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ABSTRACT

      Two disparate views of the sexual division of labour have dominated the representation of intra-household resource allocations. These *joint* and *separate* interests views differ in their interpretation of the relative roles of men and women, and make different predictions about the extent to which marriage promotes economic efficiency (i.e. maximized household production). Using an experimental "distribution task" stipulating a trade-off between household efficiency and spousal equality in allocating surpluses of meat and money, we examine factors influencing spousal distribution preferences among Tsimane forager-horticulturalists of Bolivia (n=53 couples). Our primary goal is to understand whether and how access to perfectly fungible and liquid resources – which increases with greater participation in market economies – shifts intra-household distribution preferences. We hypothesize that greater fungibility of money compared to meat results in greater squandering of money for individual fitness gain at a cost to the family. Money therefore requires costly strategies to insure against a partner's claims for consumption. Whereas nearly all Tsimane spouses prefer efficient meat distributions, we find a substantially reduced efficiency preference for money compared to meat controlling for potential confounders (adjusted OR=0.087, 95% CI: 0.02-0.38). Reported marital conflict over paternal disinvestment is associated with a nearly 13-fold increase in odds of revealing a selfish money distribution preference. Selfish husbands are significantly more likely than other husbands to be paired with selfish wives. Lastly, Tsimane husbands and wives are more likely than Western Europeans to prefer an efficient money distribution, but Tsimane wives are more likely than Western European wives to exhibit a selfish preference. In sum, preferences for the distribution of household production surplus support joint and separate interests views of marriage; a hybrid approach best explains how ecological-, family-, and individual-level factors influence spousal preferences through their effects on perceptions of marginal gains within and outside the household.

Keywords: Intra-household distribution, sexual division of labour, family, marriage, bargaining, Tsimane

1. INTRODUCTION

Intra-household resource distribution determines energy budgets available for growth, reproduction and survival, and is thus central to understanding trade-offs underlying human life history allocations. The sexual division of labour and resources – perhaps the most basic form of human economic specialization and exchange (Murdock 1949) – is also a highly complex social relationship, entailing frequent cooperation and altruism but also defections and spite. Spouses face numerous barriers to generating economic surplus and allocating resources efficiently among family members, despite generally having more opportunities and willingness to share information than dyads in non-sexual relationships. Barriers include conflicting reproductive interests (Bird 1999; Borgerhoff Mulder and Rauch 2009; Gurven et al. 2009; Maynard Smith 1977; Parker et al. 1972; Smith et al. 2003; Stieglitz et al. 2012a; Stieglitz et al. 2011; Trivers 1972; Winking et al. 2007), asymmetric information and unobservable action (Ashraf 2009; Ashraf et al. 2014; Ligon 2011). These barriers can result in reduced marital quality, verbal and/or physical disputes over appropriate levels of work effort and use of time and resources (Flinn 1988; Hewlett and Hewlett 2008; Stieglitz et al. 2012b), and can contribute to the development and maintenance of patriarchal social norms that reinforce and exacerbate these barriers.

A goal of this paper is to examine factors influencing intra-household resource distribution preferences of spouses using an experimental approach in a small-scale forager-horticultural society, the Tsimane of Bolivia. Given that Tsimane and other subsistence-level societies worldwide are witnessing rapid changes in livelihood and increasing access to cash-based economies, another goal is to examine whether and how spousal resource distribution preferences vary across populations differing in their reliance on cash and the extent to which spousal labour is more substitutable versus complementary. Despite the complexity highlighted above that emphasizes both cooperation and conflict among spouses, two disparate views of the sexual division of labour have dominated the representation of intra-household resource allocations.

According to a *joint interest* view, the origins of the nuclear family are rooted in a sexual division of labour where men hunt wild animals and women gather plant foods (Lovejoy 1981; Murdock and Provost 1973). The pair bond between sexes is viewed as a cooperative endeavour aimed at joint production of altricial offspring, where women "trade" paternity certainty for long-term provisioning and protection by men (Isaac 1978a; Lancaster and Lancaster 1983; Washburn and Lancaster 1968; Wood and Marlowe 2013). Marriage enables men and women to achieve fitness benefits by producing economies of scale such that the production of the pair exceeds the summed production of adults working alone (Gurven and Hill 2009; Gurven et al. 2009; Kaplan and Lancaster 2003). Spouses thus meet consumption demands by drawing from "pooled energy budgets" (Kramer and Ellison 2010; Reiches et al. 2009). This view is analogous to the "unitary" model of household decision-making in economics, where the household behaves as if it were a single unit with a single set of distribution preferences. Spouses either have identical preferences or only one spouse makes allocation decisions (Becker 1991). Because partner-specific labour proceeds are pooled in the joint budget, efficient intra-household labour allocation should be that which maximizes joint production; resource distributions should be efficient regardless of whether a husband or wife produces the resource.

An alternative *separate interests* view posits that fitness gains from economic efficiency alone cannot account for marriage. According to this view men's work effort in foraging societies is not primarily motivated by a desire to provision offspring because men's game acquisition is unpredictable or unreliable, and once acquired, game is shared widely with non-household members and not reciprocated (Hawkes 1991; Hawkes and Bliege Bird 2002). This view proposes that men hunt because of the desirable social attention and mating

benefits that come from providing meat, which is a widely shared public good. Because
hunting is difficult and requires substantial skill, strength, endurance and knowledge,
successful hunting is difficult to fake and serves as an honest signal of underlying male
quality to potential allies, mates and competitors (Bird et al. 2001). This signalling is
effective because visibility of returning with a kill is high, and group members pay careful
attention to men's hunting returns in order to obtain shares for themselves. Here men's work
is viewed as a form of mating effort or status competition, rather than familial provisioning,
so marriage is interpreted as a convention of publicly recognized property rights designed to
reduce male mating competition, rather than a cooperative union designed to achieve
economic efficiency. Women therefore choose good hunters because of their presumed
genotypic or phenotypic quality, not because of their willingness to provide household
resources. Intra-household distributions are thus expected to be inefficient (e.g. characterized
by a spouse's selfishness) due to imperfect enforceability of marital contracts or
informational asymmetries among spouses (Bloch and Rao 2002; Ligon 2011; Lundberg and
Pollak 1993; Mazzocco 2007).

Joint and separate interests views differ in their interpretation of the relative roles of
men and women in the energetics of reproduction and in the life history adaptation. While it
is often acknowledged that household decision-making contains elements of both joint and
separate interests views, empirical studies usually conclude by supporting one view or the
other. The topic has thus generated much controversy in anthropology, with much of the
debate focusing on production decisions (e.g. why hunters target large vs. small game) and
less emphasis on how spouses distribute production surplus. However, hybrid approaches
containing elements of both joint and separate interests views have a long history in
household economics (Bobonis 2009; Chiappori 1988; Manser and Brown 1980; McElroy
and Horney 1981). A key tenet of a joint interest view is that a sexual division of labour and
resources characteristic of marriage facilitates efficiency and maximization of household
economic surplus. Yet an inefficient non-cooperative equilibrium within marriage can still be
more advantageous (in terms of utility or fitness) for both spouses than divorce, as supported
by experimental research indicating that spouses are willing to reject joint surplus
maximization for greater personal control over resources (Ashraf 2009; Mani 2011; Munro et
al. 2006), and the observation that spouses pool income for some but not all categories of
consumption (Phipps and Burton 1998). But even if divergent spousal interests are explicitly
acknowledged (Almas et al. 2016; Anderson and Baland 2002; Basu 2006; Duflo and Udry
2004; Gurven et al. 2009; Heath and Tan Under review; Lundberg and Pollak 1993; Schaner
2015), the question of whether spousal preferences yield efficient outcomes, and what factors
contribute to household inefficiency remain unresolved. Answering these empirical questions
is essential to advance theoretical models of household behaviour (Del Boca and Flinn 2014;
Munro et al. 2006).

