, several reforms in favour of women's rights have been implemented recently, particularly with respect to inheritance law (e.g. in India in 1994, Benin in 2002, Ghana in 1985, Congo in 1987, etc.). These recent changes can in principle be used to identify the causal impact of discriminatory norms, as done by La Ferrara and Milazzo (2017).[33]

Interestingly, it is not always clear that legal reforms apparently favourable to women necessarily increase women's welfare, at least in the short run. For instance, the aforementioned paper by Anderson and Genicot (2015) precisely looks at the negative consequences for women of reforms to inheritance law in their favour. Moreover, such reforms take place in ambiguous legal environments characterized by legal pluralism, where rules derive from multiple and possibly conflictual sources (Platteau and Wahhaj 2014). The uncertainty thus generated clearly creates costs in household negotiations, as disagreeing spouses refer to conflicting rules to assess their positions (see, e.g., Lagoutte et al. 2014 for a detailed analysis of the interaction between divorce laws, traditional rules, and religious leaders in Africa).

It is likely that poverty exacerbates the impact of gender-biased norms and further deteriorates women's position in families. For instance, poverty is associated with early marriages (see e.g. Corno and Voena 2016;[34] Hoogeveen et al. 2003), with lasting consequences for women's welfare such as early pregnancy or school drop-out. While these decisions lead to imbalanced outcomes, they can still be conceived of as individually efficient, but it is not clear that they are socially efficient. First, it is not clear that poor parents who decide to marry their daughter too early correctly internalize its impact on her future bargaining position or on the total surplus that can

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[31] Note that, if the head of the household is altruistic enough, the fact that the other members may behave non-co-operatively does not necessarily create inefficiencies, as follows from the Rotten Kid theorem.

[32] This is the case, for instance, among the Fang ethnic group in Equatorial Guinea, in which a woman is expected to return the goods initially paid to her family, and can be put in prison if she fails to do so. In Uganda, a recent controversy arose nationwide about the obligation put on women to reimburse their bride price in the case of divorce.

[33] According to La Ferrara and Milazzo (2017), the matrilinear Akan group in Ghana did not traditionally allow male descendants to inherit land. They show that, by exploiting a legal change that introduced minimum quotas of land for each descendant, Akan males were typically compensated by being more educated, as compared to males of other ethnic groups.

[34] This finding is true for societies in which bride price is prevalent. Otherwise, in the presence of dowry, Corno et al. (2016) show that bad weather shocks increase the age at marriage of girls.

be generated in the household. Also, it is not clear that the newly-weds correctly internalize the long-run consequences of early pregnancy for their children in terms of health or cognitive abilities.

Following Boserup (1970), economists have recently explored the idea that gender-based norms are determined by the material conditions of the environment. As argued by Mikkola (2005: 18):

> Dowries were typical for the Eurasian monogamous marriage systems, while bride-prices are practiced in Africa, where polygyny is permitted and practiced. An explanation for the differing practices is given from the relative scarcity of land and labor. In Africa labor was traditionally the scarce resource, and consequently women were valued for both their productive and reproductive capabilities. This may have led to the practice of bride-price. In Eurasia, where land was in short supply, women were primarily valued for their reproductive ability and a dowry system was common.

Along the same lines, Alesina et al. (2013) argue that agricultural societies that traditionally rely on human strength (typically ploughing) tend to assign more rights to men. As argued in the anthropological literature, dowry payments are also more likely.

Finally, the collective model has been developed with the nuclear household as the basic unit of analysis. It is not clear to what extent it applies to an extended household, which is the basic social unit in many developing economies, because of either polygamy or sibling and inter-generational co-residence. For instance, according to the World Family Map (2015), the percentage of children living in extended families exceeds 50 per cent in countries such as India, Nicaragua, Columbia, Congo, South Africa, and Turkey. Extended families imply multiple decision-makers with various outside options. In her well-known paper, Duflo (2003) illustrates the role grandparents can play in education decisions in South Africa. With respect to the collective model, this multiplicity raises several issues.

First, coordination may be harder to achieve among all members in the family. Thus, in allowing various coalitions to emerge, there may not exist an obvious co-operative solution and the core may be empty.[35] Moreover, punishment strategies may be harder to implement or less effective, as they may also hurt other members of the family. Extended families also tend to exacerbate information and monitoring problems, while they probably provide a better risk-pooling institution (for a recent analysis of these trade-offs in the context of collective farms in Mali, see Delpierre et al. 2012). Finally, altruism is typically not symmetric under polygamy or co-living arrangements with in-laws. For instance, Pitt et al. (2006) show how, in multi-generational households in Pakistan, the welfare and health of young mothers is negatively affected by their co-residence with their mother-in-law.[36] Relatedly, Grogan (2007) measures the positive impact on educational achievements of being part of a nuclear household compared to being part of a three-generational household in Tajikistan, suggesting a causal mechanism between patri-locality and poverty.

