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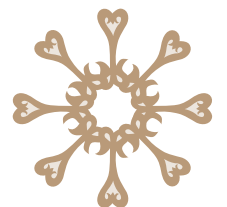
# Behaving Sociably.

Sharing and Cooperation  
among Contemporary Punan Tubu  
in North Kalimantan, Indonesia



**Rasi Lucenteza Easterlita Napitupulu**

Ph.D. Dissertation, Doctoral Programme in  
Environmental Science and Technology  
Institut de Ciència i Tecnologia Ambientals (ICTA)  
Universitat Autònoma de Barcelona



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*In loving memory of Rasmina Munthe Napitupulu (1943-2016),  
for her passion for people, her love of knowledge, and her enthusiasm for an adventure.*

## Abstract

Prosocial behavior, such as sharing and cooperation, is a central characteristic of the human species and is thought to be human adaptive tendency. Previous observational and experimental studies indicate that people share and cooperate under various motivations, which might differ according to the context. This dissertation examines individual sharing and cooperative behavior in a population of contemporary hunter-gatherer group with a strong tradition of sharing, the Punan Tubu. It also question how increasing integration into the Indonesian national society and the market economic system is influencing their prosocial behavior, a situation that is relevant to many indigenous group in developing countries,. Methodologically, I combine observations from daily behavior collected through surveys among 118 adults over 18 months of observations in two villages; with, results from two framed field experiments played with 212 adults in seven villages (including the previous two) with different levels of integration into the state system and the market economy.

The questions asked in the three empirical chapters are: 1) how individual levels of integration into the market economy and the national society relate to a prosocial practice, i.e., sharing, in a small-scale society?; 2) do variations in sharing relate to different levels of integration into the market economy when comparing a) observational and experimental data and b) the sharing of different products?; and 3) to what extent varying levels of involvement in development policies relate to decisions to cooperate in government programs?

Results from empirical observations of daily behavior suggest that sharing, and more specifically demand sharing (i.e., requesting claim of food/resource), is a prominent behavior among contemporary Punan Tubu. Moreover, sharing is neither directly related to individual levels of integration into the market economy, nor to participation in national development programs. However, I also found that there are variations in the way locally-produced and market-purchased food products are shared. I argue that variation on how products are shared depends on 1) their visibility, 2) their cultural meaning, and 3) the division of labor followed to produce or obtain them. The comparison of sharing in daily life observations and sharing in experimental conditions suggest that data obtained through the two methods are not correlated, probably because each measures different aspect of sharing. In the third empirical chapter, I analyzed cooperative behavior through an economic game experiment, framed around an ongoing house building government program that required cooperation. I found

that individuals and villages with experience cooperating with people beyond their kin (i.e., those who had previously participated in government programs) were more likely to display cooperative behavior under anonymous conditions.

Findings from this dissertation advance the understanding of how sharing and cooperation arises in a dynamic context with an interdisciplinary perspective based on mix methodology of ethnographic description, systematic observational data collection and experimental economic game. This dissertation emphasizes the importance of examining the external validity of experimental games used to measure prosocial behavior. Policies aiming to capitalize on existing cooperative behavior to stimulate community collective action should take into account the specific conditions under which sharing and cooperation occurs in daily life setting, as ignoring them might hamper the achievement of the desired outcome of social behavior.

## Resumen

El comportamiento prosocial, como compartir y cooperar, es una característica central del ser humano y también es considerada central en la estrategia adaptativa humana. Observaciones y estudios experimentales previos indican que las personas cooperan por diversas motivaciones, las cuales pueden diferir según el contexto. Esta tesis examina el compartir individual y el comportamiento cooperativo de una población de cazadores-recolectores con una fuerte tradición de compartir, los Punan Tubu. Se pregunta cómo este comportamiento cambia a medida que esta sociedad se integra cada vez más en la sociedad nacional indonesia y en el sistema económico de mercado, una situación relevante en muchos países en vías de desarrollo. Metodológicamente, combiné observaciones del comportamiento diario recogidas mediante entrevistas a 118 adultos durante 18 meses de observación en dos pueblos, con resultados de dos experimentos de campo llevados a cabo con 212 adultos en siete pueblos con diferentes niveles de integración en el sistema estatal y la economía de mercado.

Las preguntas realizadas en los tres capítulos empíricos son: 1) ¿Cómo se relacionan los niveles individuales de integración en la economía de mercado y la sociedad nacional con una práctica prosocial, i.e., compartir, en una sociedad de pequeña escala?; 2) ¿Están las variaciones en compartir relacionadas con los diferentes niveles de integración en el mercado económico cuando se comparan a) observaciones e información experimental y b) se comparten diferentes productos?; y 3) ¿Hasta qué punto varían los niveles de compromiso en las políticas gubernamentales relacionadas con decisiones de cooperación en programas gubernamentales?

Los resultados de las observaciones empíricas de los comportamientos diarios sugieren que compartir, y más específicamente la demanda de compartir, es un comportamiento prominente entre los contemporáneos Punan Tubu. Más aún, compartir no está directamente relacionado con los niveles individuales de integración en el mercado económico, ni con la participación en programas de desarrollo nacional. Sin embargo, sí encontré la existencia de variaciones en la forma en que los productos alimenticios producidos localmente y comprados en el mercado son compartidos. Argumento que la variación en cómo los productos son compartidos depende de 1) su visibilidad, 2) su



significado cultural, y 3) el reparto de las labores de trabajo seguido para producirlos u obtenerlos. La comparación entre compartir en las observaciones de la vida diaria y entre compartir en condiciones experimentales sugiere que los datos obtenidos mediante los dos métodos no están correlacionados, probablemente debido cada uno mide diferentes aspectos de compartir. En el tercer capítulo empírico, analizo el comportamiento cooperativo mediante un juego experimental enmarcado en torno a un programa gubernamental en vigor consistente en la construcción de viviendas que requería cooperación. Encontré que los individuos y los pueblos con experiencia en cooperación con personas más allá de sus familias (i.e., los que han participado previamente en programas gubernamentales) estaban más dispuestos a ejercer un comportamiento cooperativo en condiciones de anonimato.

Los resultados de esta tesis permiten avanzar en el entendimiento de cómo el compartir y la cooperación surgen en un contexto dinámico mediante una perspectiva interdisciplinar basada en una mezcla metodológica de descripción etnográfica, recogida de información de observaciones sistemáticas y juegos experimentales económicos. Esta tesis enfatiza la importancia de examinar la validación externa de juegos experimentales empleados para medir el comportamiento prosocial. Políticas orientadas a capitalizar el comportamiento cooperativo existente para estimular acciones colectivas comunitarias deberían tener en cuenta las condiciones específicas en las que el compartir y la cooperación se dan en un entorno real, ya que ignorarlos puede obstaculizar la consecución del objetivo deseado de comportamiento social.

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# Chapter 1

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## Introduction

The severity of some of the world's most pressing issues, such as climate change and collective management of global common resources, has generated a growing interest in understanding human sociality and cooperation as potential pathways to address these issues. Human societies are characterized by displaying a wide range of prosocial behaviour, or behaviour that is intended to benefit others (Jensen 2016), such as sharing (Kaplan et al. 1984), helping (Kasper & Mulder 2015), and even punishing free riders for the benefit of cooperators in a group (Bowles & Gintis 2002). According to some researchers, such behaviour is a central characteristic of the human species (Jaeggi & Gurven 2013) which explains human adaptive strategy (Gintis 2003; Reyes-García et al. 2016), and furthermore, it is not exclusively explained by kin relationship or reciprocity.

The quandary of individual versus collective interest has been the object of significant discussion, and the singularities of human "sociability" and its positive effects continue to attract research (Ostrom 1990; Council 2002; Gintis 2003; Henrich 2006). Such research ranges from topics of global tension between individual consumption and global collective interest in climatic changes, to the local tension between local community well-being and individual ambition due to changes linked to the growing integration into the market economy (Council 2002). In other words, researchers continue to be interested in understanding prosocial practices (e.g., Kaplan & Hill 1985) and especially in exploring prosocial practices with lasting outcomes in addressing individual versus collective interplay (e.g., Ostrom 2000).

This PhD dissertation fits well within this body of literature. Specifically, I am interested in exploring prosocial behaviour in a society that is not largely associated to market economy and how prosocial behaviour changes as the society faces development under market and state systems, a situation that is relevant in many developing countries. My research focus is in two specific forms of prosocial behaviour: sharing and cooperation, both of which constitute relevant examples of daily life choices (or choices people make daily within a trade-off of bundles of things they value) and social dilemmas (or situations that require choosing between personal payoff and the interest of others) (Camerer & Fehr 2002).



The importance of sharing and cooperation as key features of human social life has been highlighted by several ethnographic studies describing such practices in small-scale societies of non-WEIRD (Western, Educated, Industrialized, Rich, Democratic, see Henrich, et al. 2010) populations (e.g., Kaplan et al. 1984; Hawkes 1992; Ziker & Schnegg 2005; Alvard 2011). Moreover, small-scale societies also provide the opportunity to observe changes in behaviour among societies that are being recently exposed to the market and the state system. I am interested in exploring, if as economic theory suggests, individual self-interest is universal, or whether it is in fact a behaviour crafted within the market system.

In the specific context of this Ph.D. dissertation, the processes of integration into the market economy and into the state system are examined together, as a single analytical unit. Although I acknowledge that these are two different processes, in the study area, they go together, as the monetarization of the economy has largely arrived by the hand of the state development policies. Indeed, as in other areas of the world, in rural Indonesia the state has largely influenced the adoption of market institutions such as private property, national currencies, legal contracts, and credit markets (Graeber 2001). As the world moves toward more interdependence and one global institution of market, researchers have reported that small-scale societies and many societies at the margin of mainstream society are under threat by economic incentives and development changes (Onyeiwu & Jones 2003) and are at a disadvantage when faced with external parties including the government (Thornton 2001).

In short, through this work, I provide an empirical case study of sharing and cooperation in a traditional society and analyse whether and how the process of integration into the market economy and the state system influence sharing and cooperation. The work presented here constitutes a compilation of empirical data collected among Punan Tubu, a hunter-gatherer group in Indonesian Borneo, who are experiencing a process of rapid economic, social and cultural change. Importantly, at the methodological level, I combine ethnographic and systematic observations, with an experimental economic approach.

## **1.1 Importance of prosociality: Why do humans share and cooperate?**

Researchers have documented the prevalence of sharing and cooperation in small-scale societies (e.g., Kaplan et al. 1984). In such context, sharing may be associated to the transfer of resources from one individual to another, for example in the case of food sharing (Gurven et al. 2001; Marlowe 2004). Sharing is believed to be an adaptive mechanism that

increases group fitness through the distribution of resources (Gurven, et al. 2000; Hawkes, et al. 2001). Examples of sharing include gift-giving (Gurven 2005), or the distribution of meat from hunted animals among kin and kith (Koster 2011), but also knowledge sharing (Grootaert 1999; Reyes-García et al. 2016), or skill sharing (Mengesha et al. 2015). It has been proposed that food sharing is at the origin of human universal tendency to cooperate (Hill 2002). Through success in hunting and meat sharing, men acquire status or better social standing among other men (Hawkes et al. 2001). Hawkes (1991) reported such costly behaviour of men targeting risky game hunt to signal superior quality as a mate. Further reinterpretation may include signalling benefits of alliance building (Patton 2005), social support (Bliege Bird & Bird 1997), or mating of offspring (Gurven 2005).

On the same vein, cooperation has been defined as a joint action for social or group benefits (Bowles & Gintis 2002). Some authors suggest that people typically cooperate in activities that involve some sort of reciprocity, such as cooperating with the same kin or kith, or cooperating with previous cooperators in a tit-for-tat exchange (Gurven 2004), although some other authors argue that the human tendency to cooperate goes beyond reciprocity (Jaeggi & Gurven 2013; Henrich 2006). Indeed, cooperation with kin, an universal expression of human prosocial behaviour, is also found in other species, including birds (Bird 1999) and primates (Jaeggi & Gurven 2013). Preference for sharing and cooperation with biological kin is explained by its potential impacts on group survival and fertility. Thus, cooperation with kin has been used to understand men's hunting and meat sharing as forms of provision for the nuclear family, an explanation that was later extended to contextualize the division of labour in human societies.

Anthropological studies among small-scale societies have found that people engage in reciprocal altruism even in situations in which their generous behaviour is not met with a return according to a tit-for-tat or mutualism (Koster 2011). Therefore, researchers have reported great variety of sharing and cooperation among small-scale societies beyond reciprocity or mutualism. In studies of food sharing, for example, tolerated theft in which foragers often share their take with those who acquire less (Bliege Bird & Bird 1997) may also be a form of costly-signalling; demand sharing in foragers, or the fact of sharing in response to verbal or non-verbal demand is another example of sharing that goes beyond reciprocal altruism (Peterson 1993).

Moreover, researchers have also found that –in many cases- people are willing to endure personal costs to increase the success or benefit of the group (Nolin 2012; Gurven, et al. 2002), a behaviour that suggest a preference for strong reciprocity (Gintis 2000; Fehr et al. 2002). Studies have associated large-scale cooperation among distant- or non-kin in larger groups with behaviour of strong reciprocity, where cooperators punish non-cooperators even if such behaviour is costly (Henrich et al. 2006). The combination of cooperation and punishment suggests that social learning can determine the maintenance of cooperation in larger groups (Henrich 2009; Bock 2009; Boyd et al. 2011). Borrowing from evolutionary perspective, human capacity for social learning supports the establishment of social norms, for example, the learning to administer and avoid punishment (Henrich & Ensminger 2014). Learning strategies such as “copy the most successful” (prestige-biased transmission) and “copy the most common trait” (conformist transmission) explain how individuals calibrate diverse information to make decisions and how evolutionary theorizing leads to prediction of behaviour based on learned rules (Henrich & Boyd 2001). This further supports emerging social norms that may calibrate social interaction and stable social behaviour from free-riding problems.

## **1.2 Prosocial behaviour in market and state systems**

Although the motivation of large-scale cooperation is still questioned in cultural evolution (Reyes-García et al. 2016; Bernard et al. 2016), recent research suggests that human societies manage to maintain interactions in the market place by the co-evolution of market with social norms (Henrich 2015), where large and complex societies maintain norms and institutions that effectively sustain successful interaction in ever-widening non-kin socioeconomic spheres (Bowles & Gintis 2003). Market and other economic institutions not only allocate goods and services but they also influence the evolution of values (Bowles 1998). Market and institutions alike influence values and preference, through changing the framing or situation, influencing extrinsic-intrinsic motivations, changing the perception of tasks, or altering returns of relationships already built (Frey & Jegen 2001).

However, evidence on how the market economic system influences sharing and cooperation remains largely inconclusive. The integration of small-scale societies to the market economy may create inequality and erode traditional customs and traditional institutions that promote prosocial behaviour (Behrens 1992; Putsche 2000). This is particularly the case when markets introduce monetary benefits. For example, among Mikea

of Madagascar, there is less sharing of food with high market value of bushmeat (Tucker 2004) and among the Mpimbwe of Tanzania, wealthier individuals engage less in reciprocity than poor individuals (Kasper & Mulder 2015). However, researchers have also suggested that markets may promote prosocial behaviour: as not all needs can be met through the market, individuals establish alliances and norms to ensure in-group cooperation (Gurven et al. 2015). Furthermore, the imperfect pattern between market and cooperation is also supported by experimental research (Cárdenas & Carpenter 2008). For example, Henrich and colleagues from experimental findings suggest that those with more market integration is associated to higher level of fairness (Henrich, et al. 2010). Meanwhile, other researchers suggest there an inverse relation between cooperation and development, especially in the case of using market-based incentive policies (Cárdenas & Carpenter 2008; Narloch et al. 2012)

Given that state governments often aspire to shape human conduct (Li 2007), different authors have examined the extent to which state governments shape local and traditional cooperativeness (Cárdenas et al. 2000; Onyeiwu & Jones 2003). For example, the ability of local communities to engage in cooperative collective action has lead policy-makers to favour community-based approaches in development (Labonne & Chase 2009; Woolcock 2010). Today, especially with the growing awareness of the limitations of top-down policies, there is a large interest in the potential role of communities in enhancing local public service delivery (Putnam 1993; Woolcock 2010). Prosocial behaviour is considered as one of the communities' asset in development studies, where the cooperative behavior of the community and the shared norms, networks, trust, might provide advantages in development (Ostrom 1998; Cárdenas & Carpenter 2008; Woolcock 2010; Barr 2004), for example by providing monitoring and sanctioning the effective implementation of development programs based on the close social ties among people in a community (Abbink et al. 2006). Several government policies, such as decentralization policies, have emphasized the importance of capitalizing on existing network structures, norms, and trust relations in order to stimulate collective action targeted to development (Vollan 2012). However, these policies often do not consider that locally-established norms may change according to circumstances (Agrawal & Gibson 1999).

### **1.3 Objectives**

The overarching aim of this research is to explore how the market and state system influence individual sharing and cooperative behaviour in compliance with traditional social norms and institutions.

The specific aims of the research are:

1. To explore how individual levels of integration into the market economy and national society relate to a prosocial practice, i.e., sharing, in a small-scale society (in Chapter 2);
2. To test whether variations in sharing relate to different levels of integration into the market economy when comparing a) observational and experimental data and b) the sharing of different products (in Chapter 3)
3. To analyse the extent to which varying levels of involvement in development policies relate to decisions to cooperate in government programs (in Chapter 4).

### **1.4 Methodology**

This dissertation is part of a five-year research project entitled “The adaptive nature of culture: a cross-cultural analysis of the returns of Local Environmental Knowledge in three indigenous societies”, funded by a Starting Grant of the European Research Council (FP7-261971-LEK) and led by Dr. V. Reyes-García (see Reyes-García et al. 2016) for the main results of that project). Data presented here includes data collected as part of the cross-cultural research project as well as results from economic games specifically designed for this Ph.D. work. Data collection included the cooperative work of one postdoctoral researcher, one Ph.D. student researcher, and four research assistants throughout the whole research process. Participation in the research was voluntary. Free Prior and Informed Consent (FPIC), in adherence with the Code of Ethics of the International Society of Ethnobiology (2006), was obtained from the heads of village and from everyone participating in this study.

Each of the three empirical chapters includes specific details of the methodology used. So here, I only provide an overview of the methods used and the reasons behind the methodological approaches.

Two different methods of data collection were used in this dissertation. The first method involves the systematic observation of sharing during 18 months in two relatively isolated villages. The second method is the use of economic experiments to capture prosocial behaviour (i.e., sharing and cooperation). Two different games were used to proxy prosocial behavior: 1) the Ultimatum Game, a game typically used to measure individual's tendency to share (Camerer & Thaler 1995; Paciotti & Hadley 2003); and 2) a variation of the Common Pool Resources game (Ostrom et al. 1994) framed on an ongoing house building activity to proxy voluntarily cooperation in a social dilemma.

Experimental economic experiments are increasingly being used to measure prosocial behaviour (e.g., Ostrom et al. 1992; Camerer & Fehr 2002; Paciotti & Hadley 2003; Cárdenas et al. 2014). However, some studies suggest that there might be inconsistencies in results obtained in observational and experimental settings, inconsistencies partly explained by the lack of correspondence of behaviour in games setting with to observed natural behaviour (Gurven & Winking 2008). It is, therefore, important to critically evaluate the drivers of those differences. Ethnographic fieldwork allows a unique opportunity to compare information from sharing and cooperation in daily life setting with results from economic experiments (Gurven & Winking 2008). The use of both approaches has the potential to advance the knowledge of the existing theoretical accounts of how people make decisions.

#### **1.4.1 Systematic observation**

Systematic data from observations of daily life behaviour is typically used in studies of behavioral ecology and anthropology. In this particular study, these data were collected using a combination of methods that includes participant and non- participant observation, and interviews. Given the rarity of previous studies collecting quantitative observational data over a long period of time, such first-hand empirical dataset collected over 18 months of in-depth ethnographic fieldwork represents a unique contribution to the study of prosocial behaviour.

Ethnographic fieldwork was conducted between March 2012 and July 2013. A primary phase of fieldwork (January-May 2012) was mostly devoted to obtained

communities agreement to live in the villages and Free Prior Informed Consent (FPIC) to participate in the research, build trust with participants, learn Punan Tubu language, and familiarize myself to everyday life in the village and the field. With the help of another researcher, we conducted a census as well as semi-structured interviews on sharing and cooperation. We also conducted interviews on recent changes generated by the integration into the market and the state systems. This information was used to develop the instruments for systematic observation of sharing and cooperation that were applied during the second phase of fieldwork.

The second phase of fieldwork (July 2012-August 2013) provided a rare opportunity to systematically collect observation on sharing among the Punan Tubu. Data were collected through weekly interviews with all adult informants. I also collected quarterly basis data of income, including income obtained through trade, wage labour and salaries paid by the government.

Such systematic observations are rich in providing meaning to the manifestation of sharing and cooperation. However, an important weakness of such methodology is that it relies mostly on self-reported information from the participants, which implies that problems such as recall error and accuracy may arise, especially when having to quantify social behaviour such as sharing and cooperation. To compensate for this caveat, we complemented observational data with data collected through economic experiments.

Indeed, previous studies have not found consistent results when using data from experiments and observations in the field settings, likely because economic experiments do not capture well the context in which sharing and cooperation exist in daily setting. The external validity of experimental economic games has been subject of previous analysis, with some studies finding the experimental games reflect (to a certain extent) daily life behaviour (e.g., Güth et al. 2007; Normann et al. 2014; Englmaier & Gebhardt 2016) and some other studies finding divergences when comparing data collected by experiments and observation (e.g., Cryder & Loewenstein 2012; Gurven & Winking 2008). In other words, we lack conclusive evidence on the external validity of game experiments, as well as ways forward. My work, therefore, also aims to advance research in this field.

## **1.4.2 Laboratory economic experiments in the field**

The empirical work of this dissertation focuses on two forms of prosocial behaviour, i.e., sharing and voluntary cooperation. As mentioned, experimental economics games have been widely used to measure such prosocial behaviour (e.g., Ostrom et al. 1992; C. Camerer & Fehr 2002; Paciotti & Hadley 2003; Cárdenas et al. 2014). As this research is interested in the behaviour of a small-scale society in a developing country, the use of field experiment seems like a relevant methodological approach. Field economic experiments allow the possibility of predicting sharing and cooperative behaviour within the local context (Harrison & List 2004).

In March 2014, six months after the period of systematic observation, I returned to the study area and conducted two economic experiments in seven Punan Tubu villages. In each village, I announced the intention to play economic games and people voluntarily decided whether to play or not. In the invitation, I mentioned participants could earn some products, e.g., rice, instant coffee, and money. Village and individual agreement and FPIC were collected prior to playing the game in each village (including reestablishment of FPIC for villages already included in systematic observation).

### ***1.4.2.1 Ultimatum game: Measuring sharing behaviour***

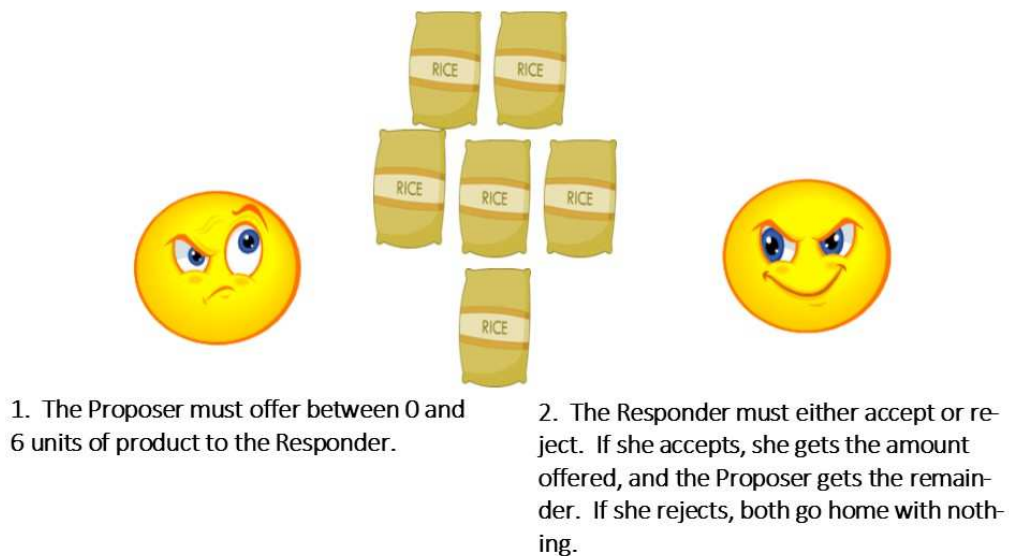
The first economic experiment I used, was the Ultimatum Game, a game commonly used to study sharing (Camerer & Thaler 1995). The game is played by two people. In the standard version of the game, one player (the proposer) receives a sum of money and proposes how to divide it with the other player (the responder), who can choose to either accept or reject the offer. If the responder accepts the offer, the money is split according to the proposal. If she rejects it, neither player receives any money.