Field experiments are uniquely poised to offer insight into these questions by
manipulating intra-household distribution choices to reveal spousal preferences. Experiments
provide novel inferences about whether and why preferences deviate from efficiency in ways
that prior observational studies cannot. Field experiments also permit more controlled
comparisons of intra-household dynamics across diverse societies.

1.1. The distribution task

Here we assess Tsimane spousal preferences regarding intra-household allocations
using a "distribution task" (Beblo et al. 2015; Cochard et al. 2014) among spouses from the
same marriage. In this task spouses must decide between two allocations of a resource
between themselves and their partner. Each of five decisions provides the choice between
option A (equally divided between partners) and option B (unequal division between partners

201 but always efficient in terms of maximizing joint payoffs). Spouses thus face a trade-off
202 between equality and efficiency (see Table 1). This equality-efficiency trade-off characterizes
203 various allocation decisions regarding food, money and other household resources (Behrman
204 1988; Engle and Nieves 1993; Farmer and Tiefenthaler 1995). The task is not designed to
205 examine spousal production decisions per se (e.g. who acquires what), but rather how spouses
206 distribute production surplus. The task permits identification of spouses who maximize joint
207 payoffs (i.e. efficient), maximize their own payoff (extreme selfish), maximize their partner's
208 payoff (extreme altruistic), or who are concerned with partner equality (inequality averse).
209 No communication between partners is allowed during this one-shot exercise and one cannot
210 deduce a partner's revealed preferences. While spousal interactions are obviously repeated
211 and communication is possible outside of the experiment, many household decisions are
212 made independently and provide incentives to free-ride on a partner. It must also be noted
213 that participants have the possibility to choose the unequal but efficient payoff (option B) and
214 then pool and distribute this payoff equally with a partner after the task. Inequality aversion
215 thus does not necessarily prevent one from choosing option B, and the number of those
216 choosing option A is only a lower bound estimate of the number of inequality averse
217 participants. If pooling and distribution of payoffs after the task is in fact common among
218 spouses, then one would expect a bias toward maximizing joint payoffs.
219
220   Insert Table 1 here
221
222   Individual preferences elicited by this task help determine the extent to which these
223 patterns are consistent with joint and separate interests views, or a hybrid approach. A joint
224 interest view predicts that spouses should always prefer to maximize joint payoffs (option B)
225 regardless of whether inequality favours a husband or wife because partner-specific incomes
226 are pooled. A separate interests view suggests that personal gains matter more than the pair's
227 total joint gains. A "selfish" individual should choose option A for decisions where their own
228 payoff is smaller than their partner's (Table 1A, questions 1-2), and choose option B when
229 inequality favours oneself (Table 1A, questions 4-5). An "altruistic" individual should do the
230 opposite. An "inequality-averse" individual should always choose option A. Any
231 combination of pure individual preferences is possible. Degree of selfishness is related to the
232 number of A choices in questions 1-2; degree of altruism is related to the number of A
233 choices in questions 4-5. A separate interests view predicts that conditions increasing spousal
234 conflict over optimal levels of household investments should promote inefficient, particularly
235 selfish distribution preferences. A hybrid approach predicts that evidence consistent with both
236 joint and separate interests views will be found, and that distinct preferences may be
237 explained by factors impacting perceptions of gains within and outside the household, and
238 relative bargaining power (Heath and Tan Under review).
239
240 *1.2. Study goals and predictions*
241   We determine spousal distribution preferences for two resource types, meat and
242 money, which have been central to economic exchange throughout human history and thus
243 central to models of intra-household distribution in anthropology and economics. Money,
244 unlike meat, serves as an abstract store of value, can be easily converted into other valuable
245 goods or services, can be easily divided into small or large values, and has only recently (past
246 few millennia) emerged in human economic exchanges (Davies 1994). The greater fungibility
247 and liquidity of money have been linked to diminished risk-seeking behaviour than when
248 food is used as experimental currency (Rosati and Hare 2015). Because money is more
249 fungible, storable, and easier to conceal than meat, it can more easily be squandered (e.g. on
250 other sexual relationships, luxury goods, recreation) by a partner at substantial cost to the

251 family, and our prior work suggests that Tsimane husbands' diversions of sporadic wages
252 away from the family for individual fitness gain (one indicator of paternal disinvestment) are
253 a principal cause of verbal disputes and physical violence among spouses (Stieglitz et al.
254 2011). The Tsimane represent an informative case study, relative to fully market-integrated
255 populations, of how reliance on a mixed economy based primarily on subsistence but with
256 increasing market involvement and reliance on cash can influence intra-household
257 distribution preferences. Understanding variability in these preferences informs evolutionary
258 economic models of the family by examining their basic predictions (e.g. whether household
259 production surplus is maximized), and builds on a growing body of psychological and
260 experimental economic research into how different resource types influence decisions
261 underlying production and distribution (Rosati and Hare 2015).
262   We hypothesize that greater resource fungibility increases paternal disinvestment,
263 thus favouring strategies employed by either spouse to protect fungible resources against a
264 partner's claims for consumption (Anderson and Baland 2002). If these strategies are
265 internalized then we should expect revealed preferences in the distribution task for equality
266 over efficiency for fungible resources that are most vulnerable to exploitation by either
267 spouse. We test whether greater resource fungibility (i.e. money vs. meat) is associated with
268 reduced preference for joint efficiency (P1). This prediction is inconsistent with a joint
269 interest view that spouses are unequivocally motivated to maximize household production
270 surplus.
271   In the distribution task distinct motivations can underlie one's preference for spousal
272 equality (i.e. household inefficiency) including inequality aversion, selfishness (if efficiency
273 entails less for oneself than equality), altruism (if efficiency entails less for one's spouse than
274 equality) or irrationality (Table 1). These alternatives highlight the fact that equal but
275 inefficient distribution preferences may still exist in harmonious marriages where spousal
276 interests converge. To tease apart these alternatives and examine whether potentially
277 divergent spousal interests affect revealed preferences, we test whether for a perfectly
278 fungible resource like money, lower self-reported marital quality is associated with inefficient
279 distribution preferences (P2). Specifically, reported marital conflict over paternal
280 disinvestment – indicating differential consumption choices between spouses – should be
281 associated with selfish money distribution preferences by either spouse (P2a).
282   In a stable marriage market, where spouses provide complementary investments,
283 resource distribution preferences of spouses should be correlated (Becker 1991) such that
284 efficient spouses are assortatively paired. This assortment may reflect either one's preference
285 for a partner with similar characteristics, consensus preferences in the market for desired
286 characteristics (e.g. with desirable spouses choosing each other, and less desirable spouses
287 "settling" for each other), propinquity effects, or convergence (i.e. the tendency for spouses
288 to become more similar over time). We thus test whether distribution preferences of spouses
289 are correlated (P3).
290   Lastly, we hypothesize that population-level differences in economic organization and
291 the nature and degree of spousal interdependence are associated with population-level
292 differences in revealed distribution preferences. We test whether Tsimane exhibit a greater
293 preference for efficiency relative to a comparative Western European sample (P4). Tsimane
294 reliance on a mixed hunting/foraging/horticultural economy coupled with their high fertility
295 favours greater sex-specific economic specialization, generating a complementarity where
296 hunted foods complement gathered/farmed foods, and men's focus on hunting increases
297 women's time spent in childcare or subsistence efforts compatible with childcare (Kaplan and
298 Lancaster 2003). In contrast, competitive labour/consumer markets and greater labour market
299 participation and income earned by women can reduce the value of a sexual division of
300 labour by making men's and women's parental investments more substitutable and less

complementary. When investments are less complementary and more substitutable, as more commonly occurs in market-integrated Western Europe versus subsistence-level Tsimane, then spousal resource distribution preferences are expected to be less efficient (all else equal).