Among polygamous households, there is also some evidence of non-co-operative behaviour among co-wives when it comes to savings or fertility, even if they may co-operate in other spheres such as land cultivation or child-raising. Rossi (2016) describes how, in Senegal, co-wives compete in taking fertility decisions to attract their husband's favours (see also Lambert and Rossi 2016 for

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[35] As a matter of fact, the collective model naturally focuses on allocations that survive unilateral deviations.

[36] The mechanism in this situation is based on the asymmetric allocation of household tasks, which involves severe exposition to indoor air pollution.

remarried divorcees). Relatedly, Boltz and Chort (2015) shows how married wives who are under the risk of polygamy tend to accumulate private savings to foster their outside option, but also to reduce their husband's ability to choose a new wife.

While the collective model can in principle be extended to accommodate several members, the arguments above call into question its relevance for extended households. In societies in which nuclear families do not prevail, the application of the collective model requires the definition of the pertinent observation unit, which is not obvious and restricts the external validity of the exercise and its relevance for policies. For instance, applying the collective model to 'well-defined' nuclear households in South Africa would reduce the number of family units concerned to about one-third of its current number, leaving out the vast majority of extended families or single parents.

8   Conclusions

The collective model provides a significant benchmark, with important implications for poverty measurement and the analysis of the impact on individual welfare of various changes in the economic or institutional environment. However, the empirical literature on intra-household decision making documents a large number of clear departures from first-best efficiency in household decisions in developing countries.

A first set of papers, mentioned in Section 3, provides evidence of limited commitment and partial risk sharing in the household in both developed and developing countries. These behaviours can be viewed as second-best efficient: spouses share resources on the basis of their outside option and their participation constraint. The inefficiencies in consumption documented in the literature fall into this category.

A second set of papers directly shows the existence of behaviours that are incompatible with efficiency: sub-optimal allocation of resources in production,[37] hiding and lying, moral hazard, and domestic violence. Those behaviours are mostly documented in developing countries, suggesting that the conditions necessary to sustain efficiency are harder to satisfy in this context.

As previously discussed, two mechanisms are at play in order to sustain a co-operative outcome in the household: repeated interactions with a punishment threat and other-regarding behaviour within the household. We argue that the ability to punish may be strongly restrained by a larger number of social norms that limit the scope of action of women inside and outside the household and by the limited rights women have in the case of divorce. Moreover, the prevalence of juvenile and arranged marriage, as well as the complex structure of the household in most developing countries, limits the existence of symmetric other-regarding preference.

Most of the existing theoretical works developed in alternative to the collective model, typically based on non-co-operative behaviour, develop limited approaches that focus on specific situations. In this respect, they fail to propose a general framework. One possible research avenue, theoretically explored for instance by d'Aspremont and Dos Santos Ferreira (2014), allows for different levels of co-operation across households and across decisions (see also Chercheye et al. 2015a). One can hypothesize that co-operation problems could be more acute among very poor agents, which makes the issue even more interesting for development economists. Empirically, a framework characterizing varying 'degrees of co-operation' across different households would be

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[37] Production inefficiency could also be interpreted as compatible with second-best efficiency in the presence of market incompleteness and lack of recursiveness of production decisions.

particularly appropriate. Even more interesting would be to relate these degrees to environmental factors and policy changes. This approach has, however, not yet been explored. Alternatively, one could extend the approaches developed in the economics of organization to household negotiations and interactions, for instance by using models of hierarchies and delegations.

Our survey also indicates a number of interesting issues that require a non-co-operative approach and have been overlooked by the literature so far. First, we need to better understand the ways in which irreversible long-term decisions are taken and outside options are determined, both strategically but also through social norms and institutions. Moreover, the mechanisms relating the latter to bargaining processes and outcomes need to be better investigated. Second, we still know relatively little about information sharing in the household, and the relative importance of the different strategies followed to hide income and expenditures. Third, the economic analysis of spousal violence in developing countries, and of its social and economic determinants, is yet to be developed in a systematic way. Finally, too little research is being done on the variety of alternative living arrangements. Of central interest, there is the question of household formation and household splits, given their implications in terms of fertility, child welfare, pressure on natural resources, and risk management.

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