The Ultimatum Game has been played many times and in many cultural contexts (Cooper & Dutcher 2011; Oosterbeek et al. 2004), with results having uncovered different sharing behaviour as a result of cultural variation (Roth et al. 1991). Overall, researchers have found a common preference towards equal share (Roth et al. 1991) when playing the game among western population, although, when the game has been played among small-scale societies, researchers have found heterogeneity in player's preference for equal share (Henrich et al. 2004). Studies played both among western populations suggest that daily life



experiences are important in explaining the difference in results (Roth et al. 1991; Henrich et al. 2005; Cooper & Dutcher 2011). However, some general patterns have been found. For instance, studies using the Ultimatum Game among people in small-scale societies have suggested that integration in the market economy might influence their tendency to share. Other studies have found that people in societies with higher levels of integration in the market economy have a tendency to offer equal shares and punish those who make low offer, therefore generating a pattern that most closely resembles the pattern found in western populations (Henrich et al. 2001).

For this study, the Ultimatum Game, commonly played with money (Güth et al. 1982; Cameron 1999), was framed by playing with food products (see Fig.1). Food sharing among small-scale society is found in many places (Isaac 1978; Koster 2011; Hames & McCabe 2007). I selected two non-perishable products to avoid the confounding effect of product duration and to enhance comparability between products. The products were chosen based on their relevance in the daily sharing practice of the Punan Tubu as determined through observation analysis. Some people played with a commercial product (i.e., instant coffee in sachet) and some other people played with a local product (i.e., rice in bags).



**Figure 1.** Ultimatum Game

The game was played after the Framed-Field Experiment explained in sub-section 1.4.2.2. I gave the instructions of the game in *bahasa* Indonesia, accompanied by a bilingual Punan Tubu school teacher who translated them to Punan Tubu. The game instructions were

also acted out, with the products played put in display, and in addition there were three research team members in the room to respond to questions and assist in the game. The script of the experiment is available in Appendix A.

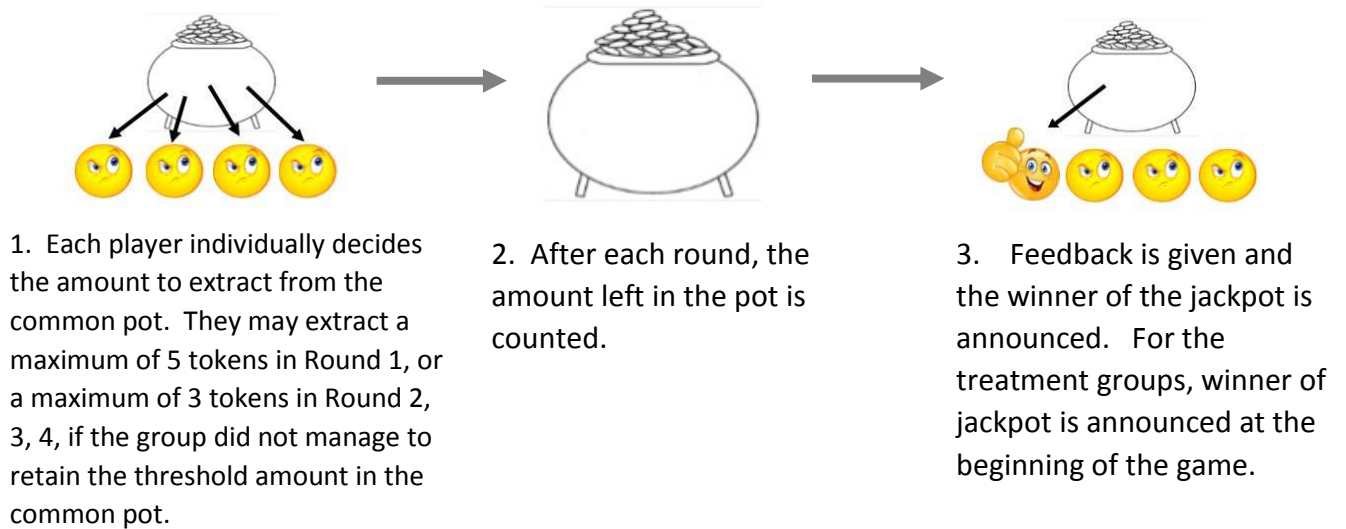
#### ***1.4.2.2 Framed-field Experiment: Voluntary cooperation of social dilemma***

To measure voluntary cooperation, I use a framed field experiment based on a collective action problem in which individual and group interest are at odds. Economic experiments have been typically used to uncover variation in cooperative predisposition (see Cárdenas & Carpenter 2008). The economic experiment that I designed was framed to reveal preference for voluntary cooperation in the case of house building community activity promoted by the government.

The experiment was played by framing the Common Pool Resource (CPR) game (Ostrom et al. 1992) as a house building game, in other words, changing the game design in line with the housing building activity in the current context of the Punan Tubu. We framed the experiment in terms of a government house building program ongoing in the seven studied villages and which required villagers' voluntary cooperation. The housing program supported by the government theoretically takes advantage of traditionally established norms of cooperation through which people help each other when building a new house. Endowment reflects cash from the government to the villages.

As mentioned, the experiment was based on the common-pool resource (CPR) game, a multi-player game where four individuals are anonymously grouped together and should make decisions regarding the portion of the endowment they would leave in the common-pot and the portion they will keep for themselves (Ostrom et al. 1994). In CPR games, money left in the common pot is multiplied and redistributed equally among the group members, regardless of their contribution to the common pot. Differently, in the game played here, only one person in each round would collect the tokens in left the common pot that particular round (see Fig.1). The tokens left in the common pot reflect the labour that each person puts aside for house building, in detriment of other potential activities (i.e., hunting, working on their own fields, etc.). Players who extract more (i.e., leave less in the common pot) are assumed to be less cooperative than those who extract less, as they are not putting aside their own activities to participate in house building. The game was played by four players ( $n=4$ ) in a group and over four rounds ( $t=4$ ). In each round, one player was designated to win a

jackpot consisting of all the tokens that were left in the common pot, and which we explained in the game as the designated turn when a family gets a house. Group members were chosen at random and the game was played anonymously.



**Figure 2.** House Building Experiment

Players' decisions were collected with a paper showing the amount of tokens the player wanted to extract. Papers were put in coded envelopes that were collected by the research team for counting. At the end of each round, participants received feedback on individual extractions and extraction of each group member, the tokens left in the group pot, and their payoff in the round.

The script of the experiment is available in Appendix B. Similar to the other game, I gave the instructions in *bahasa* Indonesia and the school teacher gave them in Punan Tubu language. In each community, I counted with the help of two other research members to respond to question and assist in the game. Participants' understanding of the game was also examined by asking control questions to the group.

## **1.5 The case study**

This section describes the context of the Punan Tubu hunter-gatherers from North Kalimantan of Indonesian Borneo. It starts with an account of the decentralization policies undertaken in Indonesia and follows with an introduction to the Punan Tubu society, specifically focusing on their socio-economic background and their practices of sharing and cooperation.

### **1.5.1 Decentralization policies in Indonesia**

Indonesia provides an excellent case study to address how the market economy and the state system modify the behaviour of small-scale societies given that, since the introduction of the Law 22/1999 on Decentralization, the country has experienced large socio-economic and political changes. Between 1965 and 1997, Indonesia experienced a 32-year long dictatorship, during the administration of Soeharto. The period was characterized by a strong influence of the central government, Javanese-oriented, in which Jakarta would claim to know the best policies to apply to each region. In 1999, following the fall of the Soeharto administration, the government of Indonesia adopted a decentralized regime aiming to shift the power from central to local governments. The shift was mostly motivated by the unbalanced economic development between the island of Java and all the other islands, many of which were rich in natural resources, yet economically less developed (Bebbington et al. 2006). An important implication of the political shift was the arrival of fiscal budget to local governments, which have been, since then, in charge of implementing their own economic decisions. In addition, decentralization policies in Indonesia also passed the Law 6/2014 on Villages, a law oriented to increase village governance, community life, and rural development. Under such law, villages were provided with budget allocation to internally govern their development pathways (Antlöv, et. al., 2016). The transfer of cash to the villages under this law is significant as the Law calls for 10% of local government budget must fall to the villages.

Decentralization policies not only brought cash to small villages, but also the empowerment of local minorities. For example, the ruling by the Constitutional Court Decision No.35/PUU-X/2012 recognized for the first-time indigenous people's rights over their traditional forests in Indonesia. This same law brought opportunities for local minorities to return to local land tenure customs and resource management systems that were opposed

by the national government during the Soeharto era (Boedhihartono 2017). In Malinau, the regency where my case study is settled, the local government endorsed this policy and recognized customary rights as early as 2014. This overall context provides a timely opportunity to explore cooperative behaviour in relation to decentralization policies.

### **1.5.2 The Punan Tubu**

The Punan are one of the groups conforming the heterogeneous population of the interior forest of Borneo, the so called 'Dayak', a generic name used to differentiate the interior indigenous population from the Muslim dwellers living in the coasts of Borneo island (i.e. Malays, Banjars, Kuteis, Bugis, Javanese) and from the Chinese population who have also long inhabited the island (Kaskija 2012; Badan Pusat Statistik (BPS) 2013). There is, however, some confusion around the term Dayak, which has been widely used by researchers to refer to the agriculturalist groups, mostly practising shifting cultivation of rice, and showing great cultural differences with the Punan (Sellato 1994; Levang et al. 2007; Kaskija 2012).

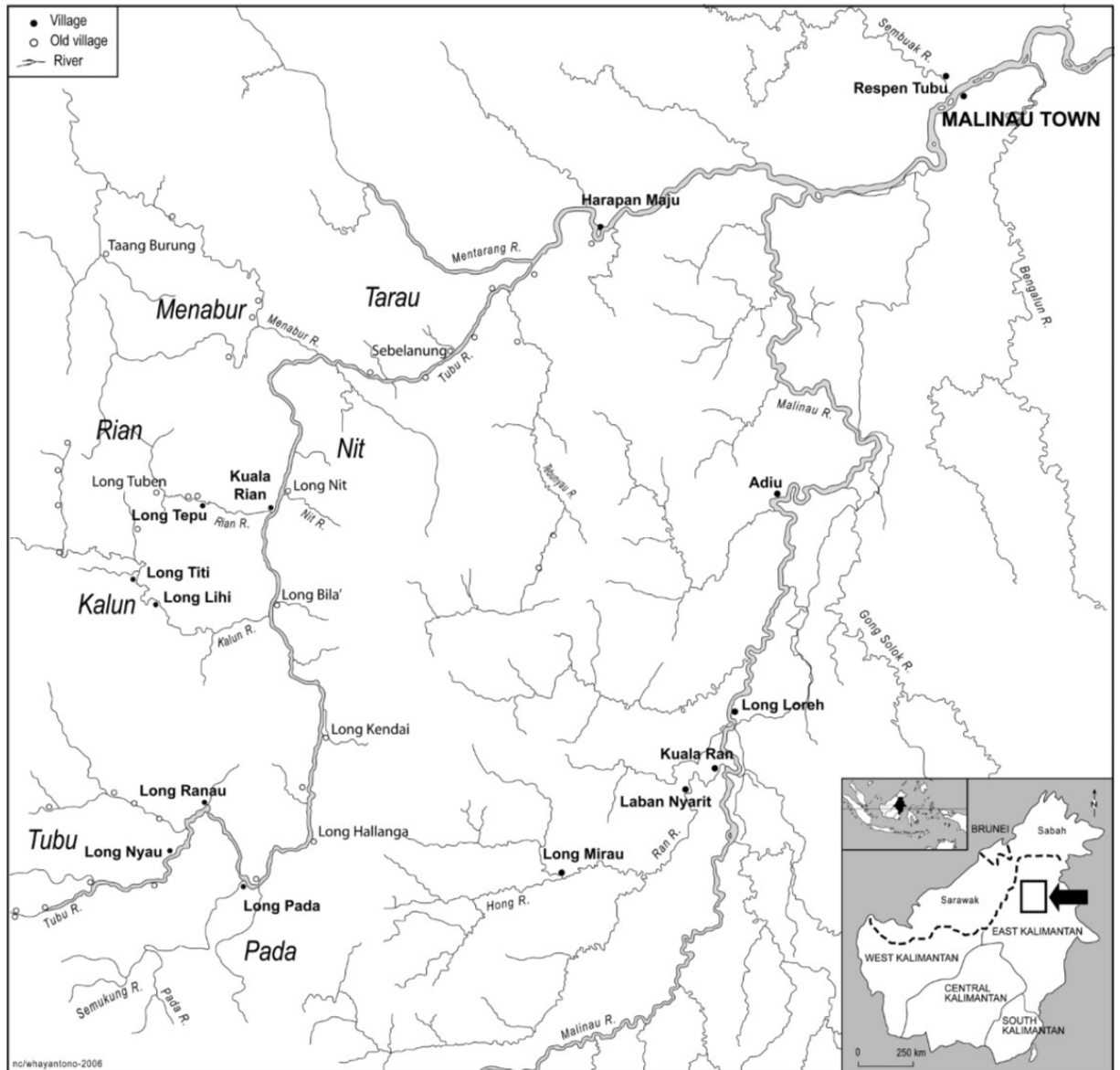
In contrast with the agriculturalist groups, the Punan traditionally were nomadic and engaged in long distance travelling (Kaskija 2012). Traditionally, the Punan lived in bands comprising several kin-related households in which resources were widely distributed, with sharing being an integral part of their way of live (Kaskija 2002; Kaskija 2012). Food was shared among all the members of the group or band, even when food was procured individually. The sharing of meat, an important component in the diet, is a well-established custom among the Punan. It is also important to notice that recent ethnographic work among the Punan has found that they practice demand sharing (Kaskija 2012; Koizumi et al. 2012), a form of sharing also observed in other hunter-gatherer groups (Peterson 1993). The Punan have had long interaction with neighbouring agriculturalist groups, who rely on them to provide non-timber forest products (NTFP), which the Punan traditionally traded for agricultural products. But despite this relation, the Punan have maintained their ability to travel lightly and rely on the forest for survival. To this day, Punan societies are characterized as flexible (Kaskija 2012). Although they continue to be different from the agriculturalist groups, they have also adopted, to some extent, practices and customs of their neighbours (Kaskija 2012). There are currently about ~10,000 Punan currently living in Indonesian Borneo (Levang et al. 2007), but because their flexibility to adapt to different

cultural context, they are divided in different groups (Levang et al. 2007), each with different languages depending on where they are located and who are their neighbouring groups.

In this dissertation, I focus on one of the Punan groups of the upper Tubu river (Malinau regency<sup>1</sup>, North Kalimantan, Indonesia), known as the Punan Tubu. The Punan Tubu live along the Tubu river, inside and in proximity with the Kayan Mentarang National Park. Before the 1970s, the upper Tubu was occupied by several indigenous groups, namely the Punan, the Merap, the Bulusu, and the Kayan (Kaskija 2012). In 1972 the government, under Soeharto administration created a conservation area in the zone, the Kayan Mentarang National Park, and restricted the entry to the upper Tubu (including a large surrounding area). The government enforced the migration of the people living in the upper Tubu and provided them with resettlements near the urban centre. Thus, in the 1972, the government built a resettlement, *Respen Sembuak*, now called *Respen Tubu*, nearby the city of Malinau, to encourage the Punan Tubu to resettle (Limberg et al. 2005). However, some people choose not to resettle in Malinau a chose to continue living in the upper Tubu River. These people now live in five villages settled in an area that is not considered the core zone of the Kayan Mentarang National Park (see Figure 3).

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<sup>1</sup> Malinau Regency was established with the legalization of the 1999 Regional Autonomy Law and Fiscal Balance Law. This is highly relevant because with this Law (and the revision Law in 2004), Malinau Regency holds power in decision making including budgetary power.



**Figure 3.** Location of study villages (Adapted from Césard 2007)

### 1.5.3 Process of integration to the market economy and the state system

The earlier engagement of the Punan with market may have been through the commercialization of forest products (Sellato 1994). To the Punan, demand for forest products came from the coast, possibly from agriculturalist groups who traded forest products with market goods, such as metal, salt, tobacco, and the like, forming patron-client relationships with the Punan to secure trade (Sellato 1994). Beside the governments resettlement program in the 1970s, it has been argued that this trade played a role in

converting the Punan from hunter-gatherers nomads to sedentarized rice farmers, with different level of conversion between different Punan groups (Sellato 1994).

In the 1990s, several changes took place in Malinau, including the grow of timber and mining companies, which created at the same time new livelihood opportunities for the Punan, but also increasing competition for land (Kaskija 2012). The changes include new roads and the popularization of outboard boat and long tail engines. Such change increased Punan access to the market and prices of forest products and reduced the role of middlemen in the trade of such products (Kaskija 2012).

Today, the Punan Tubu of the upper river are about ~860 individuals (adults and children) living in remote forest area of about 5200 sq. km (Kaskija 2012). They are now completely settled in permanent villages and, to a certain degree, participate in the national system. The economy of Punan Tubu nowadays is based on two main pillars. On the one hand, the Punan Tubu still practice a hunter-gatherer livelihood. In other words, some Punan Tubu continue to hunt and collect NTFP, and they still occasionally even practice what is known as “*mufut*” or traditional nomadism in forest camps, an activity that implies the movement of the whole household to the forest. The Punan mostly collect NTFPs for household consumption, but they also collect some products, such as eaglewood or *gaharu* (*Aquilaria* spp.), hornbills’ heads or *pecakuh*, or bezoar stones (*batu guliga*, a rock form in the intestine of the animal), which provide an important and significant source of cash income. In 2013, when data was collected, 100 gr of second quality *gaharu* could be sold at 3 million IDR (~300 USD or about 3000% of daily wage).

On the other hand, most Punan Tubu have adopted agriculture and largely rely on dry swidden paddy field and cassava, as well as in a range of vegetables (e.g., eggplant, cucumbers, etc.) and fruits (e.g., pineapple, rambutan, papaya, banana, etc.) which they grow in homegardens. Chicken are grown, but they are usually not eaten within the household, but rather traded during trips to the city or to *gaharu* gatherers visiting the villages. Agriculture, including the opening of cassava plots, the maintenance of dry paddy fields, and the harvesting of crops, is mostly done by women. Although most food consumed by the Punan Tubu is cultivated (Reyes-García et al. 2016), they are becoming increasingly dependent on cash to buy commercial goods such as school uniforms and books, as well as other commercial food products such as coffee, sugar, salt, and the like. Government salaries are an increasingly important source of cash income, especially for some households. Therefore, as



it is the case for many indigenous peoples, nowadays the Punan Tubu live between two worlds: they can freely hunt and gather wild edibles and NTFPs and then go home to watch TV.

In the last few years, Malinau district has experienced vast changes with its development budget. In 2012, the newly appointed Head of District introduced a development program, called Gerdema allowing the village level government (consisting of assigned villagers) to manage development budget independently, including decisions over village programs and management of budget and cash transfers (PEMKAB Malinau 2013). Based on this program, each village in Malinau receives an annual transfer of 100,000 USD. The Gerdema program is based 'on the initiative and participation of the people' as a central part of the development strategy (PEMKAB Malinau, 2013: 8). Money from the program has been mostly used for house building. Differently than the traditional houses in which the Punan lived, the new houses are permanently built from logs and completed with glass windows and tin roofs. Under the Gerdema program, the government calls villages to top-up government transfers with voluntary labour, materials, or even money in the pursuit of their development goals.

The government transfers, which entail a large amount of cash, have also brought new livelihood opportunities for the Punan Tubu. For example, as part of the government program, the government requires the nomination of village officers, such as a head of the village, a village legislative officer, and even a head of village customary law (*adat*), all in charge of implementing and supervising the execution of the projects and receiving a salary from the government in compensation. Also, the house and infrastructure building generated by government cash transfers have increased the demand for skilled labourers (e.g., carpenters, motorists) and unskilled cash workers (e.g., porters carrying materials to build the houses or carrying logs from the forest to the village). In sum, government policies have resulted in an increasing number of opportunities to obtain paid jobs, in addition to other government jobs which were already in place, such as district-level civil servant or staff or as local teacher.

#### **1.5.4 Sharing and cooperation**

Sharing is an integral part of traditional and contemporary Punan lifestyle. Previous ethnographic work suggests that food sharing is common among the Punan (Klimut & Puri

2007). Kaskija (2012) traces back this custom of sharing food to the inability to store food in a tropical environment. Although other researchers have also argued that hunter-gatherer groups like the Punan have a different way of looking at food sharing, Kaskija (2012) believes that the Punan see the forest as a provider, which explain why the Punan immediately finish the hunt or edibles gathered by sharing, as they think that tomorrow the forest will provide them with more food. The same characteristic has been found among other foragers groups (Bird-David 1990; Bird-David et al. 1992).

Food is shared among all the members of the group or band, even if the production of food is done individually, as in the case of hunting. Meat, an important component in Punan diet, is shared at large, not only with family, but also with all villagers, although differences exist in what is given to whom (Kaskija 2012). Some parts, for example the thigh of the wild boar (*Sus barbatus*,) are highly appreciated and therefore only given to family or close neighbours. The other villagers will then be given an equal proportion of a combination of flesh with fat, depending on the prey and the number of people present in the village. Asking the hunter to share his prey is common and is not considered shameful, a characteristic of “demand sharing” (Kaskija 2012; Koizumi et al. 2012).

Sharing is not restricted to meat. The sharing of other wild edibles such as wild fruit, wild plants, or honey is also common. Traditionally, Punan subsistence was based on small number of species of palms (e.g., *Eugeissona utilis*) from which the Punan made starch (Sellato 1994). The availability of palm groves was an important factor, back then, regulating the movement of a band of Punan. The palm grove visited once was revisited again only after a certain lapse of time (Sellato 1994). Men and women used to share the work of processing sago (a type of starch) flour from palms (Sellato 1994). Nowadays, the Punan make sago from cultivated cassava and do not collect starch from wild palms anymore. The gathering of wild fruits and other wild plants are still practiced, and are mostly done by women within a radius close to the village. Men also collect wild plants, although in a more opportunistic way, for example when returning after a non-successful hunting trip. Sharing involves both raw and cooked food from wild and cultivated areas. Modern food products, or food products obtained through market transactions such as sugar, coffee, biscuits or candies, are purchased by trading NTFP or income from salary and are also shared. As the literature has traditionally looked at meat sharing, there is a gap on how the sharing of modern products are performed and regulated.

In the same way that the Punan share food, they also have a long history of cooperation in productive activities. Cooperation is common in activities especially related to the many tasks that allow them to overcome the difficult nature of the environment in which they live. For example, in the past, the Punan cooperated in the task of making sago (Sellato 1994). Nowadays, agricultural work is also done in common, especially plot opening and crop harvesting. This is mostly done in a large group including not only family members, but also members of other households. The Punan Tubu work together in opening plots, rotating between household plots, a practice called “*pabih*”, which is now still implemented for the plot of the teacher or the village priest. “*Tenguyun*” is what the Punan call the work of more than two households in rotation, and this is mostly done at the clan level or with the extended family grouping.