2. MATERIAL AND METHODS

2.1. Study population

Tsimane are semi-sedentary forager-horticulturalists living in the Bolivian Amazon. They inhabit 90+ villages ranging in size from ~50–550 individuals. They cultivate plantains, rice, corn, sweet manioc and other crops in small swiddens, and regularly fish and hunt. These foods comprise >90% of the diet, with the remainder purchased from market stores or obtained from trade with itinerant merchants. Tsimane live in extended family clusters, where the majority of food and labour sharing occurs. Modern contraceptives are rarely used and total fertility rate is high (9 births per woman) (Kaplan et al. 2015; Mcallister et al. 2012).

There are no formal marriage ceremonies and a couple is considered married when they sleep together in the same house. Mean±SD age at first marriage for men and women in the present sample is 20.8±2.9 and 17.4±4.0, respectively. Post-marital residence rules are flexible but emphasize matrilocality early in marriage and patrilocality thereafter. Tsimane marriages are generally stable: men and women aged 45+ report a mean of 1.3 lifetime marital partners (Stieglitz et al. 2012a). Polygyny is infrequent (<10% of married adults) and usually sororal (Winking et al. 2013). Important characteristics of long-term mates for both sexes include industriousness and a good character (Gurven et al. 2009). Despite a lack of patriarchal norms and limited residential privacy, physical wife abuse is not uncommon and when it occurs is often triggered by verbal disputes over paternal disinvestment (Stieglitz et al. 2012b; Stieglitz et al. 2011). Within marriage there is a belief that a husband's infidelity leads to his children's sickness and potentially death.

''Modernization'', defined here as a trend toward urban residence and participation in the market (cash) economy, takes several forms: visits to the closest market town (San Borja), sale of horticultural and other products, itinerant wage labour (e.g. with ranchers) and schooling. Most wage opportunities are only available to men, are low income and sporadic. Many villages now have elementary schools (up to 5th grade) taught by bilingual (Spanish-Tsimane) teachers, many of whom are Tsimane trained by missionaries. Secondary schools now exist in several larger villages, and young Tsimane adults are starting to become high school graduates. Generally, however, school attendance rates are low or inconsistent and adult literacy rate is low (34% in the present sample). Fluency in the Tsimane language (which is unrelated to Spanish) is universal as Tsimane remains the native language; 39% of adults (76% male) are fluent in Spanish. Mean±SD years of schooling for men and women is 6.6±4.7 and 3.8±3.8, respectively.

2.2. Experimental assessment of spousal resource distribution preferences

A "distribution task" consisting of 15 questions was completed by husbands and wives from the same monogamous marriage (n=53 couples). Neither literacy nor Spanish fluency was required to participate, as respondents could either state their response and/or point toward a relevant image depicted on a laminated card to respond (see Electronic Supplementary Material [ESM] for additional experimental details including examples of images presented to respondents [Figure S1]). The experiment was conducted in two villages by JS and an assistant in the Tsimane language to increase informants' comfort levels. Basic numeracy was required to participate, and all respondents possessed this ability.

For each question, a respondent selects one of two options specifying his/her preferred allocation of a resource between him/herself and a partner (see Table 1 and (Beblo et al. 2015; Cochard et al. 2014) for details on the original implementation of this task among

351 French and German couples). Tsimane respondents were queried about their distribution
352 preferences for meat (dried and fresh) and money (Western Europeans were only queried
353 about money). The task thus consisted of three rounds with five questions per round: round
354 one choices concerned actual shares of dried meat, where responses determined participant
355 compensation (see ESM and this section, below); round two choices concerned hypothetical
356 shares of money (unincentivized); and round three choices concerned hypothetical shares of
357 fresh meat (unincentivized). Round three was included to assess whether incentivizing
358 options affects preferences for the same resource type (by comparing round three vs. round
359 one preferences), and serves as a more natural comparison of preferences across resource
360 types (by comparing round three vs. round two preferences, neither of which were
361 incentivized). Across rounds, values of meat (dried or fresh) and money presented to
362 respondents in each image are equivalent (e.g. 0.67 kg of actual dried meat = 30 Bolivianos
363 [Bs] depicted in the image = 23.6 oz. of fresh meat depicted in the image). Any difference in
364 preferences for meat versus money therefore cannot be attributed to a difference in value
365 across resource types. Rounds, questions and options are presented in random order (i.e. not
366 as shown in Table 1).

367   To recruit study participants, a radio message[1] was first presented in the Tsimane
368 language that briefly introduced study objectives and logistics (e.g. participating villages,
369 sampling restriction to married adults only, participant compensation). The following day the
370 researchers held a village meeting, during which study objectives and protocols were
371 explained in greater detail and any married meeting attendee was invited to participate with
372 his/her spouse. The first village meeting was well attended since it was also held,
373 coincidentally, to discuss plans for well construction by an independent engineering
374 organization. High meeting attendance increased the pool of potential study participants, and
375 limited self-selection by demographics, schooling and other factors (e.g. marital quality).

376   During both village meetings and individual trials we explained to participants that
377 they would receive two pay-outs of dried meat: 1) a show-up gift of 0.67 kg for each
378 participant (worth 30 Bs or $4.30 USD), and 2) up to another 0.67 kg (but as little as 0 kg)
379 based on their distribution task responses in round one. We explained that compensation
380 would be provided after all couples in the village participated. We selected dried meat as
381 compensation because meat is always in high demand, regardless of market involvement, and
382 because it is storable (~1 month). Participants thus did not feel pressure to consume the meat
383 immediately and could freely choose whether and how to distribute it. Money was not used as
384 compensation to avoid commodification and to minimize sample bias (e.g. money may
385 appeal more to individuals with greater market involvement, thus potentially biasing
386 participation rates). The total value of compensation per respondent was equivalent to one-
387 half to one day's worth of wage labour, as has been used in economic experiments worldwide
388 (Henrich et al. 2005). To incentivize decisions and ensure anonymity, one response in round
389 one for each couple was randomly selected for the second pay-out. This pay-out was
390 determined by two dice rolls: one to select whether the husband's or wife's round one
391 response would be used, and another to choose the response. We repeatedly emphasized that
392 responses were private and that a spouse would have no opportunity to discover one's own
393 responses even after receiving compensation. Each participant received both pay-outs of
394 dried meat simultaneously (i.e. in the same plastic bag), and could not deduce a partner's
395 responses from the weight of the bag. During the experiment participants could not
396 communicate with others, including spouses.

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[1]A former Protestant Mission maintains a radio station in San Borja which communicates messages to
listeners at fixed hours each day. Most Tsimane hear these messages (or have a neighbour who hears
messages and then informs non-listeners) on their personal home radios.

Distribution task instructions were translated into Spanish and then Tsimane by a bilingual Tsimane research assistant and JS. To test translation accuracy the Tsimane instructions were then back-translated into Spanish by a different Tsimane researcher, and discussions among the two Tsimane and JS ensued until an effective translation was found. Considerable care was taken to explain the instructions simply, both verbally and using the laminated cards (see ESM). After explaining instructions to each respondent in private, the respondent was asked two questions to test their comprehension. All respondents correctly answered both questions before beginning the study. Respondents were informed that there was no right or wrong way to complete the task, and were repeatedly encouraged to ask questions if anything was unclear. To further ensure comprehension we explained to participants how a given resource was actually distributed between spouses while the participant was presented with each question (15 questions*2 options/question*2 partners/option=60 explanations/respondent). This combination of simultaneous visual presentation and verbal explanation ruled out the possibility that individuals were responding by rote without actually considering the efficiency-equality trade-off. Indeed, for each question most participants were observed to be correctly "doing the math" prior to responding. Participants were encouraged to carefully consider each option before responding, and to use as much time as needed. Once a response was provided the participant was asked if he/she was certain, while also being reminded of the implications for not having chosen the alternative. Participants were also asked to explain their responses using an open-ended format (i.e. "Why did you choose option A and not B?"). From these open-ended questions it was clear that respondents understood the task and actively considered the alternative on a question-by-question basis. The experimenter looked only at the laminated card (or bowls of dried meat) when participants responded to avoid inadvertent social cuing.

To gain insight into respondents' task perception, respondents were asked post-experiment whether task decisions resembled those encountered in daily life (unrealistic=0, slightly realistic=1, realistic=2) and whether decisions were difficult (easy=0, slightly difficult=1, difficult=2). Over half of respondents (62% men, 55% women) perceived decisions as realistic; 68% of men and 66% of women perceived decisions as easy.

2.3. Self-reported marital quality and socio-demographics

After the experiment, participants were queried about the frequency of serious verbal disputes with their spouse in the past three months (0=none, 1=once per month, 2=once per week, 3=several per week, 4=daily). Participants then reported, without prompts, the cause of their most frequent serious verbal disputes in the past three months. This open-ended, free-listing technique was used because it does not force respondents into selecting preconceived categories and allows for a more thorough account than otherwise possible. We focused on the most serious disputes because we reasoned that they would provide the most accurate recall. No restriction was placed on the number of disputes that one could mention. After each dispute was reported, we systematically queried participants about the relevance of other potential causes (Stieglitz et al. 2012b; Stieglitz et al. 2011). For example, if a wife reported a dispute over a husband's excessive alcohol consumption (one indicator of paternal disinvestment), we then asked the wife whether this dispute was also caused by the husband's neglect of particular subsistence tasks, childcare or domestic tasks, the husband's excessive social visitation, or other causes (see ESM for additional details).

Age and marital duration were estimated based on a combination of methods described elsewhere (Winking et al. 2013). Parity, schooling, Spanish fluency and literacy were assessed during annual census updates conducted by the Tsimane Health and Life History Project. After the experiment husbands were asked about their wage labour

446   involvement (i.e. time elapsed since the last wage opportunity, and daily earnings from this
447   opportunity) to gain further insight into market participation.
448   Mean±SD age of husbands and wives is 34.8±12.2 and 30.9±12.0, respectively.
449   Mean±SD marital duration is 12.4±10.5 years (range: 1 month-46 years), and mean±SD
450   number of joint children is 3.2±3.5 (range: 0-13).
451   Procedures for all methods were approved by the UNM Human Subjects Review
452   Board, Tsimane government, village leaders and study participants.
453
454   *2.4. Data analysis*
455   Outcomes include responses to individual distribution task questions, and aggregate
456   responses in a given round (see electronic appendix). The latter are used to classify
457   respondents as follows: always maximize joint payoffs (efficient), always maximize a
458   partner's payoff (extreme altruist), or always maximize own payoff (extreme selfish). To
459   classify other respondents whose aggregate preferences are not represented, we calculate a
460   ratio of "own payoff" to "couple payoff" summed over the five questions in a round. We
461   calculate for the five questions the sum of own payoff divided by the sum of couple payoffs,
462   which corresponds to the share of the total payoff retained by the respondent. If this share
463   equals 0.5 then respondents are classified as "symmetric-inequality averse" (i.e. their
464   preference is symmetric around question #3); if this share is greater (or lower) than 0.5
465   respondents are classified as "asymmetric selfish" (or "asymmetric altruist"). Respondents
466   who did not select option B for question #3 are classified as "irrational".
467   We utilize both within- (P1) and between-subjects (P2-P4) comparisons to test
468   predictions. Chi-square and Mann-Whitney *U* tests are used for descriptive analyses.
469   Generalized estimating equations (GEE) analyses are used to model effects of resource type
470   on the probability of choosing an efficient distribution. This method accounts for the
471   correlated structure of a dependent variable arising from repeated measures on the same
472   individual (Liang and Zeger 1986). There is no standard absolute goodness-of-fit measure
473   with the GEE method (Pan 2001), which does not make distributional assumptions and uses a
474   quasi-likelihood rather than full likelihood estimation approach (see Pan 2001 for a general
475   formulation). Logistic regression is used for between-subjects analyses to model the
476   probability of being classified as efficient (or selfish, etc.) based on aggregate preferences. A
477   stepwise approach is used to fit regression models. Parameter estimates are reported as odds
478   ratios (ORs) or predicted probabilities. GEE and logistic regressions assume that between-
479   subjects measurements are independent, which may not be realistic if spousal distribution
480   preferences are correlated (P3). We therefore repeated analyses after including a random
481   intercept for couple ID in mixed effects logistic regressions, although couple ID did not yield
482   a significant variance estimate or affect results. Fixed effects of village ID and distribution
483   task question number (indicating degree and direction of inequality) were also not significant
484   and omitted. For all continuous predictors we tested for non-linear associations using
485   quadratic or cubic terms. To test for population-level differences in money distribution
486   preferences we merged French and German samples into one "Western European" sample;
487   differences between French and Germans have been reported elsewhere (Beblo et al. 2015)
488   and are not of primary interest here.
489
490   **3. RESULTS**
491   *3.1. Classification of Tsimane spouses based on aggregate distribution task preferences*
492   No respondent is classified as "extreme selfish" or "irrational" for either resource type
493   (meat [dried or fresh] or money). When meat distribution options are incentivized (dried
494   meat), all respondents choose efficiency (Figure 1). When meat distribution options are not
495   incentivized (fresh meat), all husbands and nearly all wives (96%) still choose efficiency,