Cooperation can also be seen in new tasks, somehow related to the market economy or the village governance. Transportation, for example carrying sick people to health facilities, or the pushing and pulling of boats in the river, is a task that requires cooperation. For river transportation, the Punan often travel by groups of 2-3 long-tailed motor boats (in Punan Tubu ‘*katinting*’) to ensure enough people help pull and push the boats in shallow areas or rapids. Building houses under the government program also requires cooperation, although in some cases there are salaries for the labour.

## **1.6 Outline of Dissertation**

This dissertation is organized in five chapters. Following this introduction (Chapter 1), I present my empirical research chapters in the format of scientific articles (Chapters 2, 3, and 4; see also sub-section 1.3). These empirical chapters present some similarities one with another, specifically in the description of the study area. I have preserved each chapter in its original article format in order to maintain their respective internal cohesion, even if the reader finds some duplicated information between chapters. Finally, a conclusion (Chapter 5) provides an overview of the main theoretical and methodological learnings and practical implications of this research. Further information (e.g., scripts of the games), are available in the Appendices. I also present an Annex with a list of publications that I have co-authored during my Ph.D.

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## Chapter 2

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# Sharing in a context of rural development. A study among a contemporary hunter-gatherer society in Indonesia<sup>1</sup>

### 2.1. Introduction

Researchers have documented the uniqueness in the way in which humans share and the prevalence of sharing in small-scale societies (Kaplan & Hill 1985; Hawkes et al. 2001; Jaeggi & Gurven 2013). Sharing among humans is practiced beyond kin (Bliege Bird & Bird 1997; Hill 2002) and is often done voluntarily or proactively (Jaeggi and Gurven 2013). Food sharing is considered to be one of the original forms of sharing among humans (Kameda et al. 2005) and is believed to be linked to the universal human tendency to cooperate (Hill 2002). From an evolutionary perspective, food sharing has been proposed as an adaptive mechanism that increases group fitness through the distribution of resources (Reyes-García et al. in press), contributing to greater reproductive success by facilitating faster production and greater survival of group members (Jaeggi and Gurven 2013).

Many studies on sharing among contemporary hunter-gatherer societies have adopted an evolutionary perspective, aiming to elucidate why humans share or what are the evolutionary roots of sharing among humans (see Kaplan & Hill 1985; Hawkes et al. 2001). However, integration into the market economy and participation in national society are major factors affecting the ways of life of contemporary hunter-gatherers (Behrens 1992; Putsche 2000), and for which effects on sharing remain insufficiently studied. In this chapter, we study sharing among a contemporary hunter-gatherer society undergoing rapid socio-economic changes.

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<sup>1</sup> Napitupulu, L., M. Guèze, V. Reyes-García. Sharing in a Context of Rural Development. A study among a Contemporary Hunter-gatherer society in Indonesia. In Pyhälä, A. and Reyes-García, V., (Editors) *Hunter Gatherers in a Changing World*. Springer, 2016.

Researchers have debated the effects that integration into the market economy and participation in national development may have on traditional or customary, well-established norms of sharing. The two processes are often interrelated, which contributes to magnify their impacts (Godoy et al. 2007). For example, the increase of governmental socio-economic development programs has accelerated integration into the market economy mostly by resettling and/or encouraging engagement in cash and wage labour (e.g., Thornton 2001; Odysseos 2011). Meanwhile, some researchers have found that market integration does not necessarily change sharing practices, as sharing often provides benefits that are not met through the market, such as the establishment of political alliances (Bliege Bird & Bird 1997) or showing off a personal quality that is favoured in the community (Gurven et al. 2001). Furthermore, it is suggested that even the increase of wealth will not diminish sharing practices, as wealthy households most probably become more likely to reciprocate to others with material help or in some context they might even be obliged to share more (Nolin 2012). Hence, some researchers have argued that the arrival of new market opportunities might not necessarily change sharing practices.

In contrast, some other researchers have argued that integration into the market economy destroys traditional forms of sharing and cooperation (Tucker 2004). Integration into the market economy creates income inequality, which in turn weakens traditional community customs, generates conflicts, makes exchanges difficult, and results in shifting towards self-interest rather than group-interest (Putsche 2000). For example, with more access to markets, the sharing of resources –such as of hunted game meat - has an increasing opportunity cost for the hunter and/or his household, as the time devoted to the procurement of wild meat competes with time-investment in income generating activities, such as cash cropping (Behrens 1992; Tucker 2004), or with direct commercialization of wild meat (Tucker 2004). Furthermore, some scholars have found that as societies access the market economy and participate in national development, they also access new forms of socioeconomic organization (e.g., credit, insurance, warranty) that might help them buffer against possible environmental and economic shocks that hunter-gatherer societies have traditionally faced and overcome through sharing. Such new forms of economic organization could potentially undermine the practice of sharing (di Falco & Bulte 2011).

Despite the literature on the topic, the debate continues to be unresolved. Furthermore, the topic has recently gain renewed relevance, as many governments and international organizations are implementing development programs that involve the transfer of cash. For example, conditional or unconditional cash-transfer programs (e.g., Kenya ‘*M-Pena*’, Brazil ‘*Bolsa Familia*’) aiming on reducing poverty (Das 2005). Similarly, the international community is developing mechanisms that encourage payment for environmental services to upstream stakeholders (e.g., REDD+)(Pham et al. 2014). Such influx of cash to local communities accelerates the process of integration into the market economy and into national societies with unknown effects on traditional forms of transfers, including on sharing practices.

This chapter contributes to this debate by analyzing the practice of sharing amongst a contemporary hunter-gatherer group in Indonesia, the Punan Tubu. The goals of the study are 1) to provide a description of sharing among the Punan Tubu (i.e., what do they share, to whom do they share) and 2) to explore how those practices relate to individual levels of integration into the market economy and the national society. As the Punan Tubu are currently experiencing different levels of socioeconomic change driven by Indonesia’s political emphasis for development in rural and poor-and-remote areas (Government of Indonesia 2014), they represent an ideal case study for the aims of this research.

## **2.2. Indonesia’s rural development**

In 1997, with the downfall of Soeharto after more than 32 years of dictatorship, the national government in Indonesia underwent massive changes, including a shift of power from the central to local governments, i.e. to the district level (*kabupaten*) or city level (*kota*). The shift was mostly motivated by the unbalanced economic development between Java (the centre of governance) and all the other islands, many of them rich in natural resources yet economically less developed (Bebbington et al. 2006). With decentralization, districts abundant in natural resources received large fiscal budgets for which they also received greater economic decision-making power. Thus, during the last few decades, local governments have been experimenting on how to manage their acquired power, including decisions on local development.

This has been the case for Malinau, a district in North Kalimantan established in 2012 as a result of the 1999 Decentralization Law. Covering an area of 42.620,70 square km of mostly tropical rainforest (GoI 2014), Malinau is home to 21 ethnic groups, including the Punan, the largest hunter-gatherer group in Borneo (Wollenberg et al. 2006). In 2012, the Malinau local government launched the “*Gerakan Desa Membangun*” or GERDEMA, a program committing to spend 100.000 USD per year for each village in Malinau by directly transferring cash to the village. The purpose of GERDEMA was for each village can decide how to use the cash transferred. With the introduction of GERDEMA, the government has also required the establishment of new administrative structures in each village, including the appointment of a head of village, a village legislative, and a head of village customary practices. These officers are in charge of implementing and supervising the execution of the projects and they receive an individual government salary for performing their jobs. Most villages are using the cash transfer to build permanent houses (with glass windows and tin roofs), and to purchase communal equipment (e.g., chainsaws) or agricultural inputs (e.g., herbicides). Overall, GERDEMA has resulted in many important changes for villages in the Malinau district, including changes in settlement patterns of standardized housing, increased demand for skilled (e.g., carpentry, builders, boat motorists) and unskilled labour (e.g., porters for carrying construction materials to the villages), frequency in travelling to town market for e.g., government meetings, cash spending.

### **2.3. Case study: The Punan Tubu and new livelihood**

Until recently, the Punan were a nomadic hunter-gatherer group mostly scattered in the central to north-eastern parts of Borneo. Punan settlements were found within the state territories of Brunei Darussalam, Malaysia and Indonesia. Due to the nomadic nature of the group, their level of assimilation to the modern society varies largely depends on their location to market town and also with the neighbouring village surrounding the area (Sellato 1994; Kaskija 2012).

We conducted research among the Punan Tubu, a group of Punan from the upper basin of the Tubu River, in the District of Malinau. Influenced by Indonesia’s rural development policies, the Punan Tubu are today sedentized in permanent villages, some

living in villages upstream along the Tubu River and others in a resettlement placed nearby the city of Malinau. Ethnographic accounts of the Punan describe them as an egalitarian society, without strong hierarchies. Ethnographers mention that although the Punan traditionally had a village head, most decisions were taken by individuals and households without interference (Kaskija 2002; Kaskija 2012). They were also characterized by the lack of accumulation of wealth whether it is cash or material possession (Klimut & Puri 2007; Kaskija 2012).

Traditionally, the Punan lived in bands comprising several kin-related households in which resources were widely distributed, with sharing being an integral part of the Punan way of life (Kaskija 2002; Kaskija 2012; Koizumi et al. 2012). Food was shared among all the members of the group or band, even when food was procured individually. The sharing of meat, an important component in the diet, is a well-established custom among the Punan. It is also important to notice that recent ethnographic work among the Punan has found that demands to share, a practice that has also been observed in other hunter-gatherer groups (Peterson 1993), are very common (Kaskija 2012; Koizumi et al. 2012).

At least for the past decade, the Punan Tubu have been observed to express interest in embracing the market economy and adopting the services from the Indonesian national state (Levang et al. 2007). At least since 2005, the Punan Tubu have settled in permanent villages and, to a large degree, participate in the national development. Nowadays, the Punan Tubu economic system rests on two main pillars. On the one hand, most Punan Tubu have adopted agriculture and largely rely on upland rain-fed rice and cassava cultivation, as well as on a range of vegetables and fruits which they grow in home gardens. On the other hand, they maintain a hunter-gatherer livelihood: they hunt and collect non-timber forest products (NTFP). Occasionally, they still practice *mufut*, an activity that implies the movement of entire households to the forest. *Mufut* seems to be practiced when there is shortage of wild boar in the close periphery of the village. During such expeditions, the households collect wild meat and other wild edibles for consumption and other forest products, such as eaglewood (*Aquilaria spp.*), head of hornbill (*Buceros vigil*), or some wild animals for commercial purposes. The commercialization of these products provides an important source of cash income for Punan Tubu households.

Across these livelihood strategies, there is relatively clear gender division of labour among the Punan Tubu. The opening of cassava plots and the maintenance of rice fields is mostly done by women, who are also in charge of harvesting. Meanwhile, men are more involved in the collection and commercialization of NTFPs. Men are also the direct counterparts of government programs, whether through their work as village level officers with government salary or through wage-labour work, e.g. house building, carpentry, or transportation.

Although most of the food that the Punan Tubu consume comes from their agricultural plots or from the forest, they are showing increasingly dependence on cash to buy food items such as coffee, sugar, and salt. Cash is also used to purchase other commercial goods highly valued locally, such as cigarettes, mobile phones and even televisions. In this context, cash income, either from the commercialization of forest products or from salaries and cash-transfer programs, is becoming a perceived need for Punan Tubu households.

## **2.4. Methods**

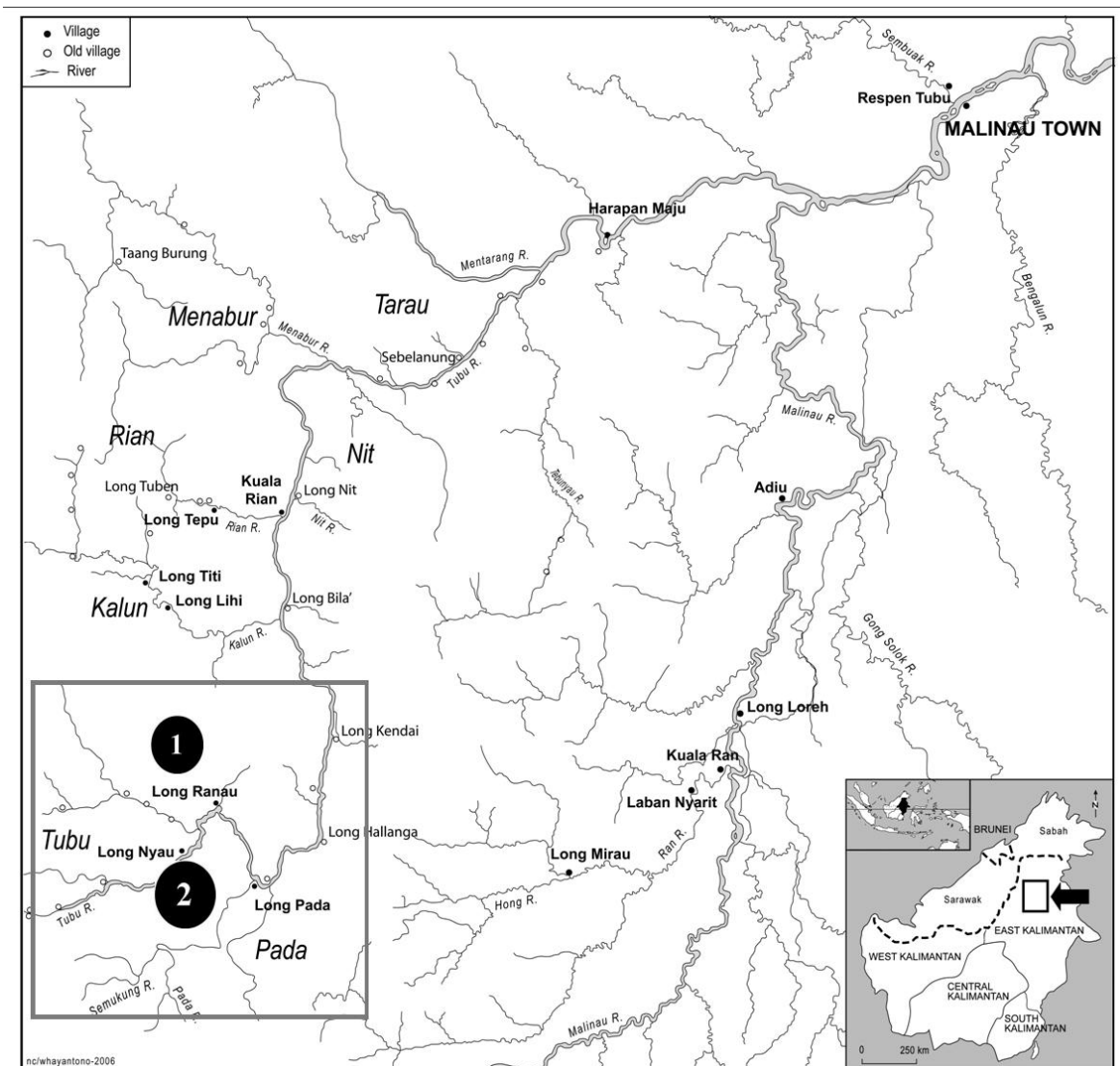
We conducted fieldwork between March 2012 and July 2013. Methods of data collection included systematic observations on sharing and the measurement of individual levels of integration into the market economy and of participation in the national development through variables such as visit-to-town, school, wage, distance of village. We devoted the first six months of fieldwork to the collection of background information through semi-structured interviews, participant observation, and a census. This background information allowed us to better understand the context in which the Punan Tubu live and to develop the instruments and more specific questions for a more systematic observation of sharing.

Prior to the fieldwork, we obtained Free Prior and Informed Consent from each village and individual participating in the study, in which we guaranteed anonymity of the individuals and village. In addition, this research adheres to the Code of Ethics of the International Society of Ethnobiology and has received the approval of the ethical committee of the Universitat Autònoma de Barcelona.



## 2.4.1 Sampling

The sample consist of all adults (> 16 years of age) living in two Punan villages and willing to participate in the study, for a total of 118 adults from which 55 (or 47%) were women. Of the two villages, one is more populated (~154 individual) and slightly closer to the city of Malinau (i.e., 3 days canoe ride) than the other (population of ~107 individual; with distance of 3 days canoe ride and 1 day walking) (Fig. 4). Both villages participate in the GERDEMA program, with the same budget allocation (about 100.000 USD/year).



**Figure 4.** Map of two main ethnographic villages (Adapted from Césard, 2007)

## 2.4.2 Methods of data collection

Individual Census: At the beginning of the study we collected individual socio-demographic information of all the participants in the sample, including data on sex, age, village of residency, education, and frequency of visits to the main town (Malinau).

Open-ended Interviews and Participant Observation: During the first months of fieldwork, we conducted open-ended interviews about sharing and about socioeconomic development in the area, especially to inform the design of the quantitative data collection instruments. We also actively participated in daily activities including accompanying informants during harvesting and helping in processing agricultural products.

Sharing-Survey: We visited all adults in the sample once every fortnight, totalling approximately 25 times per adult. We collected self-reported data on sharing using a modified version of an anthropological technique called scan interviews (Reyes-García et al. 2009). Specifically, once every fortnight, on a day chosen at random, we visited each household and asked all adults present about all the goods given to (or received from) other people in the village during the previous two days. Informants were asked about the type and quantity of products they had given/received, as well as the name of the giver/receiver and its social relation to the informant (i.e., family, neighbour, or outsider).

We compiled the information on sharing into four different variables. The first two variables capture 1) all self-reported events of giving (n=543), defined here as each recorded event of an individual giving a specific product to another individual (outside the household) and 2) all self-reported events of receiving (n=544), similarly defined. The other two variables were constructed at the individual level (n=118) to capture 3) the share of times an individual reported giving, defined as the number of giving events reported by the individual divided by the number of scan interviews in which the individual was observed and 4) the share of times the individual reported receiving, defined as above. Since each observation can include multiple giving/receiving events, the last two variables can be higher than 1.

Quarterly Wage-Survey: We proxied individual levels of integration into the market economy with information on whether the individual received wage or salary every quarter over the course of fieldwork. Specifically, we asked all adults in the sample “*in the last*

*two weeks, have you received any wage or salary?”* and coded the answer as a yes (=1) or no (=0).

Village-Price Survey: To estimate the monetary value of products being shared, we collected data on the products' village price. For tradable products, we asked informants to report the products' selling price. For non-tradable products, such as wild edibles collected for household consumption, we followed the methodology used by Wunder et al. (2011) and assigned the village price of a similar substitute product.

### **2.4.3 Methods of data analysis**

We conducted descriptive, bivariate, and multivariate data analyses. All statistical analysis used STATA for Windows version 13.

1) Descriptive Analysis: We coded items reportedly given (or received) into the following categories: 1) wild meat, 2) wild edibles other than meat, 3) cultivated food, 4) market food, and 5) non-food products. We also classified actors participating in sharing events by coding whether the person giving (or receiving) the product was 1) from the same nuclear family (parent, sibling or offspring) but different household, 2) from the same village but not the same nuclear family, or 3) from outside the village. We then computed descriptive statistics of each recorded sharing event, defined as each giving (or receiving) report of a specific good at a specific time involving people external to the household. Thus, the giving of two pieces of meat to two people from two separate households was computed as two different sharing events; similarly, the sharing of two products (i.e., meat and wild edibles) to the same person in a different household was also computed as two sharing events. We calculated the monetary equivalent of products shared based on the quantity of the product shared and the substitute market price of the product, accounting for the relative value to the purchasing power parity (in US \$).

2) Bivariate Analysis: To assess how integration into the market economy relates to sharing, we first calculated the relative sharing frequency at the individual level. We then used census data to generate five dummy variables. Our first variable (1) captured whether the person was a man (=1) or a woman (=0). The other four variables proxy for individual

levels of integration into the market economy and national society as follows: 2) visit-to-town (binary variable that takes the value of 1 if the person had visited the market-town in the 12 months prior to the interview, and 0 otherwise), 3) schooling (binary variable that takes the value of 1 if the person had received any formal schooling, and 0 otherwise), 4) wage (binary variable that takes the value of 1 if the person had received any wage or salary within the past 12 months, and 0 otherwise), and 5) village (binary variable that takes the value of 1 if the person lives in the village close to the market town, and 0 otherwise). We used a two-sample (independent) t-test to assess potential variations in individual observations of sharing (giving and receiving) across the five selected variables.

3) Multivariate Analysis: We used multivariate regression analysis to test the association between the five selected variables and individual measures of sharing. As most of the observations on sharing equal 0, we used a Tobit regression model. We tested for multicollinearity among the five different explanatory variables by doing a collinearity diagnostic with the Variation Inflation Function (VIF). As we obtained a VIF mean of 1.2 and none of the values were higher than 10, we discarded multicollinearity and included all variables in the analysis. As most of the observations on sharing equal 0, we used a Tobit regression model.

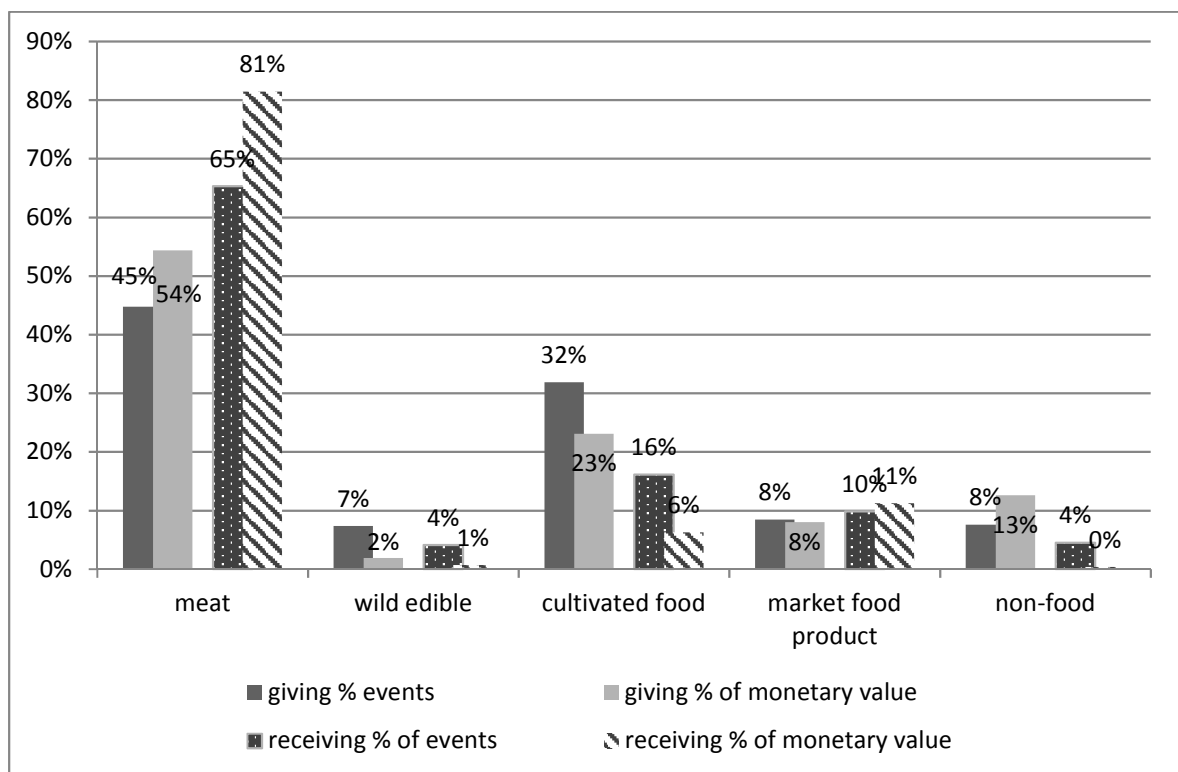
## **2.5. Results**

During the course of the entire data collection period, we obtained a total of 1946 individual observations from the 118 participants in the study. About 70% of the observations on sharing were 0, meaning that individual did not share outside of the household. From the total number of individual observations, 231 (11.8%) involved the individual giving and 348 (17.8%) receiving. Because our definition of a sharing event allows for multiple events in one interview, the total number of giving events amounts to 543 and the total number of receiving to 544 events. Over the period of study, 27 participants (%) did not report any giving event and 16 participants (%) did not report any receiving event.

## 2.5.1. Giving and receiving

### 2.5.1.1. What do the Punan Tubu share?

The large majority (about 92%) of all giving events that we recorded relate to food, including wild meat, other wild edibles, cultivated food, and market-purchased food-products (Fig. 5). Most giving events correspond to the sharing of wild meat (45%), a percentage that is even higher when accounting for the monetary value of products shared, as the value of the wild meat given represents 54% of the monetary value of all goods given. Despite this clear prevalence of wild meat sharing, in the individual interviews some people complained that there is less meat sharing than in the past.



**Figure 5.** Percentage (%) of sharing events (giving and receiving) and their monetary value, by category of products

Cultivated foods, whether raw or processed, also accounted for an important share of giving events (32% of all giving events and 23% of the monetary value of goods given). The sharing of wild edibles other than meat, such as fruits and honey, has a much lower prevalence. Events involving wild edibles represent only 7% of giving events, and only 2%

of the monetary value of goods reportedly given. Food products purchased from the market were also occasionally given to people outside the household, less than wild meat or crops, but more than other wild edibles: amounting to 8% of the giving events and 8% when accounting for the monetary value.

Finally, our data show that the Punan Tubu also share non-food products, including forest products such as firewood and rattan, and commercial non-food products such as cigarettes and clothes. Indeed, about 8% of giving events reported relate to non-food products, representing 13% of the value of all products given.

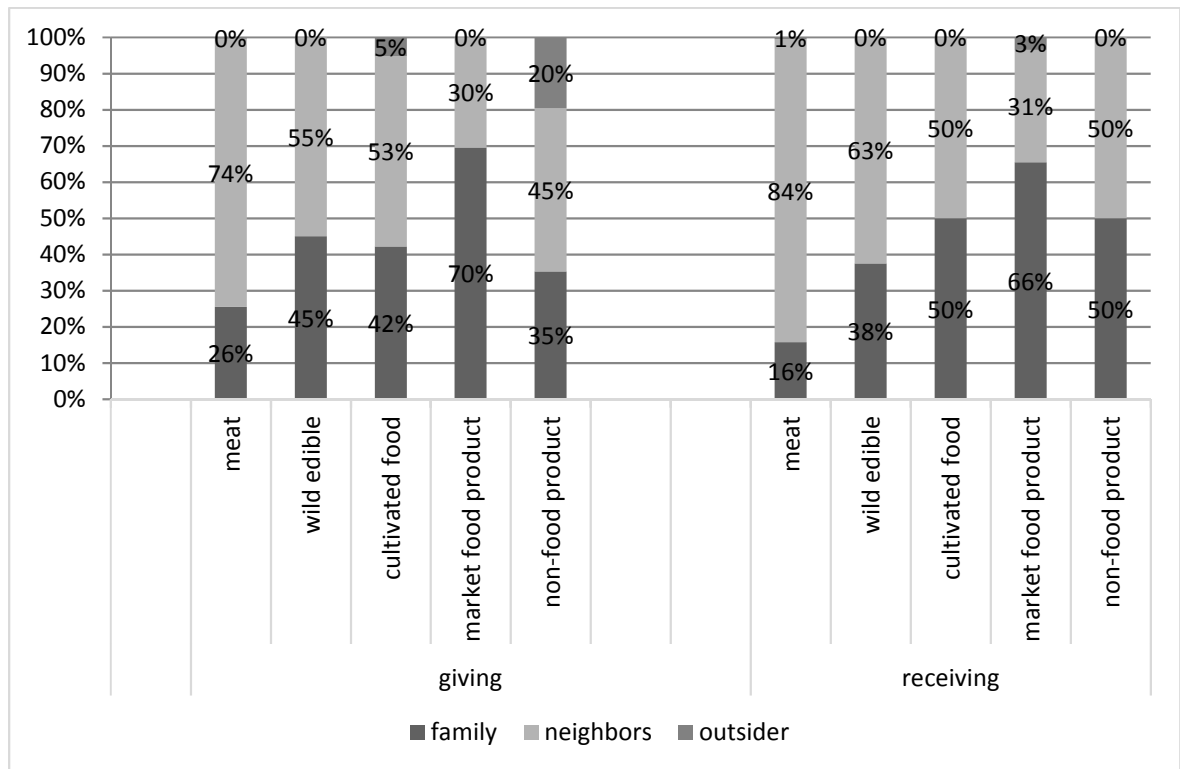
All in all, we recorded more receiving than giving events: overall informants reported to have received something from someone outside their household in 18% of the scan interviews conducted (compared to 12% having given). The distribution of receiving events across categories resembles the distribution of giving events, thus validating much of the data both ways. Of the goods reportedly received, 96% involved food items, most obtained from the forest, with wild meat being the most frequently received product both in terms of reports (65%) and in monetary value (81%). Only 4% of the receiving events related to wild edibles, which represented only 1% of the monetary value of all items received. Informants reported receiving cultivated food with a much lower frequency than they reported giving it (16% vs. 32%), with crops representing only 6% of the monetary value of products received. The monetary value of market food products was about the same as the frequency of receiving market food (11% vs. 10%). Non-food items were reported in 4% of receiving events, with an insignificant monetary value, because the items reported (e.g. firewood) had a low monetary value.

Overall, the largest differences between giving and receiving events were found for wild meat and crops. People reported more often receiving than giving wild meat (65% vs. 45%), whereas people reported more often giving than receiving crops (32% vs. 16%).

#### **2.5.1.2. *With whom do the Punan Tubu share?***

The Punan Tubu shared products differently across the three categories of extra-household actors used for analysis: i.e., family, neighbours and outsiders (Fig. 6). Meat, other wild edibles, and cultivated foods were given more often to neighbours than to family members. The sharing of meat and wild edibles to outsiders were rarely reported.

Market food items followed a different pattern as they were mainly shared with the family (70%), but rarely with neighbours (30%), and never with outsiders. Finally, non-food items followed yet another distinct pattern, as they were given more evenly across the three categories of actors (35% vs. 45% vs. 20%).



**Figure 6.** Giving and receiving, by actor and category of products

Most receiving events involved products given by neighbours (Fig. 6). Informants reported receiving wild meat (84%) and wild edibles (63%) mostly from neighbours. While informants reported receiving cultivated foods and non-food items to the same degree from family members as from neighbours (50%), when it came to market-purchased foods, family was the main giver (66%).

### 2.5.2. Bivariate analysis: Correlates of sharing among the Punan Tubu

Across all shared products, the average share of times an individual reported giving was 0.37 (Standard Deviation/SD=0.63), whereas the average share of times an individual reported receiving was 0.31 (SD=0.31) (see Table 1).

**Table 1.** Summary Description of Explanatory and Outcome

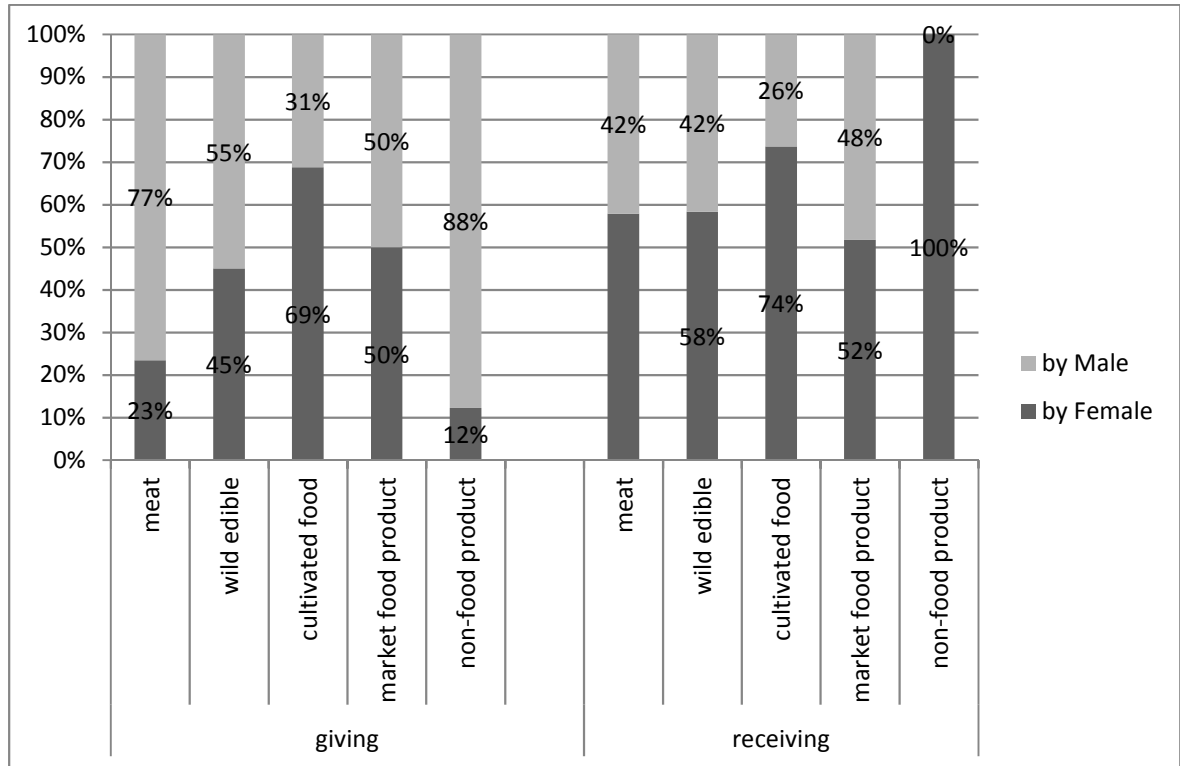
Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
<b>OUTCOME VARIABLES</b>						
sh_give	Share of times the person gave any item	118	0.37	0.63	0	5
sh_givenmeat	Share of times the person gave meat	118	0.33	0.40	0	5
sh_givenwe	Share of times the person gave wild edible	118	0.06	0.19	0	1
sh_givencult	Share of times the person gave cultivated food	118	0.26	0.37	0	1
sh_givenmod	Share of times the person gave market food	118	0.06	0.20	0	1
sh_givennon	Share of times the person gave non-food	118	0.06	0.18	0	1
sh_rec	Share of times the person received any item	118	0.31	0.31	0	1.7
sh_recmeat	Share of times the person received meat	118	0.58	0.41	0	1
sh_recwe	Share of times the person received wild edible	118	0.04	0.14	0	1
sh_reccult	Share of times the person received cultivated food	118	0.15	0.27	0	1
sh_recmod	Share of times the person received market food	118	0.09	0.22	0	1
sh_recnon	Share of times the person received non-food	118	0.01	0.06	0	1
<b>EXPLANATORY VARIABLES</b>						
male	Dummy variable that captures whether the person is male (=1) or female (=0)	118	0.53	0.50	0	1
visit-to-town	Dummy variable that captures whether the person has gone to the market town in the previous 12 months (=1) or not (=0)	118	0.59	0.49	0	1
schooled	Dummy variable that captures whether the person has gone to school (=1) or not (=0)	118	0.31	0.47	0	1
wage	Dummy variable that captures whether the person has gone received wage in any quarter (=1) or not (=0)	118	0.37	0.49	0	1
closer-to-town	Dummy variable that captures whether the person lives in the village closer to town (=1) or in the other village (=0)	118	0.58	0.50	0	1

Note: The outcome variables capture the share of times a person received a product.

Women reported giving less frequently than men: while the share of giving events reported by women averaged 0.3, the share of giving events reported by men averaged 0.50 ( $|t|(118) = 2.35, p=0.02$ ). Furthermore, the SD was much larger among men, indicating that there was a larger variation in sharing patterns among men than among women (Table 2, column A). We also found that women and men gave products belonging to different product categories (Fig. 7). Wild meat was more commonly given by men, whereas cultivated food was more commonly given by women. Food products purchased from the market were equally given by men and women, despite the fact that men are the ones commonly earning cash to buy market-food. Overall, non-food items were given more



often by men. In contrast with previous results, the share of receiving was higher for women than for men in all categories of products (Fig. 7), although a t-test proved that the differences in the share of receiving by men and women are not statistically significant; ( $t(118) = 0.90, p = 0.37$ ) (see Table 2).



**Figure 7.** Percentage of products given and received, by category of products and sex

**Table 2.** T-test on share of giving and receiving events, by socio-economic attributes of informants

Correlates of Sharing										
	<i>[A]</i> <i>Male</i>		<i>[B]</i> <i>Visit-to-town</i>		<i>[C]</i> <i>Schooled</i>		<i>[D]</i> <i>Wage</i>		<i>[E]</i> <i>Closer-to-town</i>	
	Female	Male	No	Yes	No	Yes	No	Yes	Vid1	Vid2
<i>n</i>	55	63	48	70	81	37	74	44	68	50
<i>Share of products given</i>										
Mean	0.3	0.50	0.16	0.52	0.38	0.36	0.27	0.53	0.46	0.25
SD	0.24	0.82	0.19	0.78	0.74	0.47	0.38	0.90	0.78	0.33
t-test		2.36		3.13		0.14		2.17		1.84
p-value		0.02*		0.002**		0.89		0.03*		0.07
<i>Share of products received</i>										
Mean	0.34	0.28	0.21	0.37	0.31	0.30	0.33	0.27	0.42	0.16
SD	0.29	0.31	0.22	0.34	0.30	0.34	0.31	0.31	0.35	0.16
t-test		0.90		2.79		0.27		0.86		4.74
p-value		0.37		0.006**		0.78		0.39		0.000***

Note: \*is statistical significant at 0.05 \*\*is statistical significant at 0.01 \*\*\*is statistical significant at 0.001

Out of the 118 people in our sample, 70 individuals (60%) reported having travelled to the market town at least once over the past 12 months. Overall, we found that these ‘more travelled’ individuals also appear as having a larger share of giving and receiving than those who had not visited the town; ( $|t|(118)=3.12$ ,  $p=0.002$  for giving and  $|t|(118)=2.78$ ,  $p=0.006$  for receiving) (Table 2, column B).

Only about 30% of the informants in the sample reported having attended school, with only 8% having passed the elementary grade (1-6 grades) and less than 1% having passed the standard 12-years of formal national schooling. We did not find any statistically significant difference in the share of giving or receiving events between these two groups (Table 2, column C).

A total of 44 informants (37% of the sample) reported having received wages. Of those, 77% were men working in government-related jobs, with only 4% reporting having received earnings from non-government related work (e.g., the selling of NTFP). A t-test

analysis examining differences in the share of giving events between adults who received wages and those who did not suggested that adults who receive a wage also report a higher share of giving than those who do not (0.53 vs. 0.27;  $|t|(118)=2.17$ ,  $p\text{-value}=0.03$ ). We did not find those differences when analysing data on receiving (Table 2, column D).

Finally, we did not find any statistically significant difference in the share of giving between people when comparing between the two villages. However, we found that people in the village closer to the market town reported a higher share of receiving events than people in the more isolated village (0.46 vs. 0.25);  $|t|(118)=4.74$ ,  $p\text{-value}=0.000$ ) (Table 2, column E).

### **2.5.3. Multivariate analysis of potential covariates of sharing**

Results from our multivariate analysis suggest that once we include the different covariates in the model, the only variable related in a statistically significant way to individual reports of giving is the one capturing the differences between those who have visited the town and those who have not (Table 3, Model 1). Specifically, if a person had visited the town during the last 12 months, the expected share of giving events was 0.408 higher than a person with the same characteristics but who had not visited the town (99% confidence level). None of the other explanatory variables used in the analysis appeared to be associated in a statistically significant way to individual reports of giving.

We ran a set of similar models, but using the share of products given by categories of products as the dependent variable (Table 3, Model 2-6). None of the explanatory variables explored were consistently associated with all the categories of products. Rather, the significant explanatory factors varied from model to model. Specifically, the variable *visit-to-town* was positively associated to the share of giving market food products (Model 5) and non-food products (Model 6); the variable *schooled* was negatively associated with reports of giving wild meat (Model 2), and; the variable *male* was positively associated with giving wild meat (Model 2) and negatively associated with giving crops (Model 3).

**Table 3.** Results of Tobit analysis showing the association between individual values for the share of products given and explanatory variables, by type of product given

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	sh_give	sh_givenmeat	sh_givenwe	sh_givencult	sh_givenmod	sh_givennon
male	0,18 (0,15)	0,38* (0,15)	-0,17 (0,22)	-0,49 (0,15)	-0,08 (0,25)	0,2 (0,22)
visit-to-town	0,41** (0,15)	0,003 (0,14)	0,26 (0,22)	0,09 (0,14)	0,8* (0,32)	0,79* (0,34)
schooled	-0,14 (0,15)	-0,34* (0,15)	-0,34 (0,24)	-0,03 (0,15)	0,20 (0,23)	0,30 (0,24)
wage	0,1 (0,16)	0,06 (0,16)	-0,12 (0,23)	-0,07 (0,16)	-0,06 (0,25)	0,03 (0,21)
closer-to-town	0,17 (0,14)	0,2 (0,14)	-0,56* (0,22)	0,08 (0,14)	-0,33 (0,23)	0,04 -0,22
Constant	-0,18 (0,14)	-0,17 (0,15)	-0,36 (0,21)	0,15** (0,14)	-1,17** (0,38)	-1,64** (0,48)
N	118	118	118	118	118	118

Note: Standard errors in parenthesis. For definition of variables see Table 1.

\*p< 0.05, \*\*p< 0.01

Results from the multivariate analysis for individual reports of receiving suggest that, once we control for the different covariates, only *visits-to-town* and village *closer-to-town* were positively related to share of receiving (Table 4, Model 1). Specifically, if a person had visited the town during the last 12 months, her expected share of receiving events was 0.15 higher than a person with the same characteristics that had not visited town. Similarly, for a person living in the village closer to town, the expected share of giving events was 0.22 higher than for a person with the same characteristics but living in the village further to town.

**Table 4.** Results of Tobit analysis showing the association between individual values for the share of products received and explanatory variables, by type of product received

	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12) <sup>‡</sup>
	sh_rec	sh_recmeat	sh_recwe	sh_reccult	sh_recmod	sh_recnon
male	-0.08	0,02	-0,17	-0,27	-0,23	2,56
	0,06	(0,11)	(0,19)	(0,15)	(0,19)	
visit-to-town	0,15*	0,26*	-0,05	-0,29*	0,19	-0,14
	(0,06)	(0,11)	(0,17)	(0,14)	(0,18)	
schooled	-0,32	-0,19	0,35	-0,12	-0,02	-2,5
	(0,06)	(0,11)	(0,18)	(0,14)	(0,17)	
wage	-0,034	-0,06	0,15	0,08	0,21	0,33
	0,07	(0,11)	(0,19)	(0,16)	(0,19)	
closer-to-village	0,22***	0,15	-0,42*	-0,12	0,01	0.4
	0,06	(0,15)	(0,18)	(0,13)	(0,17)	
Constant	0,133*	0,33*	-0,48	0,16	-0,59**	-2,96
	0,06	(0,10)	(0,21)	(0,12)	(0,21)	
N	118	118	118	118	118	118

Note: Standard errors in parenthesis. For definition of variables see Table 1. \*p< 0.05, \*\*p< 0.01, \*\*\*p<0.001. Model (12) <sup>‡</sup>does not converge to many explanatory dummy variables that are equal to 1 when the outcome variable is 0. For this reason, this Model does not have a result.

As for giving, we ran a set of similar models differentiating between the products received (Table 4, Models 8 to 12). Again, none of the variables analyzed were consistently associated with the share of receiving across all the product categories; rather, the significant associations varied across models. For instance, the variable *visit-to-town* was positively associated with *receiving wild meat* (Model 8), but negatively associated with *receiving crops* (Model 10); and *male* was negatively associated with *receiving market products* (Model 11).

## 2.6. Discussion

In this study, we use information from self-reported sharing events (giving and receiving) to provide a quantitative description of sharing in a contemporary hunter-gatherer society.

We point out three main findings from the study. First, our results suggest that sharing prevails among contemporary Punan Tubu. Second, despite the prevalence of sharing, we found variations between the different products being shared, with market-purchased food products shared differently from meat and other wild edibles and cultivated food products. And third, sharing behaviour among the Punan Tubu is not directly related to individual levels of integration into the market economy or to participation in national development. We discuss these three findings in more detail below.

### **2.6.1. The importance of sharing among the Punan Tubu**

The first important finding of this work is that sharing prevails among contemporary Punan Tubu. While not perhaps as commonly practiced as in other settings (e.g., Gurven et al. 2000), we observed at least one giving event in 11.8% and one receiving event in 17.8% of our observations. In terms of the numbers of individuals that reported either giving and/or receiving at least once over the course of one year, the average share of times an individual reported giving was 0.37 or the average share of receiving was 0.33, suggesting the continued importance of sharing in the studied population.

In addition to these findings, our ethnographic data suggest that there exist some additional forms of sharing not captured by our methodology. For example, we observed the frequent sharing of some product such as soap or shampoo while bathing in the river; we also observed that the Punan Tubu engage in other types of non-food sharing, such as passing on clothes from one individual to another. Gift giving is also part of Punan social relations; for example, with the birth of a child, family members from the father's side give jewels or electronics to the family of the mother, while family members from the mother's side give a rattan mat or other rattan made craft to the family of the father.

In our results, most sharing events relate to food and especially to wild meat, which the latter contributing to about half of all the sharing observations. The finding is not surprising, but rather in line with reports of food sharing, and especially wild meat sharing, among other hunter-gatherer societies (e.g., Hawkes et al. 2001; Patton 2005). Meat is shared with the family and also neighbours. It is not a rare occasion that non-relatives ask for a share of meat. Neighbours may even wait for a hunter in his house – while he is out hunting – and already ask for a share of the expected meat; the practice is not considered

shameful (Kaskija 2012). This practice of demand sharing suggests that the recipient are the instigator of sharing, such reliance on others for food procurement also signals the continued prevalence of sharing behaviour (Kaskija 2012; Koizumi et al. 2012).

Other food items, especially other wild edibles and cultivated foods, are also shared although to a lesser extent than wild meat. It is probable that the sharing of wild edibles was more prevalent in the past, when the Punan Tubu used to make sago –their traditional staple food- from wild palms (e.g., *Arengaundulatifolia*, *Eugeissonautilis*).

### **2.6.2. The sharing of different products**

The second important finding of this work is that, despite the prevalence of sharing, there are variations between the different products being shared. Most giving events correspond to the sharing of wild meat (45%). Cultivated food (both raw and processed) also accounts for an important share of giving events (32%), whereas market-purchased food items represent only 8% of the giving events. Non-food market products are even less commonly shared (Gurven et al. 2004).

Based on our ethnographic observations, we offer three plausible, non-excluding explanations for the differences in how different products are shared: 1) their visibility; 2) their cultural meaning, and 3) the division of labour in item procurement. First, in a context in which demand sharing is prevalent, differences in the visibility of the product might result in differences in the way some products are shared. Scholars suggests that when food becomes available in public display, the social pressure to share it increases (Peterson 1993; Tucker 2004). During our work, we observed that most of the wild meat shared was of medium- or large-sized animals (e.g., *Sus barbatus*, *Cervus unicolor*), hence clearly visible. Only on a few occasions did we witness the sharing of small animals such as rodents. We speculate that small animals are directly brought into the house and consumed without being noticed, while middle-to-large animal are harder to hide. Similarly, products most commonly brought from the market (such as sugar, coffee, instant noodles) are package goods that can be stored for longer time, but they can also be easily hidden. Products brought from the market can be partially (or even totally) hidden and both the amount to be shared and the pool of recipients can be more restrictive.