10

496 indicating that incentivizing options does not strongly affect preferences for the same general
497 resource type.
498   For money, most husbands (87%) and wives (70%) choose efficiency. Wives not
499 consistently preferring efficiency are either asymmetric selfish (hereafter "selfish" unless
500 otherwise noted, 13%), asymmetric altruistic (8%), symmetric-inequality averse (hereafter
501 "symmetric", 6%) or extreme altruistic (4%). Selfish wives are more likely than other wives
502 to report a spousal dispute over paternal disinvestment (86% vs. 17%, Fisher's Exact
503 p=0.001) (Table S1), but do not differ from other wives in terms of demographics, indicators
504 of modernization or task perception. Husbands not consistently preferring efficiency are
505 either selfish (6%), symmetric (6%) or extreme altruistic (2%)[2] (Figure 1). Efficient husbands
506 are more likely than other husbands to be fluent in Spanish (63% vs. 29%, Fisher's Exact
507 p=0.096) and earn more per day from their last wage opportunity (mean=68 vs. 57 Bs, Mann-
508 Whitney U p=0.081) (Table S2). Wives are less likely than husbands to choose efficiency
509 (χ^2=4.50, p=0.034, 106 individuals), are more likely to be asymmetric altruistic (Fisher's
510 Exact p=0.059), but are not more likely to be selfish (χ^2=1.77, p=0.184).
511
512   Insert Figure 1 here
513
514 *3.2. Is greater resource fungibility (i.e. money vs. meat) associated with reduced preference*
515 *for joint efficiency (P1)? Yes.*
516   Tsimane respondents selected the inefficient option for 6.1% of observations[3], and
517 90.4% (47/52) of inefficient responses occur with money as the resource type. Probability of
518 choosing efficiency is much lower for money (adjusted OR_{Money}=0.087, 95% CI: 0.02-0.38,
519 p=0.001) after controlling for potential confounders including demographics and indicators of
520 marital quality, modernization and task perception (Table S3). Holding significant
521 confounders constant (at the sample mean), the predicted probability of choosing efficiency is
522 0.99 for meat and 0.92 for money; these probabilities do not change after including fixed
523 effects of village ID and distribution task question number (indicating degree and direction of
524 inequality), which are not significant. Across resource types, inefficient responses of both
525 husbands and wives are equally prevalent based on whether a husband or wife receives the
526 greater resource share (i.e. half of inefficient responses [husbands: 8/16, wives: 18/36] occur
527 when a wife receives the greater share, and half occur when a husband receives the greater
528 share) (Figure S2). Resource type effect size is therefore similar if regressions are restricted
529 to question #'s 1-2 (inequality favours wife) or to question #'s 4-5 (inequality favours
530 husband). Inclusion of separate interaction terms between resource type and either age, sex or
531 number of joint children does not yield significant parameter estimates.
532
533 *3.3. Is lower self-reported marital quality associated with inefficient – particularly selfish –*
534 *money distribution preferences (P2)? Yes.*
535   Inefficient preferences can result from selfishness, altruism or inequality aversion, but
536 analyses in section 3.2 do not distinguish between these alternatives. To test P2 it is therefore
537 necessary to conduct between-subjects analyses using aggregate responses.

---

[2]Total≠100 due to rounding.
[3]For consistency the sample is restricted to distribution preferences for fresh meat and money (both of
which are unincentivized and elicited using hypothetical resources); preferences for dried meat (which
are incentivized and elicited using the actual resource) are omitted from analyses. Moreover, for each
resource type responses to question #3 (where there is no efficiency-equality trade-off) are omitted
because no respondent selected the irrational option A. The analysis sample is thus 848 observations
(2 resource types [fresh meat and money]*4 questions/type*106 respondents).

538   Sixty-nine percent of respondents (66% husbands, 72% wives, χ^2=0.396, p=0.529)
539 reported having a serious verbal dispute with a partner in the past three months. Respondents
540 who reported having a dispute are more likely paired with someone who likewise reported a
541 dispute (χ^2=6.324, p=0.012), indicating spousal consistency in reporting. Further, respondents
542 who reported having a dispute over paternal disinvestment (15% husbands, 26% wives,
543 χ^2=2.065, p=0.151) are more likely paired with someone who also reported this same type of
544 dispute (Fisher's Exact p=0.023). Disputes over paternal disinvestment are among the most
545 commonly free-listed disputes by both sexes (Figure S3).
546   As predicted, those reporting paternal disinvestment disputes are more likely to be
547 selfish ($OR_{Disinvestment}$=12.6, 95% CI: 2.93-54.28, p=0.001). Respondents reporting any
548 disinvestment dispute trend toward being less efficient ($OR_{Disinvestment}$=0.38, 95% CI: 0.14-
549 1.07, p=0.067), but this negative effect weakens slightly after including demographic controls
550 ($OR_{Disinvestment}$=0.47, 95% CI: 0.16-1.39, p=0.172, controlling for age, age^2 and sex).
551 However, respondents reporting any recent dispute are not less likely than other respondents
552 to choose efficiency, but trend toward being less altruistic after controlling for potential
553 confounders (adjusted $OR_{Dispute\ Reported}$=0.258, 95% CI: <0.01-2.02, p=0.1) (Table 2). No
554 indicator of modernization or task perception is significantly associated with aggregate
555 distribution task preferences in bivariate or stepwise regressions, thus ruling out these
556 potential confounders. The fact that preferences for inefficiency and greater selfishness are
557 associated with paternal disinvestment disputes – but not any dispute (Table 2) – reduces the
558 possibility that other types of marital conflicts influence this association. Indeed, in separate
559 analyses (not shown) aggregate distribution task preferences among respondents reporting
560 disputes other than paternal disinvestment (e.g. over a wife's "neglect" of domestic work, see
561 Figure S3) are not significantly different from respondents reporting no such disputes. We
562 find no significant interaction effect of sex and dispute reports (over paternal disinvestment
563 or other causes) on preferences. Similarly, no indicator of modernization interacts with
564 dispute reports to affect preferences.
565
566   Insert Table 2 here
567
568 *3.4. Are distribution preferences of spouses correlated (P3)?* Partially.
569   To test P3 we restrict analyses to money distribution preferences given limited
570 variance in meat distribution preferences. Seventy-four percent of efficient husbands (n=46)
571 are paired with efficient wives, compared to 33% of selfish (n=3), 0% of altruistic (n=1) and
572 67% of symmetric husbands (n=3) (Figure 2). Efficient husbands are less likely than other
573 husbands to be paired with selfish wives ($OR_{Husband\ efficient}$=0.127, 95% CI: 0.02-0.78,
574 p=0.026, n=53), and efficient husbands are more likely (albeit not significantly) paired with
575 efficient wives ($OR_{Husband\ efficient}$=3.778, 95% CI: 0.74-19.38, p=0.11). Sixty-seven percent of
576 selfish husbands are paired with selfish wives, compared to 9% of efficient, 0% of altruistic
577 and 33% of symmetric husbands (Figure 2). Selfish husbands are more likely paired with
578 selfish wives ($OR_{Husband\ selfish}$=18.000, 95% CI: 1.38-235.69, p=0.028). These results – while
579 based on a small sample size – do not change controlling for schooling of each spouse, which
580 is moderately positively correlated (Pearson r=0.37, p=0.006). Results also do not change
581 controlling for task perception of each spouse, which is positively correlated for one but not
582 both indicators (agree task easy: χ^2=4.02, p=0.045; agree task realistic: χ^2=0.29, p=0.591).
583 Spousal distribution preferences are not more strongly correlated with increasing martial
584 duration, suggesting minimal/no convergence in preferences over time.
585
586   Insert Figure 2 here

3.5. Are efficient money distribution preferences more common among Tsimane than Western Europeans (P4)? Yes.

We restrict analyses of P4 to money distribution preferences since Western Europeans were not queried about preferences for other resource types. Tsimane husbands and wives are more likely than Western Europeans to choose efficiency (husbands: 87% vs. 56%, χ^2=15.87, p<0.001, n=209; wives: 70% vs. 53%, χ^2=4.80, p=0.028, n=209) (Figure 3; Table S4). The group-level difference is significant controlling for age and sex (adjusted $OR_{Tsimane}$=2.631, 95% CI: 1.56-4.45, p<0.001, n=418), and is not attenuated after including other demographic covariates (marital duration, spousal age difference or number of co-resident children). Inclusion of a group-by-age interaction term yields a significant parameter estimate (interaction p=0.01, controlling for sex), indicating that Western Europeans but not Tsimane are less likely to choose efficiency with age (Figure S4). Inclusion of additional interaction terms between group and other demographic predictors does not yield significant parameter estimates.

Despite no Tsimane being classified as "extreme selfish", Tsimane wives are more likely than Western Europeans to exhibit selfish preferences (asymmetric selfish or extreme selfish) (wives: 13% vs. 3%, Fisher's Exact p=0.007; husbands: 6% vs. 7%, Fisher's Exact p=0.506). There is a significant group-by-sex interaction effect on the probability of exhibiting any selfish preference (interaction p=0.033, controlling for age) (Figure S5). Inclusion of other demographic predictors as either main effects or interacting with group does not yield significant parameter estimates.

There are no group-level differences in the probability of exhibiting altruistic preferences (asymmetric altruist or extreme altruist) (Figure 3; Table S4). Tsimane husbands and wives are less likely than Western Europeans to prefer a symmetrical distribution (husbands: 6% vs. 20%, χ^2=5.87, p=0.015; wives: 6% vs. 30%, χ^2=12.51, p<0.001). These group-level differences are significant controlling for age and sex (not shown); inclusion of other demographic predictors as either main effects or interacting with group does not yield significant parameter estimates.

Insert Figure 3 here

4. DISCUSSION

Using an experimental approach stipulating a trade-off between household efficiency and spousal equality in distributing production surplus, we find that Tsimane spouses strongly prefer efficient meat distributions. Meat distribution preferences are similar for unincentivized responses (Figure 1), and are consistent with a joint interest view that marriage in small-scale societies achieves economic efficiency and maximization of household production surplus (Isaac 1978b; Kaplan and Lancaster 2003; Lancaster and Lancaster 1983; Lovejoy 1981; Murdock and Provost 1973). The efficiency preference is apparent even though our distribution task does not specify who acquired the resource, which could in principle minimize salience of the perceived benefits provided by sex-specific economic specialization and complementarities between spouses' distinct productive efforts. The fact that Tsimane women in particular prefer household efficiency – regardless of whether a wife or husband possesses meat – is not compatible with a separate interests view that women's mate choice is indifferent to men's willingness to provide acquired game for household consumption.

Consistent with P1 we find a much stronger efficiency preference for meat compared to money, despite the fact that both resources are almost exclusively acquired by men in this socioecological context. Including numerous potential confounders does not influence the strong effect size of resource type, equivalent to an 11-fold increase in odds of choosing

efficiency for meat compared to money. While most spouses prefer efficiency over other distributions (Figure 1), inefficient preferences result from a combination of selfishness, altruism and inequality aversion. This variability in preferences is consistent with a hybrid approach containing elements of both joint and separate interests views of marriage (Table 1B) (Gurven et al. 2009). The preference for household inefficiency may be related to intra-household inequality aversion since no Tsimane prefers to maximize his/her own monetary payoff (extreme selfishness) and only 3% prefer to maximize a partner's payoff (extreme altruism). Despite the possibility of post-experiment payoff pooling resulting in an equal distribution regardless of revealed preferences, 22% of Tsimane (13% men, 30% women) prefer the inefficient but equal money distribution option at least once (47/530 round two observations [8.9%]), providing a lower bound prevalence of inequality aversion.

Our finding that meat and money elicit different preferences is broadly consistent with prior experimental and neuroimaging research indicating that people make value-based decisions differently when faced with decisions about money versus either food or other concrete inedible payoffs (Rosati and Hare 2015). People exhibit fewer risk-seeking preferences and reduced reward discounting for money, even in small amounts, compared to desirable food or inedible prizes. Distinct brain regions also appear to underlie value-based decisions based on whether payoffs are monetary or not (Clithero and Rangel 2014). It has thus been suggested that different psychological processes motivate decisions about abstract compared to concrete payoffs of similar value. Money may uniquely influence decision-making because of its fungibility and liquidity, as people exhibit fewer risk-seeking preferences in experiments when money can be freely exchanged for other payoffs compared to when this ability is constrained (Rosati and Hare 2015). Taken together, this prior research – usually conducted in Western populations and in contexts where payoffs are not divided with others – suggests that expectations about resource fungibility and liquidity directly affect consumption decisions. The present study generalizes to a non-Western subsistence-level population the finding that money elicits different preferences for use compared to food, and provides an ultimate explanation for why resource fungibility and liquidity is central to understanding consumption and distribution preferences within households.

We hypothesized that the greater fungibility of money compared to meat, and as a result the greater potential to squander money for individual fitness gain at a cost to the family (Stieglitz et al. 2012a), favours unique individual strategies to protect money against a partner's claims for consumption (Anderson and Baland 2002). As expected if these strategies are internalized, we find that spouses are more likely to reject household efficiency for an equal distribution of the highly fungible resource most vulnerable to exploitation by a partner. This finding is not compatible with a joint interest view that spouses are unequivocally motivated to maximize household production regardless of resource type. Resource fungibility may be one of several resource characteristics (e.g. in addition to variance in daily acquisition, degree of complementarity with other household investments) that influence perceptions of the marginal gains from individual consumption and distribution (Kaplan and Gurven 2005).

Consistent with P2 we find that reported marital conflict over paternal disinvestment is associated with a nearly 13-fold increase in odds of revealing a selfish money distribution preference (Table 2). Greater preference for costly selfishness is uniquely associated with recent paternal disinvestment disputes, but not any other recent marital disputes, which is broadly consistent with prior research indicating that paternal disinvestment is the principal cause of intense verbal and physical conflict among Tsimane spouses (Stieglitz et al. 2012b). Paternal disinvestment thus presents a principal barrier to allocating household resources efficiently, as suggested by a separate interests view that spousal disagreement over appropriate use of household resources leads to costly selfish actions (Bloch and Rao 2002;