A second explanation of the different patterns found in the sharing of products relates to the different cultural meanings attached to different products. Scholars have suggested that, beyond the intrinsic value or purpose of products, the sharing of certain products provide individuals who share a higher status and prestige (Hawkes et al. 2001; Mccracken 1986). For example, scholars argue that meat sharing signals the giver's value as a good hunter and as a good mate (Bliege Bird & Bird 1997; Franzen & Eaves 2007), or demonstrates the approval on behalf of the villagers, the latter favouring prosocial characteristics (Nolin 2012). Studies have found that particularly sharing meat is socially important (Hawkes et al. 2001). Hence, the question arises about how cultural meaning varies according to the sharing of different market and non-market products. We found that market-purchased food items are mainly shared with the family but rarely with neighbours. As market products arrived relatively late into the Punan Tubu consumption patterns, the rules about how and with whom to share might be less defined compared to local resources (like meat), which have been traditionally shared over multiple generations, thus allowing for more time for associated customs and norms to form (Bird-David 1990; Nolin 2012)

The third possible explanation for differences in the amount and type of sharing that takes place relates to the division of labour between men and women during the acquisition of the shared item. Previous works suggest that the items women share is commonly acquired, come in smaller sizes, have a relatively low risk of unsuccessful procurement, and are often associated with high processing costs. In contrast, men produce and share products that are rarely acquired, larger, have higher risk of pursuit failure, and are associated with lower processing costs (Bliege Bird & Bird 1997). Along the same line, our results suggest that men and women share according to what they procure or produce: men share wild meat and honey more often than women, while women share cultivated goods more often than men. However, the fact that households typically pool resources is a factor that needs to be considered when interpreting individual patterns of giving and receiving. This is particularly relevant when examining patterns of receiving events, where –overall– women receive more products than men: a finding that probably relates to the fact that households are the units of consumption among the Punan Tubu, and women in a household are in charge of food preparation.



### **2.6.3. Socio-economic covariates of sharing**

The third important finding from this work is that sharing behaviour among the Punan Tubu is not directly related to individual levels of integration into the market economy, nor to their participation in national development programs. Indeed, only the variable *visit-to-town* appeared to be statistically associated with more reports of sharing. Given the relative isolation of the studied villages, people who had visited the nearest town might be in a better position to give purchased market food and non-food products, incentivizing further gifts to such individual.

Overall, we find that integration into the market economy and participation in national development do not necessarily relate to different sharing behaviour among the Punan Tubu. Our proxies did not suffice to explain the extent of sharing among the Punan Tubu, possibly because the context in which sharing occurs is not only about distributing one product from one person to another, but might be an expectation (or cultural obligation) that applies to everyone, regardless of their socioeconomic status. Nor does it exclude the giver's possible interest to hide what they have and thereby get away with not sharing (Koster 2011; Widlok 2013).

## **2.7. Conclusion**

The main goal of this study was to explore how sharing relates to individual levels of integration into the market economy and participation in national development. We found that while sharing practices prevail, differences in sharing behaviour among individuals cannot be explained through individual level variation in integration into the market economy and participation in national development. However, our results do suggest that there are differences in the way products are shared, and particularly that market-purchased food products are shared differently from locally produced or sourced resources. This is important to note, for with the increasing level of engagement by the Punan Tubu in government work and other wage labour, they are also increasingly introduced to new products and consumption patterns, thereby likely to change the context and dynamics in which sharing occurs.

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## Chapter 3

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# The things we share: Sharing in daily life and experimental settings among Punan hunter-gatherers, Indonesian Borneo<sup>2</sup>

### 3.1. Introduction

Ultimatum bargain experiments are largely designed to explain social preferences for reciprocal behaviour (Camerer & Thaler 1995; Güth & Kocher 2013) and to uncover differences in people's tendency to share and to punish others who do not share (Paciotti & Hadley 2003). Typically, this game is played by two people. One player (the proposer) receives a sum of money and proposes how to divide it with the other player (the responder), who can choose to either accept or reject the offer. If the responder accepts the offer, the money is split according to the proposal. If she rejects it, neither player receives any money. The Ultimatum Game, as commonly known, has been played many times and in many cultural contexts (Cooper & Dutcher 2011; Oosterbeek et al. 2004). When the game has been played among Western, Educated, Industrialized, Rich and Democratic societies (or WEIRD societies as coined by Henrich et al. 2010), researchers have found a common preference towards equal share (Roth et al. 1991). However, when the game has been played among small-scale societies, researchers have found heterogeneity in player's preference for equal share (Henrich et al. 2004).

Two important insights stand out from studies using the Ultimatum Game to explain reciprocal behaviour among small-scale societies. First, the level of market integration of the society seems to be a critical factor in explaining overall group preference for equal share: higher levels of integration into the market economy correlate with a higher preference for reciprocity (i.e., equal share in the game) (Henrich et al. 2001; Henrich et al. 2004). And second, while

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<sup>2</sup> Napitupulu, L., Bouma, J. & Reyes-García, V. The things we share: Sharing in daily life and experiment settings among Punan hunter-gatherer, Indonesia. Manuscript in preparation to be submitted to *Ecological Economics*.

people in WEIRD societies frequently punish those who do not equally share (i.e., those who make low offers) (Roth et al. 1991), people in small-scale societies rarely punish in the game (Henrich et al. 2005; Gurven 2014).

In a way, these findings seem at odds with anthropologists' reports of sharing in small-scale societies. Sahlins (1972), and many others after him (e.g., Bliege Bird & Bird 1997; Woodburn 1998; Gurven 2005), have noted that in small-scale societies people give and share without apparently being concerned by direct reciprocity, probably because sharing is largely done with people who have long term and strong social ties (Hooper et al. 2015; Dyble et al. 2016). Food sharing -in particular- seems to be an ubiquitous form of sharing in many small-scale societies (e.g., Isaac 1978; Enloe 2004). Moreover, anthropologists have also documented that integration into the market economy and the introduction of cash income seem to erode sharing behaviour in small-scale societies, as the ability to obtain money from selling products can easily conflict with local norms of sharing and reciprocity because people may decide to sell products rather than to share them (Behrens 1992; Putsche 2000; Gurven et al. 2015). For example, Tucker (2004) reported that, among the Mikea in Madagascar, the possibility to commercialize meat led to a reduction of meat-sharing; and Behrens (1992) found the same trend among the Shipibo in Peru, where traditional food sharing behaviour diminished as a consequence of the shift to agricultural labour and the introduction of a cash market for meat.

What explains the divergent results between observational and experimental studies of sharing in small-scale societies? We can think of two different reasons. First, it is possible that the external validity of Ultimatum Games played in small-scale societies is low. In fact, the external validity of experimental games has been the subject of some previous research with conflicting findings. Some studies have found that experimental games reflect (to a certain extent) daily life behaviour quite accurately (e.g., Henrich et al. 2005; Güth et al. 2007; Normann et al. 2014; Englmaier & Gebhardt 2016) whereas other studies have found divergences when comparing experimental with field observational data (e.g., Cryder & Loewenstein 2012; Gurven & Winking 2008). Hence, to date we lack concluding evidence regarding the external validity of game experiments.

A second potential explanation of the divergent results between observational and experimental findings when studying sharing in small-scale societies is that such research has largely focused on how the level of market integration displayed by an individual (or a group) relates to the tendency to share (Gowdy et al. 2003; Henrich, et al. 2010), without questioning whether different products are shared in different ways. The neglect is surprising given that, among small-scale societies, integration into the market economy brings not only variation in how different individuals embrace the new economic system, but also variation in the type of products available to any given individual. The Ultimatum Game is typically played with money, a currency that does not take into account that people in small-scale societies engage in sharing as relational connection as much as for distributing material resources (Bird-David 1990; Widlok 2013). Moreover, integration into the market economy allows for the assignation of commercial value to products that previously only had a consumption value and introduces new products for which the society has not developed clear sharing norms or expectations (Graeber 2001). Cultural norms that might dictate the sharing of a product traditionally shared within a group (i.e., bushmeat) might not be applicable to the sharing of a market product (i.e., sugar), as factors such as the way in which the product is obtained, the symbolic value, or the cultural meaning of the product might not make easy applying norms for sharing traditional products to the sharing of market products (Henrich, et al. 2010; Napitupulu et al. 2016).

In this work, we explore these two topics using data collected among the Punan Tubu, a hunter-gatherer society in Indonesian Borneo. We compare observational data on sharing collected during 18-months of field work with experimental data obtained by playing a framed version of the Ultimatum Game, where informants played with a local and a market product. Using the two data sets we assess whether different products (i.e., local products vs market products) are shared differently. Since individuals and villages in our sample display different levels of integration into the market economy, our study allows us to test whether variations in sharing relate to different levels of integration into the market economy when comparing a) observational and experimental data and b) the sharing of different products.

### **3.2. Sharing and market integration: The Punan Tubu of North Kalimantan**

The Punan Tubu lived a nomadic lifestyle in the tropical forest of Kalimantan until around the 1970s, when the government of Indonesia established the Kayan Mentarang National Park and restricted their access to this protected area. Today, they live in five villages (and one hamlet) upstream the Tubu river and in two resettlement villages near the city of Malinau. Over the last decades, the Punan Tubu living in the resettlement villages have developed differently from the Punan Tubu that remained in the remote upstream villages. The Punan Tubu living in the resettlement villages have come to rely mostly on subsistence agriculture, although they occasionally also engage in the collection and consumption of forest products. In addition, they have good access to formal education, health care, markets, and employment opportunities. In contrast, the Punan Tubu in the upstream Tubu river are more isolated -being at a three days long-tail boat ride from Malinau- and they still depend mostly on slash-and-burn agriculture, hunting, and the collection of forest products for their subsistence. Although Punan in both settings display increasing dependence on cash to buy food items such as coffee, sugar, and salt, the tendency is more pronounced in the resettlement villages. Cash is also used to purchase other commercial goods highly valued locally, such as cigarettes, mobile phones, and televisions.

Ethnographic accounts of the Punan Tubu characterize them as an egalitarian society in which everyone has more or less equal access to forage in the forest and in which the accumulation of material wealth was rare (e.g., Sellato 1994; Klimut & Puri 2007; Kaskija 2012). Moreover, traditionally, the Punan Tubu displayed high levels of cooperation and sharing (Kaskija 2012). It is worth noting that the Punan Tubu practice ‘demand sharing’, or the act of giving as a response to direct verbal and/or non-verbal demand for food, products, labour or other support (Kaskija 2012).

Nowadays, sharing continues to be an integral part of a life of the Punan groups. As Koizumi and colleagues (2012) stated when describing the sharing practices of the Punan Benalui “...*(families are) asked to share with others until nothing is left.*” In the same line, recent work among the Punan Tubu living in the upstream more isolated villages has found that,



to this day, sharing and demand sharing prevail, even in the context of rapid integration into the market economy and the national society (Napitupulu et al. 2016).

### **3.3. Methods**

Data were collected between March 2012 and March 2014, as part of a cross-cultural study on the returns of local environmental knowledge (Reyes-García et al. 2016; Napitupulu et al. 2016). Data were collected with two different samples and using two different methodological approaches. Observational data were collected over 18 month-long fieldwork, from which six months were devoted to participant observation and semi-structured interviews and 12 months were devoted to the systematic observation of sharing in daily life. Six months later, in March 2014, we conducted the Ultimatum Game experiments in seven Punan Tubu villages. Data from the Ultimatum Game were complemented with a survey collecting individual and village level information.

Sampling: The sample for the observational study includes all Punan Tubu adults ( $\geq 16$  years of age) living in two villages upstream the Tubu river. We selected two villages: Long Nyau, most upstream and furthest from the city of Malinau, with a relatively small population, and Long Ranau with a larger population and closer to Malinau. Of the total adult population in both villages, more than 90% was willing to participate in our study, resulting in a sample size of 118 informants.

We played the Ultimatum Game in both villages, but also extended the sample to include three other upstream villages and the two resettlement villages near Malinau. We extended the sample to include other upstream villages as we did not expect all adults would be able to join the Ultimatum Game. In each village, we announced we would play a game and people voluntarily decided whether to participate in it or not. In the invitation, we mentioned that the game would last about three hours and that participants could earn instant coffee or rice. In the upstream villages, we invited all adults. In the resettlement villages, after informing the village head, we distributed invitations to every other Punan Tubu household. Moreover, in the resettlement villages we limited participation to one adult per household. A total of 208 adults voluntarily participated in the game and answered follow up survey questions. We obtained Free

Prior and Informed Consent in each village from the head of village and from everyone participating in the observational and the experimental studies.

Participant observation and open-ended interviews: During the 18-months of fieldwork, we actively participated in village daily activities, e.g., accompanying informants during agricultural harvesting, assisting in rice and cassava processing, and sharing meals and conversations with households. At the onset of the study, we conducted open-ended interviews about the sharing of different products and the norms and reasons for sharing. The cultural understanding gained from these observations and interviews helped us design the methods described below.

Observational data: We collected observational data on sharing using a modified version of an anthropological technique called scan interviews (Reyes-García et al. 2009). Specifically, over a 12-month period, once every fortnight, on a day chosen at random, we visited each household in the selected villages and asked all adults present about the goods given to other people in the village during the previous two days. Informants were asked about the type and quantity of products they had given, as well as the name of the receiver and its social relation to the informant (i.e., family, neighbour, or outsider). Since researchers visited all adults in the sample multiple times, we have several observations per subject: in total 1762 sharing observations from 118 adults were recorded. For all the informants for whom we have observational data on sharing, we also obtained individual sociodemographic information through a census. These data included informant's sex, age, village of residence, and level of education, and whether the person received a government salary or not.

Experimental data: We played a framed version of the ultimatum bargaining experiment developed by Güth and colleagues (1982) in the seven selected Punan Tubu villages. The framing of the experiment consisted in substituting cash with food products. To enhance comparability, we selected two non-perishable products with different cultural meanings: a locally produced and widely shared item (i.e., rice) and a commercial product only recently introduced in the area (i.e., instant coffee). For both products, the total amount to be shared in the game was the equivalent to US\$ 4.45, or a little less than the daily wage. The rules to this version of the Ultimatum Game closely resemble the rules used in the original game of Henrich and colleagues (2004) also Andersen and colleagues (2011), except that players negotiated over 6 units of bags-of-rice or 6

units of instant coffee-sachet. Each participant played with one type of product and only acted in one role, either proposer or responder. Couples were randomly assigned to play with either rice or instant coffee; 52 pairs played with rice and 52 with instant coffee. The game was played anonymously, so neither the proposer nor the responder knew with whom they were playing. Beforehand, the game was translated to the Punan Tubu language and explained to the players by the first author (whose mother tongue is Bahasa Indonesia) in both Bahasa Indonesia and Punan Tubu language (see the script of the game in Appendix A).

After the game, we used a survey to collect data on 1) individual characteristics (i.e., age, sex, and school attendance) and 2) proxies to measure variation in exposure to the market economy (i.e., whether the person received a government salary or not).

Data Analysis: We coded all products reportedly given by informants in the two ethnographic villages into the following categories: 1) wild meat, 2) wild edibles other than meat, 3) cultivated food, 4) market foods, and 5) non-food products. We also classified people receiving the products as 1) from the same family but different household (i.e., parents, siblings and offspring), 2) from the village, but not the same family (i.e., neighbours), and 3) from outside the village. We then created a variable capturing the *share of times an individual reported giving*, defined as the number of giving events reported by the individual divided by the number of scan interviews in which the individual was observed.

We used data from the Ultimatum Game to construct variables related to sharing and rejections and a dummy variable that captures whether the person played with *rice* (rice=1) or instant coffee (rice=0). We used data from the follow up survey to construct two explanatory variables: i) *upstream* (1 if the person lived in one of the five villages upstream the Tubu river and 0 if not); and 2) *government salary* (1 if the person receives a regular government salary and 0 otherwise). We also constructed control variables capturing the player's *age* (measured in years), sex (*male* =1), and school attendance (*schooled* =1 for people who have gone to school and 0 for people who have not).

In analysing the data, we start with a description of the observational data, accounting for sharing events documented through scans. The description takes into account the type of product being shared (i.e., wild meat, cultivated food, wild edibles, market-foods, and non-food products)

and the type of actor with whom the product is shared (i.e., family, neighbour, or outsider). We then use multivariate analysis to explore the correlates of sharing behaviour of giving events. Since our data is left-censored, with many participants not having reported any sharing events, we use Tobit multivariate regression analysis with the *share of times an individual reported giving* as a dependent variable and the two variables related to individual levels of market integration (i.e., village of residency and government salary) as main explanatory variables while controlling for the person's age, sex, and school attendance. Our first regression includes the variable that measures the overall *share of times an individual reported giving* and subsequent models include the share of times an individual reported *giving products in each of the categories*.

We followed a similar approach for the analysis of experimental data. Thus, when using experimental data, we start describing it, specifically comparing offers and rejections of the two products used to play the game (i.e., rice and instant coffee). We then use OLS regression analysis and ordered-logit (Ologit) multivariate regression analysis with the proposer's offer of one of the products as the dependent variable (i.e., we ran separate regressions for the subsample playing with rice and the subsample playing with coffee). To enhance the comparability of the analysis of the two data sets, in this set of regressions we use the same explanatory and control variables as we did for the analysis of the observational data. Thus, our regressions include variables that capture whether the informant was from an *upstream village* and *received a government salary* and controls for age, sex, and school attendance.

Finally, we compare observational and game data. We first use the two full samples to test whether there are differences in the average *share of times an individual reported giving* and in the *mean offers* done when playing the ultimatum game across a) men and women, b) people who have attended school and those who have not, and c) people with and without government salaries. We then focus on the subsample of 68 people who are part of both samples. For this subsample, we use a Spearman rank correlation to test whether the *share of times an individual reported giving* correlates with the *offer* made when playing the ultimatum game.

## **3.4. Results**

### **3.4.1 Sample description**

In the two upstream villages, where we did the ethnographic work, we interviewed a total of 118 adults. On average, people in this sample were 36 years old, 47% were female, 31% had gone to school, and 37% received a government salary (Table 5). The game was played by 208 people. Players were slightly older than informants in the ethnographic villages (39 years of age). This sample also included more female participants (54%) and more people who had gone to school (52%) than the sample of people in the ethnographic villages. Participants from upstream villages were overrepresented in the sample of people who played the game (70%). We found no differences in the socio-demographic characteristics of players taking the role of proposers versus those taking the role of responders in the game (Table 5).

We have observational and experimental data for a subsample of 68 people, all of them in the upstream villages. This sample has a similar proportion of men and women. Overall, the distribution of this subsample resembles the distribution in the observational study, but this subsample has a lower percentage of participants who have gone to school (30% vs 52%) and a higher percentage of participants with government salaries (32% vs 24%) than the full sample of players (Table 5).

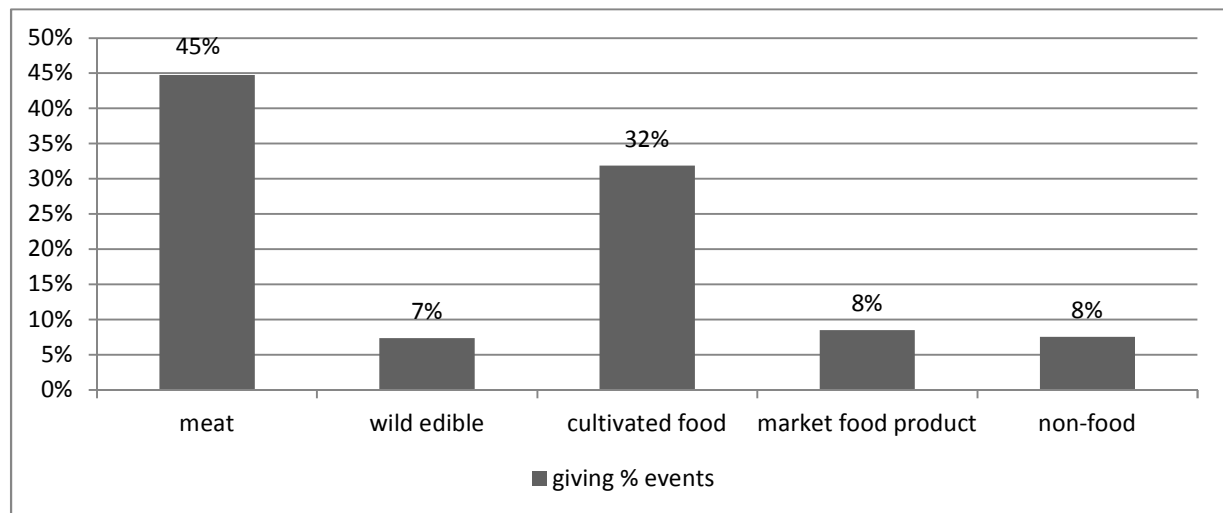
### **3.4.2 Sharing in daily life**

Results from the observational data show that 92% of the sharing observations related to the sharing of food: 45% of the sharing events reported involved the sharing of wild meat, 32% the sharing of raw or processed cultivated food (e.g., rice, cassava, cultivated fruits and vegetables), and 7% the sharing of wild edibles (e.g., fruits, honey) (see Fig.8). The sharing of foods obtained through cash transactions (i.e., sugar, coffee, cooking oil, and the like) represents only about 8% of the giving events reported. According to our data, the Punan Tubu also occasionally share non-food products: about 8% of the sharing events reported relate to non-food products, including forest products such as firewood or rattan and commercial non-food products such as cigarettes or clothes.

**Table 5.** Description of the sample

	Ethnographic study	Framed Ultimatum Game		Overlapping sample	
		Pooled sample	Proposer		Responder
Average age participants (years)	36.29 (14.36)	39.0(15.56)	38.9(15.35)	39.1(15.85)	38.2 (13.16)
% female participants	47%	54%	56%	53%	52%
% participants have gone to school	31%	52%	52%	52%	30%
% upstream village residency	100%	69%	69%	69%	100%
% participants with government salary	37%	24%	24%	24%	32%
No. of observations	118	208	104	104	68

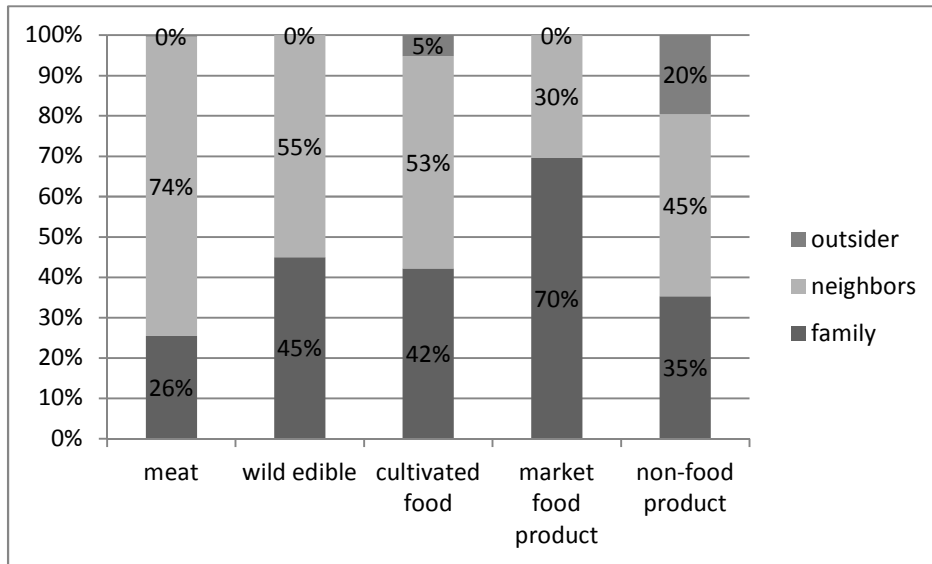
Note: the parenthesis is the standard deviation (SD)



**Figure 8.** Percentage of products shared in ethnographic villages, by category

The Punan share products differently with family, neighbors, and outsiders (Fig.9). Meat and wild edibles were largely shared with family (26%) and neighbors (74%). Wild edibles were shared more often with neighbors than with family members (55% vs. 45%), so were cultivated foods (53% vs. 42%). Market-food items seem to follow a different pattern as they are mainly

shared with family (70%) less with neighbors (30%), and never with outsiders. Finally, non-food items seem to be distributed across family, neighbors, and outsiders (35% vs. 45% vs. 20%).



**Figure 9.** Products shared in ethnographic villages, by actor and category

Results from multivariate analysis suggest that none of the variables used in the model significantly explains the share of times an individual reported sharing (Table 6, Model 1). When we extend the analysis to run similar models using the sharing of different categories of products as the dependent variable, some associations become statistically significant. In this analysis, we found that men give more meat (Model 2, Table 6) and less cultivated food (Model 4, Table 6) than women, and that people living in the village closer to town give less wild edibles than people in the more isolated village (Model 3, Table 6). None of the variables analyzed relate in a statistically significant way to the sharing of food and non-food market products.

**Table 6.** Multivariate analysis of covariates of sharing by products (Tobit model)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	All	Meat	Wild edible	Cultivated food	Market product	Non-food Market product
<b>Explanatory</b>						
Village 1 (=1)	0.2294 (0.1430)	0.2197 (0.1395)	-0.5316** (0.2201)	0.1100 (0.1366)	-0.2238 (0.2353)	0.2997 (0.2258)
Government Salary (=1)	0.1582 (0.1607)	0.0717 (0.1536)	-0.0730 (0.2326)	-0.0555 (0.1587)	0.0305 (0.2604)	0.1546 (0.2297)
<b>Control</b>						
Age	-0.0036 (0.0053)	0.0036 (0.0050)	-0.0061 (0.0079)	0.0025 (0.0049)	-0.0030 (0.0091)	0.0036 (0.0079)
Male (=1)	0.2497 (0.1576)	0.3685** (0.1532)	-0.1297 (0.2242)	-0.4947*** (0.1533)	0.0611 (0.2614)	0.3005 (0.2413)
Schooled (=1)	-0.1141 (0.1618)	-0.3010* (0.1602)	-0.3533 (0.2591)	0.0237 (0.1580)	0.2686 (0.2716)	0.1549 (0.2269)
Constant	0.0978 (0.2586)	-0.3291 (0.2585)	-0.0441 (0.3606)	0.0792 (0.2419)	-0.7709 (0.4875)	-1.3635*** (0.4896)
<i>N</i>	118	118	118	118	118	118

Note: Standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### 3.4.3 Sharing in the Ultimatum Game

We collect 104 pairs of offers from proposers and acceptance/rejection decisions from responders. Overall, the mean and mode of rice offers were lower (38% of the stake,  $M=2.28$ ;  $SD=1.24$ ) than the same values for instant coffee offers (44% of the stake,  $M=2.63$ ;  $SD=1.44$ ). Moreover, there were more rice low offers and less rice hyper offers than for instant coffee (Table 7). Results of a t-test suggest that differences are significant in statistical terms ( $t(102)=1.31$ ;  $p\text{-value}=0.09$ ).

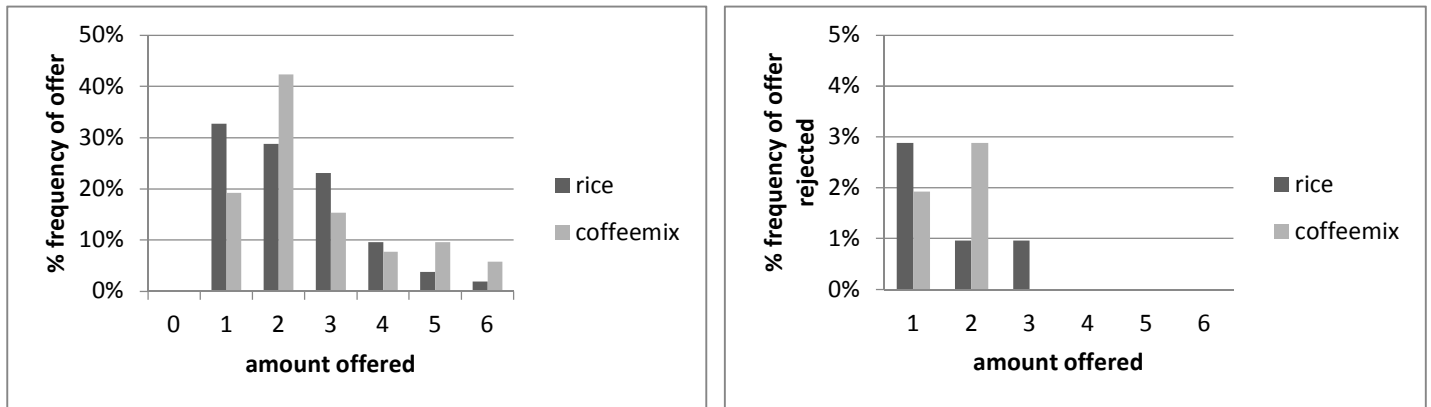


**Table 7.** Summary of decisions, by type of product

Product	All	Rice	Coffeemix
# of Proposer-Responder pair	104	52	52
Stake <sup>§</sup>	6 units	6 bags	6 sachets
Mean offer (SD)	2.46 (1.35)	2.28(1.72)	2.63(1.99)
Mode offer	2.00	1.00	2.00
% frequency of low offers (1 bags/sachets)	26%	33%	19%
% frequency of equal offers (2-3 bags/sachets)	55%	52%	58%
% frequency of hyper offers (larger than 3 bags/sachets)	19%	15%	23%
Mean offer rejected (SD)	1.60 (0.69)	1.60 (0.89)	1.60 (0.54)
Rejection frequency	10% [10/104]	10% [5/52]	10% [5/52]

Note: <sup>§</sup> equivalent to half-a-day-work of unskilled labor in the villages; the parenthesis is the standard deviation (SD)

Despite these differences, most offers for both products ranged between 33% and 50% of the stakes, with 27 occurrences of offering 2 or 3 bags of rice (52%) and 30 occurrences of offering 2 or 3 sachets of instant coffee (58%) (Fig. 10). Overall, there were 27 occurrences of low offers (17% of the stakes) with 17 occurrences of rice and 10 occurrences of instant coffee. There were 20 occurrences of high offers (67% the stake or above) or offers larger than 3 units, with 8 occurrences of rice and 12 occurrences of instant coffee.



(a) Proposer's offer

(b) Responder's rejection

**Figure 10.** Frequency of offers and rejections, by type of product

The rejection rate was low: from a total of 104 offers there were only 10 rejections (or 10%) (Table 7). In relation to low offers, there were 3 occurrences of low offers of rice and 2 occurrences of low offers of instant coffee. Due to the small rejection rate, we cannot test whether there are statistically significant differences between rice and instant coffee rejections.

Results from multivariate analysis suggest that location of the village of residence was not associated to the offer made in the Ultimatum Game (Table 8). People who received a government salary made lower offers of rice than people who did not received a government salary ( $p < 0.01$ ), although their offers of instant coffee were similar (Model 1 versus Model 2, Table 8). Among the other variables, age and school attendance were positively associated to making higher offers of instant coffee ( $p < 0.10$ ) (Model 2, Table 8). None of our control variables was associated to higher offers of rice.

As our sample over-represents people living in upstream villagers, we tested the robustness of our results by running the same regression model but using only the sub-sample of people living in the upstream village group (Model 3, Table 8). Results from this model resemble results from Model 1, i.e., from the variables included in the model, only government salary is significantly associated to the rice offers made ( $p < 0.01$ ). In other words, in this model people with government salaries also offer less rice than people without it.

**Table 8.** Correlates of proposer's offer (OLS and Ordered-logit Model)

	Model 1: Rice		Model 2: Instant Coffee		Model 3: Rice*Upstream	
	OLS	Ologit	OLS	Ologit	OLS	Ologit
<b>Explanatory</b>						
Upstream village (=1)	0.2200 (0.5039)	0.4670 (0.6928)	0.5625 (0.6859)	0.7482 (0.9954)	^ ^	^ ^
Government salary (=1)	-0.7321** (0.1945)	-1.2571*** (0.3551)	0.6040 (0.4438)	0.7256 (0.5828)	-0.7402* (0.2152)	-1.3538*** (0.2971)
<b>Control</b>						
Age	0.0131 (0.0193)	0.0217 (0.0238)	0.0230 (0.0095)	0.0286* (0.0136)	0.0114 (0.0343)	0.0195 (0.0405)
Male (=1)	0.5056 (0.6331)	0.7452 (0.9354)	-0.5845 (0.6842)	-0.7636 (1.1284)	0.7289 (0.7450)	1.2949 (1.0811)
Schooled (=1)	-0.0676 (0.5527)	-0.0692 (0.7169)	1.0163 (0.5209)	1.4851 (0.8665)	-0.3548 (0.8426)	-0.4750 (1.1861)
<b>Contants/Intercept cut 1</b>	1.594 (1.2012)	0.4415 (1.4851)	0.9380 (0.7105)	0.6318 (1.0052)	1.8882 (1.2873)	-0.0566 (1.5303)
<b>Intercept cut 2</b>	^	1.7306 (1.6257)	^	2.7532* (1.2139)	^	1.3229 (1.4708)
<b>Intercept cut 3</b>	^	3.0150 (1.6474)	^	3.5837** (1.2639)	^	2.4132 (1.4759)
<b>Intercept cut 4</b>	^	4.1042** (1.4697)	^	4.1565** (1.2942)	^	3.6406** (1.3967)
<b>Intercept cut 5</b>	^	5.2536*** (1.4527)	^	5.2954** (1.6400)	^	^ ^

<i>N</i>	52	52	52	52	36	36
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Note: All Ologit regression are clustered by villages. Standard errors in parenthesis.

\* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ , ^ variable intentionally omitted from analysis; n/a not available.

### 3.4.4 Does sharing in the Ultimatum Game correlate with sharing in daily life?

Results of t-test analysis using observational data suggest that men share more than women and that people with a government salary share more than people without such source of income. The result of observational data is consistent both when using the full sample (Table 5) and when using the subsample of people with data in both data sets (Table 9). Specifically, in the full sample, the share of giving events reported by men averages 0.49, while the share of giving events reported by women averages 0.22 (p-value<0.05). The share of giving events reported by people who receive a government salary averages 0.53, whereas the share of giving events of people who do not have government salary averages 0.27 (p-value<0.05). We note that this might be largely driven by the significant sharing of wild meat, although results from Table 5 suggest that men also share more cultivated food than women.

**Table 9.** Comparison of observational and experimental data on sharing

		Full Sample		Overlapping sample	
		Ethnographic Study	Framed Ultimatum Game	Ethnographic Study	Framed Ultimatum Game
		Share of giving (SD)	Mean offer (SD)	Share of giving (SD)	Mean offer (SD)
Sex	Female	0.22 (0.23)	2.46 (1.36)	0.29 (0.25)	3.07 (1.89)
	Male	0.49 (0.82)**	2.45 (1.34)	0.56 (0.62)**	2.38 (1.39)
Schooled	No	0.37 (0.67)	2.24 (1.23)	0.40 (0.43)	2.40 (1.46)
	Yes	0.35 (0.54)	2.67 (1.42)*	0.48 (0.60)	3.07 (1.84)
Government salary	No	0.27 (0.37)	2.45 (1.36)	0.36 (0.36)	2.76 (1.70)
	Yes	0.53 (0.89)**	2.48 (1.44)	0.55 (0.65)*	2.5 (1.55)
<i>N</i>		118	104	68	35

Note: t-test analysis. \*  $p < 0.1$ , \*\*  $p < 0.05$

We ran a similar t-test comparison, but comparing offers made when playing the Ultimatum Game. Results from this test only show differences in mean offers when comparing

people who have attended school and those who have not. Moreover, these differences were only statistically significant for the full sample (i.e., both offer of rice and instant coffee) (Table 9).

Finally, results of a Spearman's correlation between observed frequency of sharing in daily life and proposer's offer in the experiment suggest that the two variables are not correlated in a statistically significant way (Spearman  $\rho = -0.033$ ,  $p$ -value = 0.856,  $n = 68$ ).

### **3.5. Discussion**

Using observational and experimental data on sharing collected among a small-scale society in Borneo, this study compares 1) whether different products (i.e., local and market products) are shared differently, and 2) whether variables related to levels of integration into the market economy relate to sharing. Since we asked subjects to play with products, rather than with cash, the currency commonly used in studies using the Ultimatum Game, we start the discussion by comparing results from our game with results from previous studies to assess the reliability of our data (e.g., Roth et al. 1991; Gurven 2004; Henrich et al. 2005).

A major methodological difference between our study and previous research using the Ultimatum Game to explain social preferences for reciprocal behaviour, is that we asked informants to play the game with products, rather than with cash. Despite this difference, we found that levels of sharing in our game were within the ranges of previous studies in which players were asked to share cash (e.g., Roth et al. 1991; Cameron 1999; Gurven 2004; Henrich et al. 2005). Thus, proposer's offers in our game ranged between 33% and 50%, a range not far from the 40-50% of the stake found when playing with Western populations (Bolton & Ockenfels 2000; Fehr & Schmidt 1999; Roth et al. 1991), or the 26-58% range found when playing with small-scale societies (Henrich et al. 2001; Henrich et al. 2005). Moreover, similar to results obtained when playing the Ultimatum Game in other small scale societies (Henrich et al. 2001; Henrich et al. 2004; Henrich et al. 2005), but in contrast to results when playing with Western populations, there were only few rejections. Thus, only 10% of Punan Tubu in our study rejected the proposer's offers and half of those rejections corresponded to offers below 20% of the stake. In comparison, researchers have found zero rejection among other small scale societies, such as the Achuar, the Ache, and the Tsimane' but 40-60% rejections of offers below 20% in industrial societies (Henrich et al. 2001; Gurven 2014). Researchers have argued that the

low rejection rate among small-scale societies is possibly related to the fact that, getting low offers is interpreted as bad luck, and therefore would accept them in the same way that one would accept bad luck in hunting (Henrich et al. 2005). This explanation also seems plausible in our case study. In any case, as the ranges to which products were proposed and rejected are within the ranges found in previous studies in small-scale societies in which players were asked to share cash, we consider that our results are comparable to results obtained in past research.

If we consider our experimental data comparable to previous studies, the single most important finding of our work is that results obtained when using observational data on sharing seem to differ from results obtained when using experimental data on sharing. Thus, while local products (e.g., wild meat, crops) seem to be shared in daily life more often than market products (e.g., sugar, cigarettes), offers of the market product (i.e., instant coffee) were larger than offers of the local product (i.e., rice) when playing the game. Moreover, in the table comparing the covariates of our two proxies for sharing (Table 5), none of the three variables analysed (i.e., sex, schooling, and government salary) was consistently associated in the same way to observational and experimental data on sharing. We are aware that results from the two methods are not directly comparable, as –for example- in the game participants played with non-perishable products while most observations of daily life sharing relate to wild meat (a perishable product). However, we still think we can learn something from trying to explain the differences in these results. So, in the rest of the discussion, we explore two results from our empirical analysis, i.e., variation in how different products are shared and the lack of consistent covariates of sharing, in the aim to understand the lack of relation between observational and experimental data.

When looking at how products are shared, we found that different products are shared differently, although the way in which they are shared in daily life and in the Ultimatum Game varies. Thus, the analysis of observational data suggests that most daily life sharing events relate to food and especially to wild meat, which is mostly shared with family and neighbours. Other food products are also shared, but to a lesser extent than wild meat. Market-purchased food items and non-food market products are shared even less commonly and mostly with family but rarely with neighbours. In contrast, in the game, offers of the local product (i.e., rice) are lower than offers of the market product (i.e., instant coffee), for which the local product is less shared.

Results from observational data dovetail with reports of high frequency of wild meat sharing and with reports of low frequency of non-food market products sharing in small scale societies (e.g., Hawkes et al. 2001; Patton 2005). Variation in the sharing of these different types of products in daily life have been related to the different cultural meanings attached to them (Napitupulu et al. 2016). Scholars have suggested that, beyond the intrinsic value or purpose of products, sharing of certain products provide individuals who share them a higher status and prestige (McCracken 1986; Hawkes et al. 2001), i.e., by sharing products individuals' might increase their prestige as good hunters or as a good village-mate (Bliege Bird & Bird 1997; Franzen & Eaves 2007). Because those cultural meanings are not attached to products shared in the game setting, such products might be shared differently than in daily life. Moreover, we know that the Punan Tubu practice demand sharing, in which the receiver play the active role by verbally or non verbally asking for a share of products and the donor would then receive praise for their generosity after sharing (Bird-David 1990; Peterson 1993; Widlok 2013). Ethnographic observations suggest that individuals actually seem in obligation to share once information about product ownership is available to the public (Napitupulu et al. 2016). If, in general, the Punan Tubu share on demand, their incentives to make higher offers under game conditions –when demand was not allowed- might be low, which might explain the differences in our findings when using the two datasets.

We also found that government salary was related to sharing when using both observational and experimental data, although the association ran in the opposite direction for each dataset. Results from the observational study suggest that people who receive a government salary share more than people who do not have a salary (although the result is only statistically significant in bivariate analysis), whereas results from the experimental data suggest that people with government salary make lower offers (i.e., shares less), specially rice. Ethnographic studies suggest that economically better off people, i.e., people with higher wealth or income, commonly give more and to more people than poorer people (Gurven et al. 2000), a behaviour potentially being motivated by higher pressures of demand sharing (Peterson 1993) or by the willingness to signal generosity (Gurven et al. 2015). Similarly, in previous work, researchers have found that integration into the market is associated to higher offers and rejection of low offers in the



Ultimatum Game (Henrich et al. 2004; Henrich, et al. 2010), a finding that has been related to a combination of familiarity of interaction with strangers (Bolton & Ockenfels 2000) and the spread of generalized trust (i.e., trust which goes beyond specific personal settings) as small-scale societies embrace the market economy (Fafchamps 2011). For these authors, when social ties are distant and fragile, or when exchanges are impersonal, reciprocity should be the norm in order to maintain the system functioning (Ziker & Schnegg 2005). Our results, however, do not confirm this explanation, as those with government salary make lower offers. Indeed, we argue that this finding might, again, be considered an example of the relational argument. People with government salary might locally enjoy some status from their position, so in daily life they are compelled to share. However, when the visibility of sharing is low and behaviour anonymous (i.e., in the game) they share less.

On a last note, it is interesting to mention that we found no covariates for the sharing of market products, neither for observational nor for experimental data. As market products are relatively recent among the Punan Tubu, the rules about how and with whom to share might be less defined compared to local resources (like meat), which have been traditionally shared, for which market products might be randomly shared (i.e., without an established pattern) therefore not displaying strong covariates.

### **3.6. Conclusion**

Differences between results from observational and experimental data suggest that the two methods, indeed, measure different aspects of sharing. It is possible that the context in which daily life sharing occurs helps explain the results. In other words, sharing is not only about distributing one product from one person to another, but might be an expectation (or cultural obligation) that applies to everyone, regardless of their socioeconomic status. If this obligation applies to all members of the society, but only when sharing is public, then it is not surprising neither than results from observational and experimental data differ (as the observational data is public and the experimental data is private), nor that there are not strong correlates to sharing (as everyone is subject to the same social pressures to share). However, our findings also show that understanding the effects of market integration in sharing should include considerations regarding the type of product to be shared.

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## Chapter 4

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# Can government development policies shape voluntary cooperation? Results from a framed field experiment among the Punan Tubu, Indonesia<sup>3</sup>

### 4.1. Introduction

A large body of empirical evidence suggests that communities have the ability to cooperate in overcoming social dilemmas, or situations in which there is a conflict between the individual and the collective interests (Ostrom 1990; Cárdenas 2000; Patton 2005; Lewis et al. 2014). Over the last decades, researchers have unravelled some of the nuances of how communities voluntarily cooperate in solving collective action problems. A strong finding of this literature is that cooperative behaviour is largely guided by the effectiveness of local norms enforced through effective peer monitoring (Hawkes 1992; Ostrom 2000; Fehr et al. 2002; Narloch et al. 2012). The presumed effectiveness of voluntary community cooperation has lead policy makers to try to capitalize on existing network structures, norms, and relations of trust to stimulate community collective action targeted to community development (Vollan 2012). Such policies, however, tend to disregard the potential unintended impacts that the development process itself might have on the local practices that it aims to capitalize.

Empirical studies among small scale societies have analysed two different pathways through which government development policies might influence communities' behaviour. First, scholars have focused on the long-term dynamic processes through which, over time, governments attempt to bring development and change to previously isolated indigenous peoples and rural communities (e.g., Henrich et al., 2001, 2010). In such analysis, involvement in development policies is largely confound with the process of integration into the market economy, as systems of government adopts practices of market such as private property, legal contracts, etc. (Graeber 2001). For example, in their cross-cultural study, Henrich and colleagues (2001) focus on the levels of integration into the market economy of

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<sup>3</sup> Napitupulu, L., Bouma, J. & Reyes-García, V. Can government development policies shape voluntary cooperation? Results from a framed field experiment among the Punan Tubu, Indonesia. Manuscript in preparation to be submitted to *Development & Change*.

several indigenous societies and analyse how those levels relate to cooperation. A main finding of this work is that –overall– societies with higher levels of involvement into the market show more generous behaviour than societies more isolated. Second, involvement in government policies has also been measured as a less dynamic and more contemporary variable, focusing on contemporary individual participation in ongoing government policies without considering the long term perspective (Onyeiwu & Jones 2003). An important outcome of this literature is that government interventions and related processes might affect communities' willingness to contribute to collective action, although the literature remains ambiguous regarding the direction of such influence (Onyeiwu & Jones 2003; Dasgupta & Beard 2007; Narloch et al. 2012).

In this article, we consider both the long-term process that is captured in the variation of distances between communities, and the short-term process that is captured in the variation of level of involvement between individuals, to analyse the extent to which varying levels of involvement in government policies relate to decisions to cooperate in government programs. We do so by using a framed field experiment designed to measure the tendency to voluntarily cooperate in a local community setting. We played the game in seven Punan villages settled along the Tubu River, Malinau regency, North Kalimantan, Indonesia. The Punan Tubu are a small-scale society of hunter-gatherers with longstanding cooperative behaviour. The setting provides an ideal case to assess the relation between involvement in governmental development policies and voluntary cooperative behaviour for at least two reasons. First, since the passing of the Law 6/2014 on Villages, Government of Indonesia (GoI) has aimed to increase village governance, community life, and rural development. One of the mechanisms implemented to achieve this aim has been to provide villages with budget allocations to internally govern their needs (Antlöv, et. al., 2016). In the study area, the government of Malinau started a program, named *Gerdema*, which distributed cash directly to villages, for which villages could invest the money on development initiatives of their own choice. Based on this program, each village in Malinau receives an annual transfer of IDR 1,000,000,000 (~USD 100,000). The Gerdema program is based 'on the initiative and participation of the people' as a central part of the development strategy (PEMKAB Malinau, 2013: 8). Under the Gerdema program, the government expects communities to top-up government transfers with voluntary labour, materials, or even money in the pursuit of their development goals.