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687   Borgerhoff Mulder and Rauch 2009; Mani 2011; Munro et al. 2006). Experimental research
688   in rural Kenya demonstrates that greater spousal heterogeneity in discounting preferences –
689   similarly indicating differential consumption choices – leads to inefficient and selfish savings
690   behaviour, whereas greater spousal homogeneity in preferences facilitates household
691   efficiency in savings (Schaner 2015). Our results suggest that greater resource fungibility per
692   se can promote costly selfish actions even among spouses with homogenous allocation
693   preferences, and that actions are explained by factors impacting perceptions of individual
694   fitness gains within and outside of marriage.
695   Despite a small sample size, we find partial support for P3, as selfish husbands are
696   significantly more likely than other husbands to be paired with selfish wives. Marital
697   assortment may result from "market forces", i.e., consensus in the marriage market regarding
698   desirable partner characteristics. If selfishness is a characteristic that most find undesirable in
699   a partner, then selfish individuals should attract fewer partners and thus pair with the less
700   desirable (in this case, other selfish individuals). Similar logic may explain why efficient
701   husbands are less likely paired with selfish wives, although we cannot rule out alternative
702   explanations (e.g. propinquity effects, preference for a partner with similar characteristics as
703   oneself). Among Tsimane, work effort and productivity are important mate choice criteria for
704   both sexes, spouses engage in similar levels of work effort, and time allocation to work for
705   each spouse is positively associated with fertility (Gurven et al. 2009). Positive assortment by
706   personality is also evident for traits such as agreeableness and conscientiousness
707   (unpublished data), which may facilitate household coordination and efficiency. Spousal
708   distribution preferences are not more strongly correlated with increasing marital duration,
709   which ranges from one month to 46 years in the present sample. Assortment may therefore be
710   due to initial preferences upon union formation rather than preference convergence over time.
711   Odds of being paired with an efficient wife are nearly four-fold higher for efficient versus
712   inefficient husbands, although the effect is not significant because of the small sample size of
713   inefficient husbands (n=7, see Figure 2). Given the percentage of efficient and inefficient
714   husbands paired with efficient wives (74% and 43%, respectively), a post-hoc power analysis
715   indicates that a sample size of 125 husbands (a 136% increase from the current sample size)
716   would be required to attain 80% power at an alpha of 0.05 with an identical unbalanced
717   design. Obtaining this larger sample would have entailed visiting multiple additional Tsimane
718   villages, which was not possible given various constraints. Nevertheless, prior experimental
719   studies with larger sample sizes in rural Africa find that spouses with similar characteristics
720   (e.g. level of schooling) generate greater household surplus (Munro et al. 2006; Schaner
721   2015), which is broadly consistent with the findings reported here.
722   Consistent with P4, we find that Tsimane are more likely than Western Europeans to
723   choose efficiency (Figure 3). We suggest that group-level differences in economic
724   organization and degree of complementarity in parental investments motivate the observed
725   differences in distribution preferences. Multiple lines of evidence (Henrich et al. 2005)
726   indicate that common economic tasks affect basic values underlying preference formation,
727   and that these values in turn affect temperament and behaviour. If these values are
728   internalized, generalized and expressed, and if learning processes are adaptive and flexible,
729   then the greater preference for monetary efficiency among Tsimane in a novel experimental
730   situation may not be so surprising in light of their comparatively limited market exposure.
731   Specialization in household production by sex that is characteristic of forager-horticulturalists
732   can inform one's expectations of a spouse's preferences, such that even in an experiment
733   Tsimane may expect a partner to behave in a similarly efficient manner. These expectations
734   can sustain a high degree of cooperation throughout marriage, which may help explain why
735   Tsimane efficiency preferences vary little with age (unlike for Western Europeans, see Figure
736   S4). At the same time, a greater preference for selfishness among Tsimane women compared

15

to Western European women (Figure S5) suggests a willingness to sacrifice household efficiency for greater personal control of fungible and liquid resources. This preference can indicate a broader adaptive strategy employed by Tsimane women to protect money against a husband's claims for consumption, especially because monetary access is often male-dominated and can result in costly paternal disinvestment.

4.1. Strengths and limitations

The research design minimizes response and sampling biases. Data are obtained independently from both spouses instead of only one spouse, permitting assessment of spousal consistency in reporting. Indeed, we find consistency in reporting recent verbal disputes in marriage (section 3.3). Study recruitment and participant compensation (section 2.2) also limited self-selection by demographics, degree of modernization and marital quality. Moreover we can rule out potential "contamination effects", which are expected if Tsimane participants, after completing the study, informed others of what to expect and thus biased others' distribution task responses. To test for such effects we examined whether distribution preferences within a village changed over time but found no such evidence. Regarding external validity, a majority of respondents indicated that distribution task questions resembled the types of decisions encountered in daily life (section 2.2). Variability in task perception did not significantly affect any outcome or modify effect sizes of primary predictors. The fact that no Tsimane exhibited an irrational distribution preference and the fact that all Tsimane correctly answered both pre-task comprehension questions suggests that Tsimane understood the task. Results of cross-population analyses (section 3.5) are not affected if irrational Western Europeans are omitted from analyses. Our study is the first to our knowledge to systematically compare resource distribution preferences among couples in subsistence-level and fully market-integrated populations using a common experimental framework.

Nevertheless, resource transfers outside of the "laboratory" obviously cannot be prevented in experiments among spouses. If post-experiment transfers are indeed common then this affects our ability to correctly classify spouses based on their aggregate preferences (e.g. an "asymmetric-selfish" wife may transfer half of her resources to a husband post-experiment and thus prefer inequality aversion to selfishness). Relatedly, there are other possible explanations of altruistic preferences; altruistic spouses may allow or expect a partner to divide a resource equally among co-resident kin, and thus altruism could be a sign of partner respect even at the expense of household efficiency. Perhaps this helps explain why degree of offspring dependency is associated with inefficient distributions (see Table S3, Table 2). Alternatively, altruism could be a form of extra-pair mating effort, as predicted by a separate interests view of marriage, if reputational benefits of altruism entail extra-pair mating opportunities or other social benefits. Our inability to validate revealed preferences with subsequent behavioural measures represents a significant study limitation that hinders stronger interpretation of observed empirical patterns. Another study limitation is the small sample size, especially for testing P3.

4.2. Conclusion

Examination of spousal preferences for distributing household production surplus reveals evidence for both joint and separate interests views of marriage (Anderson et al. 1999). Shared and distinct spousal preferences are explained by ecological-, family-, and individual-level factors impacting perceptions of marginal gains within and outside the household. A hybrid approach explains intra- and inter-population variation in distribution preferences. Determining whether such preferences predict marital behaviour and outcomes should be a focus of future research.

CONFLICT OF INTEREST

None reported.

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TABLES AND FIGURES

Table 1. A) Distribution task design. The task consists of three rounds and five questions/round. Respondents choose option A or B for each question. Spouses face a trade-off between equality and efficiency for every question except #3, where options A and B both offer equal divisions but B is also efficient. In round one respondents indicate their preferences for actual shares of dried meat (X=0.67 kilograms), and responses determine compensation. Round two choices concern hypothetical shares of money (unincentivized; X=30 Bolivianos). Round three choices concern hypothetical shares of fresh meat (unincentivized; X=0.67 kilograms). Rounds, questions and options are presented in random order (not as shown here). B) Classification of individuals based on their aggregate preferences. Efficient individuals maximize joint payoffs. Selfish individuals retain a disproportionate share (>0.5) of joint payoffs for themselves, whereas altruists retain <0.5 for themselves. Symmetric individuals choose equality instead of efficiency at least once, retaining an equal share (0.5) of joint payoffs as a partner.

A)	Option A		Option B		
	Payoff for	Payoff for	Payoff for	Payoff for	
Question # in a given round	self	partner	self	partner	
1	X*0.33	X*0.33	0	X	
2	X*0.33	X*0.33	X*0.25	X*0.75	
3	X*0.33	X*0.33	X*0.5	X*0.5	
4	X*0.33	X*0.33	X*0.75	X*0.25	
5	X*0.33	X*0.33	X	0	

B)	Preference (#'s below indicate question #'s above)		
Classification of individuals based on aggregate preferences	Option A	Option B	Consistent with which view of marriage?
EFFICIENT (maximize joint payoff)		1-5	Joint interest
EXTREME ALTRUISTIC (max. spouse's payoff)	4-5	1-3	Hybrid
EXTREME SELFISH (max. own payoff)	1-2	3-5	Separate interests
ASYMMETRIC- ALTRUISTIC		Multiple possibilities	Hybrid
ASYMMETRIC - SELFISH		Multiple possibilities	Hybrid
SYMMETRIC-INEQUALITY AVERSE		Multiple possibilities	Hybrid
IRRATIONAL	3		Neither

Table 2. Determinants of being classified as efficient, selfish, altruistic, or symmetric-inequality averse based on aggregate money distribution preferences (n=53 husbands and wives from the same marriage). Logistic regression coefficients are presented as odds ratios.