The second reason why the selected setting provides an ideal case to assess the relation between involvement in development policies and cooperative behaviour relates to the studied population. The Punan Tubu lived a nomadic lifestyle until around the 1970s, when the government of Indonesia established the Kayan Mentarang National Park, restricted entry to the protected area, and moved most indigenous groups -including the Punan Tubu- to resettlement areas near the town of Malinau. Today, most Punan Tubu live in these two resettlements, although a group of about ~800 people continues to live in five small and difficult-to-access villages of the up-river Tubu, District Tubu. Therefore, the Punan Tubu are an ideal case to examine the relation between cooperative behaviour and governmental development policies because of their long history of cooperative behaviour (Kaskija 2012) coupled with several decades of differential involvement with government policies. Ethnographic accounts suggest that traditionally the Punan practiced extensively sharing (i.e., food sharing) and cooperation (i.e., opening of agricultural plots) (Sellato 1994, Kaskija 2012). Moreover, according to recent work, sharing and cooperation continue to be important among the Punan living in the upper watershed of the Tubu river (Kaskija 2012; Napitupulu et al. 2016). However, for the last forty years, the Punan Tubu living in resettlements have benefited from government policies of schooling, health care, and employment opportunities; they have also become familiar with market transactions, urban forms of leisure, and daily interactions with outsiders. In contrast, the Punan Tubu living in the upstream villages heavily rely on the environment to make a living, with a subsistence economy based on upland rice swidden cultivation, wild boar hunting, and forest products gathering (Levang et al. 2007, Kaskija 2012). However recently, the most important source of income in these villages was the commercialization of non-timber forest products (i.e., eaglewood, hornbill head, or bezoar stones). In addition, wage salaries (i.e., as village officials or from participation in government projects) have become a regular source of cash income for Punan Tubu in upstream villages only recently (Napitupulu et al. 2016).

## **4.2. Methods**

This study is part of a cross-cultural study on the returns to local environmental knowledge involving 18 months of fieldwork (from March 2012 to July 2013) in two isolated villages (Reyes-García et al. 2016). The experiment was played in March 2014 in the seven Punan Tubu villages. We obtained Free Prior and Informed Consent in each village and from



each participant in the study. The research has received the approval of the Ethics Committee of the Universitat Autònoma de Barcelona.

#### 4.2.1. Participant recruitment

We recruited participants within seven locations: the five upstream villages and the two resettlement villages (Table 10). In each village, we announced we would have an event lasting about three hours in which attendants would play two games from which they could earn some money (for the second game see Napitupulu, Bouma and Reyes-García, unpublished). Because population in upstream villages were generally small, we could invite all adults ( $\geq 18$  years of age) in all households. In contrast, in resettlement villages, after informing the village head, we could only distribute invitations to every other Punan Tubu household. Moreover, in those villages we limited participation to one adult per household. In both cases, after extending the invitation people voluntarily decided whether to participate in the games or not.

**Table 10.** Study sample, by village

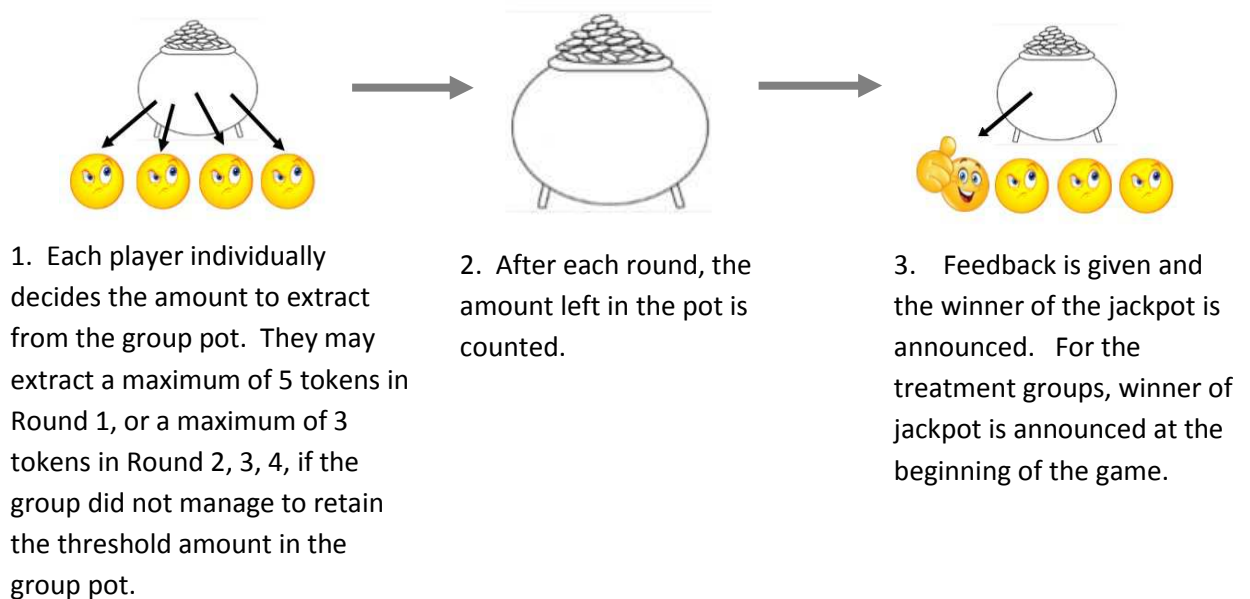
Village	Settlement	# households in village	Travel distance to town	Sample
Vid1	Upstream	32	2 days	48
Vid2	Upstream	24	3 days	24
Vid3	Upstream	40	1 days	36
Vid4	Upstream*	8	1 days	16
Vid5	Upstream	25	1.5 days	24
Vid6	Resettlement	200	2 min	40
Vid7	Resettlement	100	30 min	24
Total				212

Note: \* This settlement is not a village under the official statistics, but treated as so in this work, due to the distance from the main village

#### 4.2.2. The House Building Game

Data on individual decisions to cooperate were collected through an economic experiment based on the Common Pool Resource game (Ostrom et al. 1994). The game was played in groups of four people ( $n=4$ ) who played together over four rounds ( $t=4$ ). Group members were chosen at random and the game was played anonymously. There was an initial group pot of 20 tokens (1 token=Rp. 3,000 or  $\sim$  US\$ 0.22) from which each player was asked

to extract between 0 and 5 tokens (Fig.11). The tokens extracted belonged to the person who extracted them, while whatever was left on the pot by the group (after all players had made their withdrawal) was given to one player, the “winner of the jackpot,” who was a different player each round. If the group left less than 10 tokens in the common pot, then the group endowment was reduced from 20 to 12 tokens in the following rounds (or a maximum of three tokens for each player from the original five tokens each). The maximum amount of money a person could gain playing the game was the equivalent of a day’s wage.



**Figure 11.** House Building Game

Economic experiments have been typically used to uncover variation in predisposition to cooperate (see Cárdenas & Carpenter 2008) and framing the game in the context of actual cooperative decisions being made seems to facilitate that respondents mimic daily life behaviour while playing the game (Cárdenas and Ostrom, 2004; Ostrom, 2006; Dufwenberg, et. al., 2011; Bouma and Ansink, 2013; Bouma, et. al., 2014). Therefore, we framed our game around the house building program described above. The housing program supported by the government takes advantage of traditionally established norms of cooperation through which people help each other when building a new house. The house building setting is an ideal case to examine the relation between voluntary cooperative behaviour and governmental policies for two reasons. First, villagers must ensure that houses are build following the schedule, as the non-execution of the program penalizes future disbursements, thus presenting the

possibility that other families would not receive funds to build their houses. Although people working in building the houses may receive wages for their work, the government fund is generally not sufficient to cover all the work and finishing the houses requires that neighbours contribute with additional labour and local material (i.e., wood). To reflect these procedures, we added the threshold in the experiment, or a minimum amount of money that the group had to leave in the group pot to ensure the same endowment in the next round. In the instruction, participants were told that ‘the token you leave in the group pot is like a contribution to group activities, like when helping built a house for another household in the community. However, as in the government housing program, the endowment is not completely guaranteed, as government funding may be reduced if output is not achieved. So, in the same way, if group account is not met, that is if group account is less than 10 tokens, the endowment for next round will be reduced from 20 to 12.

Second, in the Gerdema program, villagers must decide the sequence in which the houses will be built, as only a limited number of houses can be built each year. In other words, there are differentiated outcomes that stem from voluntary cooperation: while all households are expected to cooperate throughout the program, they will only get the house once. To reflect on the differentiated outcomes associated to the program, in our game we included a ‘jackpot’, attributing all tokens remaining in the group pot after individual extractions to only one player. Winning the jack pot was explained as the designated turn when a family gets a house. We also removed the account multiplier, common to the Common Pool Resource game, as in the house building program outcomes are private and collective action is required to make sure all group members receive a house. Finally, because in daily life having received a government house might condition the decision to cooperate, we introduced a treatment aiming to capture differences in cooperation according to the moment in which the person will receive the house. Thus, from the beginning of the game, half of the groups had the information regarding on which round a player will win the jack pot (treatment group), whereas the other half did not have that information beforehand and were only informed of who was the winner of the jackpot at the end of the round (non-treatment group).

Player’s communicated their decision on the number of tokens they wanted to extract by using coded envelopes. After each round, researchers collected the envelopes and counted the number of tokens extracted by each player and gave feedback on individual and group

extractions and on the endowment that the group received for the following round. Instructions were given in Bahasa Indonesia by the first author, a native speaker and in Punan Tubu language. Beforehand, the game instruction was translated to the Punan Tubu language. The understanding of participants was examined by asking some control questions to the group. Additionally, during the game, three team members were available in the room to respond to questions and assist in the game.

#### **4.2.3. The survey**

Data from the experiment were supplemented with a survey to all participants. The survey collected data on 1) individual demographic information (i.e., age, sex, schooling level, and village of residency); 2) two proxies of individual variation in involvement in government policies: i.e., whether the respondent owned a government house and/or received a government salary; and 3) trust in fellow villagers. To proxy trust in fellow villagers, we asked ‘If you were in need, for example if you needed [*double average monthly wage*] because someone in your family was sick, could you get that money from other people in the village?’

#### **4.2.4. Data analysis**

Data analysis explores the extent to which varying levels of involvement in development policies relates to decisions to cooperate. In previous work, Henrich and colleagues (2005) had found that people who have been influenced by socioeconomic changes are more likely to cooperate in anonymous games than their peers, probably as a consequence of the increasing number of interactions with people beyond their kinship network. Drawing on this finding, we expect a) that people living in villages with more long-term exposure to government policies (i.e., resettlement villages) and b) that people currently participating in government programs (i.e., having a government house or receiving a government salary) would behave more cooperatively in government induced programs than people with less long-term exposure or not currently participating in such programs.

To test these hypotheses, we used game data to generate an outcome variable that captures participant’s extractive behaviour in the game, a proxy for non-cooperativeness. Since, according to the rules of the game, the endowment changed from one round to another depending on group’s extractive behaviour in the previous rounds, our dependent variable captures the relative extraction, tokens extracted from the maximum number of tokens that the participant could extract in each particular round.

We used survey data to generate explanatory and control variables to be included in multivariate regression models. We used information on participant's village of residency to generate a dummy variable, *resettlement*, which took the value of 1 for people living in the two resettlement villages and 0 for people living in the upstream villages. This variable should capture the long-term effect of involvement on government policies. We then generated two variables that capture the differential involvement in ongoing development policies by individuals within a village: 1) *government house* (1= the person lives in a household which already owns a house built through government program and 0 otherwise), and 2) *government salary* (1= the person receives salary by the government and 0 otherwise). Control variables included in the analysis are *age* (measured in years), *male* (1= male; 0= female), *schooling* (maximum school grade completed), and *treatment* (1= the person was in the treatment group and 0 otherwise).

We conducted descriptive, bivariate, and multivariate analyses using STATA for Windows version 13. We start by providing a descriptive analysis of explanatory and control variables and use a Chi-square to test potential differences in such variables between a) participants living in upstream and resettlement villages and b) participants in the treatment and non-treatment groups. We then used an Ordinary Least Square (OLS) multivariate regression to explore the association between extraction in the first round of the game (outcome variable) and our three explanatory variables (i.e., *resettlement*, *government house*, and *government salary*) while controlling for participant's standard demographic data (i.e., *age*, *male*, *schooling*) and whether the participant was in the *treatment* or in the non-treatment group.

We tested the robustness of our main findings in two different ways. We started by changing the model specifications to see whether the associations found in our main model varied. First, we rerun the model including robust standard errors by village of residency to relax the assumption that observations within a village were independent. Second, we included village dummies to control for village fixed-effects. Third, as about 40 % of participants extracted the maximum tokens available, we used a Tobit -rather than an OLS regression- to take into account the skewed distribution of the dependent variable. Finally, in our last two models we introduced two interaction terms to capture the relation between living in a resettlement village and *i*) receiving a government salary or *ii*) owning a government house.

The second way in which we tested the robustness of our findings was by running a set of regressions using only the sub-sample of people living in upstream villages. We did so because our sampling strategy varied in upstream and resettlement villages, so using only this part of the sample allow us to test whether results were independent of the sampling procedure used. In this set of regressions, our first model resembles the core model discussed above and includes robust standard errors by village of residency. We then added to this model a set of variables that might affect the relation between the outcome and the explanatory variables. Thus, our second regression includes the variable that measures trust in fellow villagers. As group dynamics in the games might be different in different villages because of differences in group characteristics, the last three regressions include variables that capture village-level characteristics. Specifically, we included a variable that captures the share of people in a village *i*) having a government house, *ii*) receiving a government salary, or *iii*) with schooling.

## **4.3. Results**

### **4.3.1. Sample description**

A total of 212 adults participated in the game and answered survey questions. Our sample includes 148 participants from upstream villages (or 70% of adults) and 64 participants from the resettlement villages (or 30% of adults). Overall, a slightly higher number of women (54%) than men (46%) participated in the game (Table 11). The average age of participants was 39 years and the average grade completed at school was 3rd grade, although 48% of the participants had never attended school. More than half of the participants (58%) lived in a household that had already received a government house at the time of the study and almost a quarter (23%) received a government salary at the time of the survey.

**Table 11.** Summary statistics of informant's characteristics, by village groups

	Pooled Sample	Upstream villages	Resettlement	p-value*
% female	54%	55%	53%	0.830
Average ( $\pm$ SD) age, years	39.1 (15.59)	36 (13.5)	46 (17.8)	0.005
Average ( $\pm$ SD) schooling, years in school	2.91 (3.55)	2.07 (3.13)	4.86 (3.70)	0.000
% schooled	52%	40%	81%	0.000
% living in government house	58%	71%	30%	0.000
% receiving government salary	23%	27%	16%	0.073
% who trust fellow villagers	68%	88%	22%	0.000
No. of observations	212	148	64	^

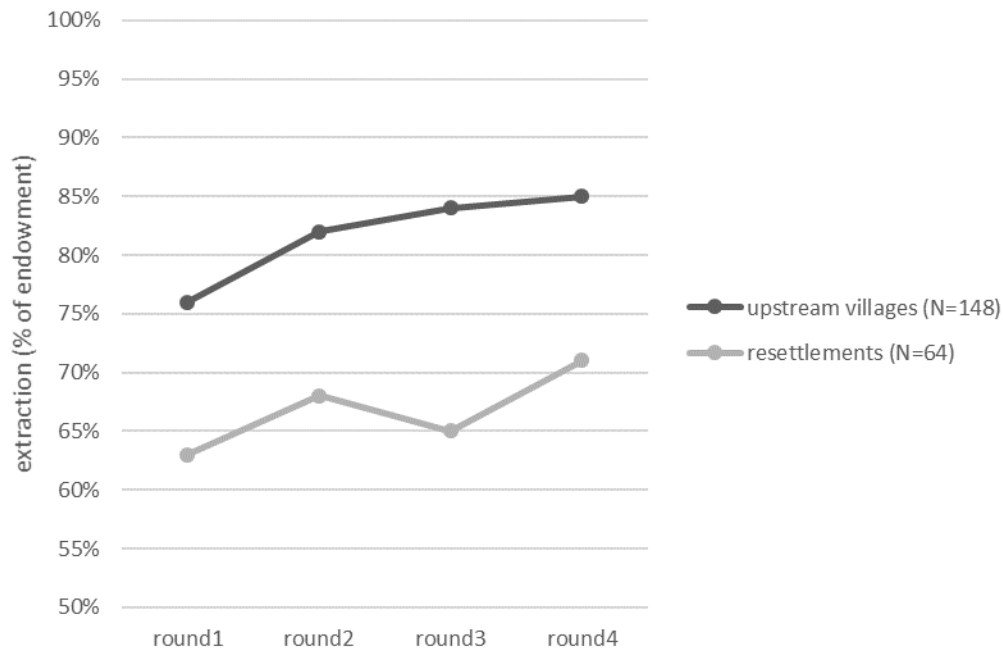
Note: \* with a Chi<sup>2</sup> test.

We used a Chi-square test to analyse whether there were differences in the characteristics of participants living in resettlement and upstream villages, and found some differences (Table 11). First, participants in the resettlement villages were, on average, 10 years older than participants in the upstream villages (46 vs. 36,  $p$ -value=0.005). Second, the average school grade of participants living in upstream villages was almost three years lower than the average in resettlement villages (2.07 vs. 4.86,  $p$ -value<0.001). In the same line, while 81% of participants in the resettlement villages have received some schooling, the share was only 40% in the upstream villages ( $p$ -value<0.001). Third, ownership of a house built under the government program was significantly higher in the upstream than in the resettlement villages (71% vs. 30%,  $p$ -value<0.001). Fourth, a higher share of participants living in upstream villages received government salary (27% vs. 16%,  $p$ -value=0.073). Finally, a higher share of participants living in the upstream villages trusted their fellow villagers as compared to participants in resettlement villages (88% vs. 22%,  $p$ -value<0.001).

#### 4.3.2. Behaviour across round

The results of the experiment are summarized in Fig. 12. Generally, across rounds, participants extracted an average of 63-85 % of the endowment given to the group, with extraction rates increasing each round. Moreover, many individuals extracted all the tokens they could potentially extract. For example, in the first round 40% of the participants extracted the five tokens available to them. Only six out of the fifty-three groups playing the

game managed to retain number of tokens in the group pot above the threshold in the second round, and only one of the groups managed to maintain the number of tokens in the group pot above the threshold level until the last round of the game.



**Figure 12.** Average extraction per round, by village groups (in percentages)

Fig. 12 also illustrates the differences in extraction between people living in upstream and resettlement villages. Across rounds, people in upstream villages extracted a higher share of tokens than people in resettlement villages. For example, in the first-round participants living in upstream villages extracted an average of 3.8 tokens (or 76% of the tokens available to them), whereas participants in resettlement villages extracted only 3.2 (or 64%). Results from Mann-Whitney rank sum tests suggest that differences between the two groups are statistically significant for all rounds (Round 1:  $|z|=2.84$  ( $p\text{-value}=0.004$ ), Round 2:  $|z|=3.50$  ( $p\text{-value}=0.001$ ), Round 3:  $|z|=4.05$  ( $p\text{-value}<0.001$ ), Round 4:  $|z|=3.50$  ( $p\text{-value}=0.001$ )).

We also tested whether there were statistically significant differences in the levels of extraction of people in the treatment and the non-treatment groups (not shown). We found that having the information of when a participant would get the jackpot did not affect behaviour in the game (Round 1:  $|z|=0.64$  ( $p\text{-value}=0.517$ ), Round 2:  $|z|=0.84$  ( $p\text{-value}=0.401$ ), Round 3:  $|z|=0.17$  ( $p\text{-value}=0.859$ ), Round 4:  $|z|=1.43$  ( $p\text{-value}=0.151$ )).



### 4.3.3. Multivariate analysis of first round behaviour

As mentioned, only six of the fifty-three groups managed to remain above the threshold, thus avoiding the reduction of the endowment to play the second round of the game. Because so few groups were able to remain number of tokens above the threshold, we focus our analysis on first round behaviour.

Results from our multivariate analysis of first round behaviour confirm that people living in resettlement villages extract less (i.e., leave more tokens in the pot) than people living in the upstream villages (Table 12, Model 1). As our dependent variable varies between zero (when the person did not extract any token) and one (when the person extracted all the available tokens), the coefficient for the variable *resettlement* can be interpreted as a percentage. Thus, according to our results, people living in resettlement villages extracted about 22 % less of the tokens available to them than people living in upstream villages ( $p < 0.001$ ). Living in a household who already owns a house funded by the government program is associated to a 13% lower level of extraction from the common pot ( $p < 0.05$ ), whereas receiving a government salary was not associated to participant's extraction in the first round. None of the control variables included in the model (i.e., age, male, schooling, and treatment) shows a statistically significant association with participant's extraction in the first round.

**Table 12.** Multivariate analysis of first round behaviour

	Dependent variable: Extraction in Round 1				
	Model 1	Model 2	Model 3	Model 4	Model 5
Resettlement (=1)	-0.2165*** (0.0002)	-0.1565*** (0.0254)	-0.3553*** (0.0899)	-0.2574*** (0.0428)	-0.2403** (0.0553)
Government house (=1)	-0.1299* (0.0082)	-0.1235** (0.0250)	-0.2374** (0.0744)	-0.1349** (0.0235)	-0.1500*** (0.0195)
Government salary (=1)	0.0078 (0.0830)	0.0147 (0.0704)	0.0439 (0.0789)	-0.0513 (0.0752)	0.0092 (0.0669)
Age	0.0035 (0.0009)	0.0033 (0.0020)	0.0066* (0.0027)	0.0032 (0.0021)	0.0034 (0.0020)
Male (=1)	-0.0274 (0.0039)	-0.0132 (0.0232)	-0.0698 (0.0705)	-0.0166 (0.0258)	-0.0275 (0.0220)
Schooling (in years)	0.0019	0.0010	0.0025	-0.0001	0.0011

	(0.0022)	(0.0037)	(0.0114)	(0.0042)	(0.0041)
Treatment (=1)	0.0165	0.0129	0.0553	0.0213	0.0185
	(0.0384)	(0.0506)	(0.0626)	(0.0542)	(0.0493)
Vid1	^	^	^	^	^
	^	^	^	^	^
Vid2	^	0.0555***	^	^	^
	^	(0.0066)	^	^	^
Vid3	^	-0.0180	^	^	^
	^	(0.0089)	^	^	^
Vid4	^	0.1344***	^	^	^
	^	(0.0137)	^	^	^
Vid5	^	0.0655**	^	^	^
	^	(0.0143)	^	^	^
Vid6	^	-0.0360*	^	^	^
	^	(0.0106)	^	^	^
Vid7	^	n/a	^	^	^
	^	n/a	^	^	^
Resettlement*Gov Salary	^	^	^	0.2601*	^
	^	^	^	(0.0795)	^
Resettlement* Gov House	^	^	^	^	0.0638
	^	^	^	^	(0.0572)
Constants	0.7246*	0.6927***	0.8196***	0.7535***	0.7437***
	(0.0447)	(0.0939)	(0.1140)	(0.0906)	(0.0908)
R2/Pseudo R2	9%	12%	8%	12%	10%
N	212	212	212	212	212

Note: Model 1 includes robust standard errors by village of residency. Model 2 includes village dummies. Model 3 uses a Tobit regression. Models 4 and 5 include interaction variables. Standard errors in parentheses \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 12 also presents the results of our first set of robustness test. Overall, the sign and statistical significance of the associations found in the core model remain after changing the specifications (Models 2-3). Since we found no substantial difference in the models without and with robust standard errors, for subsequent analysis we present the findings with robust standard errors. The main results in Model 1 (Table 12) also remain invariant when we introduce interaction terms (Models 4 and 5). Regarding the explanatory power of the interaction variables introduced in these models, we found that people with government salary living in the resettlement villages extract more than people with government salary but living in the upstream villages (Model 4, Table 12). The interaction between living in resettlement villages and living in a household who already owns a government house is not associated to first round extraction behaviour (Model 5, Table 12).