Predictor	Bivariate models				Stepwise models			
	Efficient	Selfish	Altruistic[h]	Symmetric	Efficient	Selfish	Altruistic[h]	Symmetric
Indicator of reduced marital quality								
Any dispute reported[a] (vs. not reported)	1.237	1.061	0.311*	2.353	-----	-----	0.258*	-----
Any dispute over paternal disinvestment[b] (vs. not reported)	0.380*	12.600***	-----[i]	0.752	-----	12.600***	-----[i]	-----
Demographic								
Age[c] (years)	0.806	0.982	5.928*	1.009	0.743*	-----	-----	-----
Age^2 (years)	1.003*	-----	0.969*	-----	1.004*	-----	-----	-----
Sex=male	2.842**	0.394	0.151*	1.000	3.314**	-----	0.108*	-----
# joint children < age 10[d]	0.669**	1.184	2.122**	1.146	-----	-----	2.148**	-----
Indicator of modernization								
Schooling[e] (years)	1.012	1.063	0.666*	1.057	-----	-----	-----	-----
Fluent in Spanish (vs. not or partially)	2.066	0.654	0.246	0.782	-----	-----	-----	-----
Partner schooling[f] (years)	0.916*	1.113*	1.013	1.080	-----	-----	-----	-----
Time since H's last wage opportunity[g] (months)	1.033	0.973	0.993	0.905	-----	-----	-----	-----
H's daily wage from last opportunity[g] (2014 Bs)	1.012	0.984	0.994	0.992	-----	-----	-----	-----
Task perception								
Realistic (vs. not)	1.739	0.437	0.943	0.695	-----	-----	-----	-----
Easy (vs. not)	2.253*	0.289*	1.250	0.471	-----	-----	-----	-----

[a]Refers to serious verbal disputes with a partner in the past three months.   [b]Dispute causes were free-listed by respondents without prompts. Paternal disinvestment includes excessive alcohol consumption, infidelity (perceived or real) or irresponsible use of money (see Stieglitz et al. 2011, 2012).   [c]Marital duration is strongly correlated with age (Pearson r=0.83, p<0.001) and is not a significant predictor in univariate models; marital duration is thus omitted. Spousal age difference (H-W, years) is also not a significant predictor and is omitted.   [d]Whether a respondent has any living children from prior unions (vs. none) is not a significant predictor and is omitted (# of children from prior unions [total or < age 10] is also not significant).   [e]Literacy (vs. none or partial) is not a significant predictor and is omitted. [f]Neither partner literacy nor partner Spanish fluency are significant predictors and are omitted.   [g]As reported by husband; logged value also yields a nonsignificant result.   [h]Includes both "asymmetric altruistic" and "extreme altruistic" classifications.   [i]No altruist reported a dispute over paternal disinvestment.

*p≤0.1   **p≤0.05   ***p≤0.01

Figure 1. Classification of husbands (H) and wives (W) based on aggregate distribution task preferences for each resource type (n=53 husbands and wives from the same marriage).
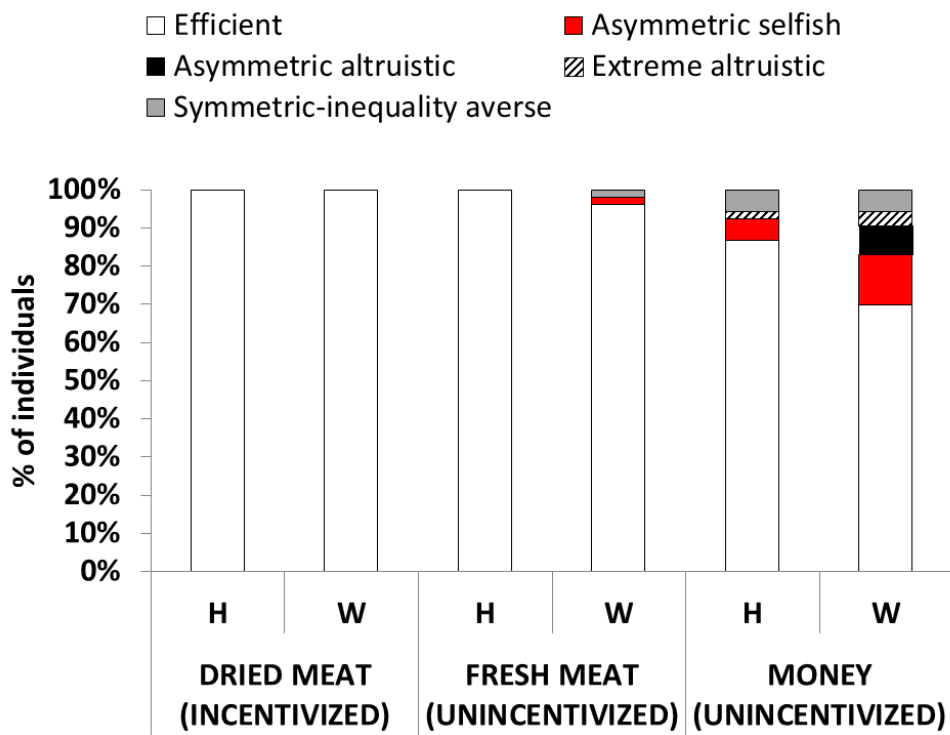
Figure 2. Marital assortment by money distribution preferences among Tsimane (n=53 couples).
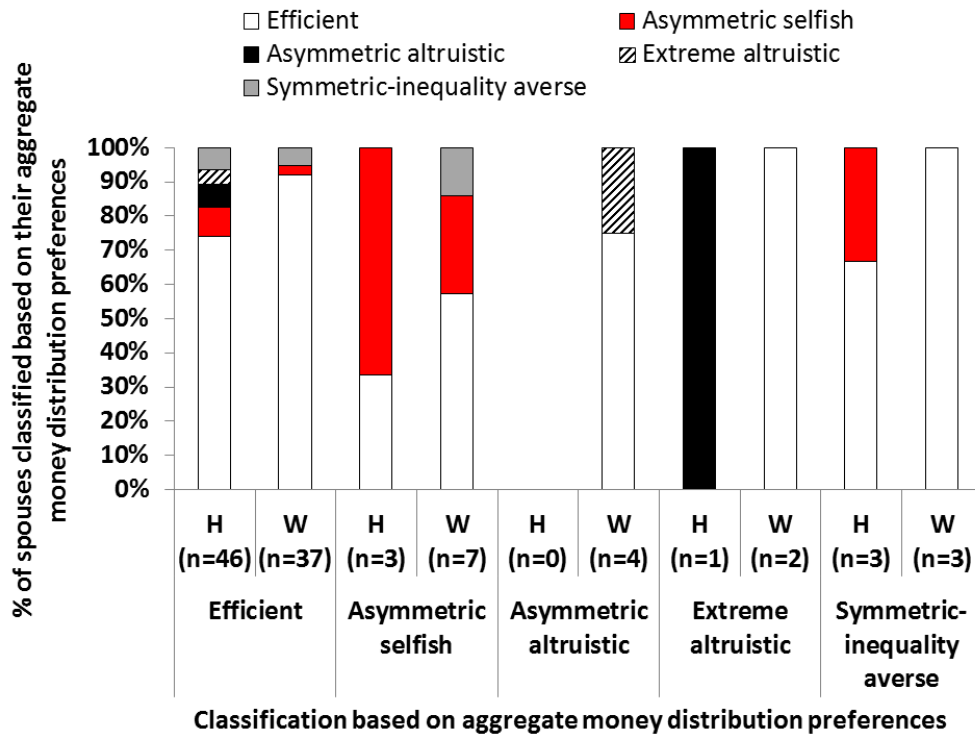
Figure 3. Money distribution preferences of Western European and Tsimane spouses (n=209 total couples).

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