**Table 13.** Multivariate analysis of first round behaviour, sub-sample upstream villages

	Dependent variable: Extraction in Round 1				
	Model 1	Model 2	Model 3	Model 4	Model 5
Government house (=1)	-0.1394** (0.0234)	-0.1310** (0.0211)	-0.1319** (0.0219)	-0.1338** (0.0214)	-0.1296** (0.0199)
Government salary (=1)	-0.0447 (0.0751)	-0.0483 (0.0776)	-0.0442 (0.0761)	-0.0338 (0.0765)	-0.0418 (0.0759)
Age	0.0028 (0.0030)	0.0030 (0.0031)	0.0028 (0.0031)	0.0026 (0.0030)	0.0028 (0.0031)
Male (=1)	-0.0230 (0.0310)	-0.0242 (0.0287)	-0.0180 (0.0294)	-0.0077 (0.0308)	-0.0131 (0.0310)
Schooling (in years)	-0.0001 (0.0055)	0.0022 (0.0057)	-0.0010 (0.0052)	-0.0016 (0.0050)	-0.0015 (0.0051)
Treatment (=1)	0.0454 (0.0687)	0.0359 (0.0691)	0.0428 (0.0684)	0.0446 (0.0669)	0.0422 (0.0676)
Trust fellow villagers	^	-0.0804* (0.0289)	^	^	^
Average Gov house	^	^	-0.2159 (0.1453)	^	^
Average Gov salary	^	^	^	-0.4531** (0.0694)	^
Average Schooled	^	^	^	^	0.2161 (0.1107)
Contants	0.7610** (0.1307)	0.8176** (0.1483)	0.9082** (0.1528)	0.8815** (0.1209)	0.6666* (0.1512)
R2	10%	10%	10%	10%	10%
N	148	144	148	148	148

Note: Model 1 includes trust in fellow villagers. Model 2 includes the average number of people in the game owning a government house. Model 3 includes the average number of people in the game receiving a government salary. Model 4 includes the average number of people in a village having any schooling. Standard errors in parentheses \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

In our second set of robustness tests, i.e., in regressions using only the subsample of people living in upstream villages, we found similar results to those reported in Table 12. Thus, in these models, owning a government house is negatively associated to first round extraction behaviour (Models 1-5, Table 13). Some of the variables included in these models have a significant explanatory power. Thus, trust in fellow villagers was negatively associated

to extraction in the first round ( $p < 0.05$ ) (Model 2). Similarly, higher village average of people with government salary bears a negative and statistically significant association with extraction in the first round of the game ( $p < 0.01$ ) (Model 4). Contrarily, higher average number of people owning a government house in a village and higher average number of people with schooling were not associated to first round extractive behaviour (Models 3 and 5).

#### **4.4. Discussion**

We have used a framed field experiment to explore the extent to which varying levels of involvement in government policies relates to voluntary cooperation in government programs. Three main findings stand out. First, uncooperative behaviour seems to be the dominant strategy when playing the game framed around the house building program. Second, group level variables are important predictors of first round extractive behaviour in our field experiment. And third, living in a household which had already received a house under the government scheme program is associated to lower extraction, or more cooperative behaviour. We devote the discussion to the explanation of these three main findings.

First, only six out of the fifty-three groups playing the game managed to attain levels of cooperation that allowed them to retain enough tokens in the group pot to avoid endowment reductions in future rounds. In other words, uncooperative behaviour was the dominant strategy when playing the game framed around the house building program. At a first sight, the finding is of contrast with ethnographic studies of the Punan Tubu, which have characterized them as being an egalitarian society, where food sharing and cooperation are prevalent (Sellato 1994; Kaskija 2012; Napitupulu et al. 2016) and are likely related to an adaptive strategy under an unpredictable environment (Kaskija 2012). Ethnographic reports have also noted, however, that the Punan Tubu practice demand-sharing, i.e., sharing as a reaction to other's implicit and explicit demands to share (Sellato 1994; Kaskija 2012). For example, when commenting on the sharing practices of the Punan Benalui – a group closely related to the Punan Tubu, Koizumi and colleagues (2012) noted that “...*(families are) asked to share with others until nothing is left.*” If the Punan Tubu mostly share and cooperate under demand and if subjects bring context (e.g., economic, cultural factors) from their daily lives when playing experimental games (as some scholars have emphasized, e.g., Cárdenas & Ostrom 2004; Henrich et al. 2005), then our results do not necessarily contradict daily life behaviour. As for cooperative behaviour to occur, we should have allowed that participants

could demand others to share. Unfortunately, we did not include a treatment of demanding cooperativeness in our design, so our data do not allow us to test whether people would have cooperated more when asked to do so. Nevertheless, this seems to us a promising line for future research.

The second finding of this work is that some village level variables are consistently associated to participants' extractive behaviour. The village-level variable that appear most consistently associated to extractive behaviour is the variable that captures settlement type (Table 12) but, even when removing this variable from the model, we find that there are also other village attributes such as trust (Model 2, Table 13) and share of people in the village with government salary (Model 4, Table 13) which relate to participants' first round extractive behaviour. Indeed, empirical results from previous economic games have reported that group level-differences can have more explanatory power than individual-level differences, arguably because norms –such as when and with whom to cooperate- are influenced by contextual situations, e.g., village level economic condition (Gowdy et al. 2003; Bahry & Wilson 2006) or shared expectations of what other members of the group would do (Ostrom 1998; Ostrom 2000). In other words, our finding supports the idea that cooperation is highly contextual, probably because social norms related to cooperative behaviour are learned and spread within groups (Ehrlich & Levin 2005).

Among the village level variables associated to extractive behaviour, the one that captures settlement type deserves special attention. We found that people living in resettlement villages extract less, i.e., display more cooperative behaviour, than people living in upstream villages. The finding is in line with previous research showing that cooperative behaviour in anonymous transactions is more likely to occur in settings exposed to such type of transactions (i.e., transactions between strangers) (Henrich et al. 2001; Henrich et al. 2006). As mentioned, the Punan Tubu in upstream villages live in small groups of close-kin, who depend on each other for hunting, gathering, and crop planting (Sellato, 1994; Kaskija, 2012; Napitupulu, et.al., 2016). In contrast, the Punan Tubu living in the resettlement villages live in larger settlements, mingling with non-kin and strangers, with whom they frequently have to engage in social and economic transactions. Given these differences, it is possible that people living in the resettlement villages might have already conformed to new types of interactions that are more common in anonymous settings; what would allow them to display more cooperative behaviour in an anonymous transaction like our game (Henrich et al. 2005).

The finding, however, should be read with caution as the inclusion of one variable to measure settlement type does not allow us to discern what exactly drives the differences in cooperative behaviour between upstream and resettlement villages. For example, the differences could be driven by proximity to market town, but also by proximity to other ethnic groups, or by discrimination in government policies, all factors that co-vary with settlement type. We tried to untangle this variable by interacting it with variables measured at the individual level (i.e., testing for the specific effect of people in resettlement with government salary, and people in resettlement with government house). Interestingly, we found that people living in resettlement villages and receiving a government salary cooperate less. However, overall, the inclusion of these variables does not modify the main finding that people from resettlement villages extract less. In subsequent analysis with the sample in upstream villages only, we also tried to examine the importance of specific village-level variables by including variables that capture village-level characteristics (i.e., village dummies, or share of people with a government house, receiving a government salary, or having schooling). We found that people in villages with higher share of people receiving a government salary extracted less in the game than their peers. To us, this association suggest that, in addition to the effect that long term exposure to larger socio-economic settings might have in cooperation, other group level characteristics are also important in understanding group dynamics in experimental games.

The last finding of this work is that, from the two individual-level explanatory variables, only the variable that captures whether the participant lived in a household that had already received a house under the government scheme program is associated to lower extraction in the game. It is possible that, motivated by their own experience, people with government houses are participating in such costly behaviour as a way to broadcast their own cooperative behaviour (Henrich et al. 2005). Evolutionary theory has used explanations related to costly signalling to explain gift giving or meat sharing, arguing that the costly-signalling of cooperative behaviour might occur in context when the benefits from cooperating are significant (Patton 2005; Henrich 2009). A similar explanation has been suggested by Agrawal and Gupta (2005), which have found that those who have socially and economically benefited from externally introduced interventions (e.g., policies, regulations) are more likely to participate in collective action, probably because having already benefited from some interventions, they have expectations to further benefit from similar programs.

## 4.5. Conclusion

We played a framed field experiment with a small-scale society in Indonesian Borneo with a long tradition of demand-sharing and recently exposed to government programs. The aim was to explore the extent to which varying levels of village and individual involvement in government policies relate to voluntary cooperation within community setting. Participants' cooperation in the experimental setting was low, probably because the Punan are used to share and cooperate under demand. Variation in experimental behaviour related both to individual- and village-level variables, with participants living in the villages close to town and participants living in a house constructed under the government program displaying more cooperative behaviour than their peers, probably because individuals and villages with experience cooperating with people beyond their kin (i.e., those who have participated in government programs) display more cooperative behaviour in anonymous settings like our game. Policies aiming to capitalize on existing cooperative behaviour to stimulate community collective action targeted to community development should take into account the specific conditions under which cooperation occurs in real setting, as ignoring them might lead to not achieving the desired levels of cooperation.

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## Chapter 5

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### Conclusion

This dissertation is an interdisciplinary study of sharing and cooperative behavior among a population of contemporary hunter-gatherers in North Kalimantan, the Punan Tubu. It examines how sharing and cooperation change with increasing integration into the market economy and the Indonesian national society. The Punan Tubu constitute an excellent case study for this purpose because having traditionally displayed strong sharing practices and cooperativeness they are now largely exposed to by changes from the market economic system, state government programs, and the national society. In this dissertation, I have addressed three main research questions in three empirical chapters.

The first empirical chapter (Chapter 2) analyses how a prosocial practice (i.e., sharing) varies alongside individual levels of integration into the market economy and the national society. Results from observations of daily behaviour suggest that sharing, and more specifically demand sharing (i.e., the verbal or non-verbal request to share food or other resources when in need), is a prominent behaviour among the Punan (Sellato 1994; Kaskija 2002). Contrary to what I had expected, sharing is neither directly related to individual levels of integration into the market economy, nor to participation in national development programs. Interestingly, however, I found variations in the way in which locally-produced and market-purchased food products are shared, i.e., market products are less shared than wild meat, wild edibles, and cultivated food. I have argued that variation on how products are shared depends on 1) their visibility, 2) their cultural meaning, and 3) the division of labour followed to produce or obtain them.

In the second empirical chapter (Chapter 3), I continue examining variations in sharing related to levels of integration to the market. In such case, I use observational and experimental data collection, while still paying attention to how the sharing of different products varies. Results from the comparison of measures of sharing in daily life and measures of sharing using an economic game suggest that data obtained through the two methods are not correlated, arguably because each method captures a different aspect of sharing. Sharing in daily life has a relational value (i.e., different things are shared with different people under different conditions), a value that is not captured in an anonymous setting of economic experiment game.

Lastly, in the third empirical chapter (Chapter 4), I questioned whether varying levels of involvement in development policies are related to willingness to voluntarily cooperate. I measure cooperative behavior through a multigroup game experiment framed around an ongoing house building government program which requires villagers' voluntary cooperation. I found that individuals and villages with more exposure to anonymous transaction (i.e., transaction between strangers) are more likely to display cooperative behavior. I argue that such behaviour might be explained because people in more exposure to anonymous transactions have conformed to new types of interactions and relations with anonymous people –i.e., beyond kin and group- which require to signal cooperativeness (Henrich, et al. 2010).

The next section provides some concluding remarks from the main findings of this dissertation along three main axes: theoretical contributions, methodological contributions, and policy recommendations. I end the dissertation by discussing some limitations of this work and presenting some ideas for future research.

## **5.1. Theoretical contributions**

One of the central aims of this work was to examine the relation between sharing and cooperation, on the one hand, and integration into the market economic system, on the other. Empirical findings of research addressing the question of how markets influence sharing had found contradictory evidence, with anthropologists arguing that the arrival of cash erodes prosocial behavior by shifting social dependence to services from the market (Behrens 1992; Tucker 2004) and economists arguing that the spread of anonymous transactions that comes with the market allows for the spread of generalized trust towards strangers (Fafchamps 2011) and thus enhances prosocial behaviour between strangers (Henrich, et al. 2010).

Far from showing a clear direction of this relation, results from my work suggest that, indeed, the relation between sharing and integration into the market and the national system is noisy and extremely complex. Findings in Chapter 2, suggest that Punan Tubu increasing level of engagement in government work is not associated to decrease in sharing. As a matter of fact, to a certain extent, the results suggest that those with wage or salary share more. A novel aspect of my work relates to different patterns of sharing for different products. I found that the sharing of market products does not abide with the same norms as the sharing of wild meat. If so, as people with government wage might purchase more market products, then the integration to market and state system, although it may not influence sharing practices of

local products, but may result in a decrease of sharing practices as market products become more common.

Another important theoretical contribution of my research is the argument that the study of prosocial behavior should be highly contextualized. In Chapter 3, I found that daily life and experimental measures of sharing were not related, a result that should not be used to favour one measure versus the other, but to emphasize that the two measures should be explained in their own context. High levels of sharing during daily life by people with large exposure to the market economy might be motivated by higher pressures of demand sharing (Peterson 1993) or by the willingness to signal generosity (Gurven et al. 2015), conditions that disappear in the anonymous game. In other words, the two measures might not be correlated because the context that prompt sharing behaviour is different that the context in which the game is played. In the same line, in Chapter 4, I also found that village level differences have an important explanatory power in predicting cooperative behavior because norms are influenced by contextual situation, e.g., village level economic condition (Gowdy et al. 2003; Bahry & Wilson 2006). In other words, my findings support the idea that sharing and cooperation are highly contextual, probably because social norms related to cooperative behaviour are learned and spread within groups (Ehrlich & Levin 2005), and therefore sharing and cooperation should be studied within the context in which they occur.

My results in Chapter 3 highlight the importance of analysing the unit in which cooperation occurs (i.e., settlement, village, household). Empirical results from previous economic games have found that group level-differences can have more explanatory power than individual-level differences in explaining variation in sharing, arguably because norms – such as when and with whom to share– are influenced by highly contextual situations, e.g., village-level economic conditions (Gowdy et al. 2003; Bahry & Wilson 2006) or shared expectations of what other members of the group would do (Ostrom 1998; Ostrom 2000). This finding fits well within the growing research on multilevel governance of common-pool resources, which suggest that multilevel governance (i.e., governance through different organizational levels) improves the management of resources because it allows to select rules and institutions that are the best fit for the specific social and ecological setting (Ostrom 2010; Agrawal 2014).

Overall, this dissertation builds on previous research questioning whether self-interest or pro-social behavior are universal features of human societies, or rather socially learned features which might change from one group to another and even within the same group (i.e.,

as societies get exposed to the anonymous interactions that come with market transactions) (Henrich, et al. 2010; Henrich 2009). Findings from my research support the argument that prosocial behavior is a complex and dynamic characteristic of social groups, meaning that we cannot take for granted the pre-existent form of the society, as prosocial behaviour by individuals and groups respond to context. Moreover, results presented here bring forward the argument that prosocial behavior should be analysed from a multidimensional perspective, as people share different things with different actors and taking into account the specific conditions in the moment of sharing (e.g., visibility, cultural or relational significance).

## **5.2. Methodological contribution**

The first important methodological contribution of this work relates to the comparison of sharing in daily life observations and sharing in experimental conditions, which do not seem to be correlated. I have argued that this finding can largely be explained by the fact that the two measures capture different aspects of sharing. In other words, the fact that they do not correlate do not invalidate one or the other. Both measures may be valid, but they measure different things. For example, in Chapter 3, while measures from daily life observations probably capture the relational value of sharing, measures from the game potentially capture individual propensity to share in a more abstract way. Therefore, researchers should be cautious when deriving conclusions from different measures of sharing or generalizing across them.

Consequently, the second methodological contribution of this work is to highlight the advantage of combining ethnographic description, systematic observations, and experimental methods. Expanding the methodological tool kit used to measure pro-social behaviour allows to triangulate and to better understand the measurement of sharing and cooperation, thus overall providing external validity in measuring prosocial behavior. Using these three methods in combination, allows contextualizing sharing behaviour in a richer and more nuanced way than any of these separate tools alone would.

A final methodological contribution of this work is in highlighting that there is value in framing laboratory field experiments to a local choice or dilemma. I notice, however, that framing experiments to the local context does not belittle the complexity of interpreting the findings. Experimental games take place on a different level of reality from actual social

behaviour, and they are intended to be a controlled situation to observe a behavior, thus deducing general patterns only from games can lead to a skewed vision of prosocial behaviour.

### **5.3. Policy implications**

As in other developing countries, Indonesia has stressed the need to achieve high levels cooperativeness and civic engagement for effective governance. The new political regime, after dictatorship, has deliberately opted for transferring decision making power to local communities increasingly supporting initiatives promoting cooperation or self-governance of communities. This political decisions have been done partly counting on that pro-social behaviour would contribute to the success of decentralized policies (Antlöv et al. 2016).

Results from the work presented here, especially from Chapter 4, suggest that government initiatives to promote cooperation might not necessarily work, even if implemented with a population with strong cooperative norms. The finding, however, should not be used to discourage Indonesia's decentralization polices, but rather to call for a better articulation of government policies that stimulate communities or local level problem solving capacity.

### **5.4. Limitations**

This dissertation has several limitations and caveats, some of them already discussed in the empirical chapters. I highlight here the three most important caveats of this work. First, data collected using systematic observations of sharing with is limited to the self-report of products shared in a daily context. However, as reported in Chapter 2 based on findings from ethnographic work, the extent of sharing among the Punan Tubu is much broader. Consequently, my data on daily life sharing might just be a conservative estimate of daily prosocial behavior.

Second, I am aware that results from the two methods used to proxy prosocial behavior are not directly comparable. For example, results from Chapter 3 are based in a game in which participants played with non-perishable products, while most observations of daily life sharing are inferred to the way the Punan Tubu share wild meat (a perishable

product). The comparison of results from data obtained with the two methods should be then taken with caution.

Finally, in my work I did not include measures to test the extent of how the Punan Tubu share and cooperate under demand. Indeed, only the ethnographic knowledge gained through the 18 months of field work allowed me to observe the importance of demand sharing, and therefore concluding that this practice is an underlying strategy for achieving prosocial behaviour in the group. However, this conclusion should also be taking with caution until it is properly tested.

## **5.5. Recommendation for future research**

As mentioned, one of the important findings of this work is in highlighting the importance of context to explain prosocial behavior. Therefore, an important recommendation for future research on the study of sharing and cooperation is to pay larger attention to context. Specifically, for the study of sharing among hunter-gatherer groups, how sharing is done (i.e., under demand sharing) should be included in the design of experimental games so to test whether people would have shared or cooperated more when asked to do so, and to what extent.

However, beyond such testing, I also suggest that the study of demand sharing is worth more scholarly attention. In light of many issues related to unequal development (e.g., climate change, management of commons, and demand of resources by the west) a better understanding of how prosocial behavior occurs, and how it can be prompted (i.e., under which circumstances demand sharing is effective) may provide concrete insights to building a more prosocial global society. The challenge is not only to extend positive local traditions of sharing and cooperation among each other or similar groups (e.g., the rural or urban poor), but also to extend such mutual sharing and cooperation to be reached across social groups to involve external parties that may be able to provide more resources, ideas and skills, e.g., local government, local businesses.

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## APPENDIX A.

### Ultimatum Game Instruction

(original instruction from Henrich et al. 2004; Andersen et al. 2011)

We play this game in pairs, you don't know with whom you will be playing. Neither before, nor after the game, will you learn with whom you played the game. Thus, your actions are again a secret and nobody will come to know your identity.

(bags of rice and bags of coffee mix are in display for the participant to see that it is real)

#### INSTRUCTIONS FOR PROPOSERS:

I give you 6 bags of rice/coffee. These rice/coffees are now yours, you can give some of them to the second person that I have market to do this work with you. It is your choice: you can give 0 and keep 6 for yourself, you can give 1 and keep 5 for yourself, you can send 6 and keep 0 for yourself.

I will give you a paper like this, mark how many you want to give to the other person.

I offer



Then I will give the paper to the second person, and ask “do you want accept this rice/coffee”. If s/he says, “I accept” I will give him/her the amount of rice/coffee and give you the reminder of the rice/coffee. But, if s/he says, “I reject”, s/he will be given nothing at all and you too will receive nothing at all.

Now, we will give you an envelope inside the envelope.

Please tell us your proposed split of the 6 bags of coffee between yourself and the responder. By crossing the bag, you are going to give.

We will collect your result. Please wait for the decision of the other group. Then we will give you their decision.

**INSTRUCTIONS FOR RESPONDERS:**


I will now explain the second game. We play this game in pairs, you don't know with whom you will be playing, I have mark them with drawing paper (like before). Neither before, nor after the game, will you learn with whom you played the game. Thus, your actions are again a secret and nobody will come to know your identity.

I have asked the first person to split of 6 bags of coffee or rice (*show again the coffee or rice*) between him/her and you. They have made an offer that specifies how much of the total of bags of rice or coffee you will receive, and how much s/he will receive.

You can choose either to accept or to reject this offer. If you accept the offer, both you and the first person receive the amounts specified in the offer. If you reject the offer, both you and the first person will receive nothing.

The proposer has offered that out of the total amount of bags of coffee or rice. For example, here the proposer offers 2 bags for you and 4 bags for him/herself.

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I offer 

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I accept :                       I reject :

Now, please tell us if you accept or decline this offer by the proposer by writing an “X” on the appropriate answer. Thank you for your participation.

## APPENDIX B.

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### House Building Game Instruction

*(A room –school room or church- with envelopes set in the location of each players seating, is set prior to the arrival of the participants)*

*(Participants are asked to sit down, where the envelopes are located)*

Greetings and welcome to all of you. *(Introduction)*.

Depending on the choices made by you and others in these games you can earn money. The payment that you receive for these games is not from my pocket but from my university research fund. This is not a lie; this is true *(show money)*.

Before playing the game, we will give you instructions. It is very important that you listen to these instructions carefully. In case you do not understand the instructions please raise your hand and ask for clarification. You are not allowed to communicate during the game. If you violate this rule, you will be dismissed from the game and will not earn any money. Is this clear?

Now to start the game, all the people sitting on a white envelop can go outside with *(research assistant)*.

*(The research assistant will undergo survey, while the first group plays the 1<sup>st</sup> game)*

Now I will start explaining the first game.

At the start of the game we randomly divide you into groups of four. You will play the game with these four people. Nobody will know with whom they are playing. Neither before, nor after the game, will you learn with whom you played the game. Your actions are a secret, and nobody will come to know. The groups will remain the same throughout the game.

At the beginning of each game your group will receive 60000 rupiah or 20 tokens in its account.

*(Visual: pot of 20 token of the picture below in one stack/use of a big pot for everyone to see)*



In each round, each participant can take between 0, 1 of this (refer to the token or 3000 rupiah), 2, 3, 4, 5. This is real money, and this will be for you.

The amount left in the group account will go to one of the player of the group.

For example, (choose 4 people from the participant), (for each one asks) how much do you want to take? (everyone takes 2. after everyone had taken). What is left? This will be given to one person, then we play again.

The game will be played 4 times and each of the players will one time receive the amount left in the group account. The group will be refill again, 20 tokens. However, if less than 10 tokens are left in the group account, the next round will start with only 12 tokens. The value of the group account is thus reduced from 60000 to 48000 rupiah.

Your task is to decide how much of the token you want to extract from the group account. **(treatment 1) We will tell you before the start of the game in which round you receive the token remaining in the group account.**

**(treatment 2) we will randomly decide at the end of the game who will receive the remaining token in the group account from the different rounds.**

The token you leave in the group account can be seen as your work to a collective project like the government housing paid by the government (*pekerjaan bersama seperti pembangunan rumah atau balai desa dana dari pemerintah*). Like in the government housing if there is no one to work the houses are not build, the government will give less in the next round (*kalau tidak cukup orang yang angkat papan maka pembangunan tidak berhasil dan bantuan dari pemerintah untuk tahun berikut bisa berkurang*).

This is real money: after each round, we will note down how much you extracted from the group account and at the end of the game the money will be paid to you. You can extract 0,1,2,3,4,5 token from the group account. Every token that you extract raises your earnings with 3000 rupiah. Every token that you leave in the group account rises the earning of the group member who gets the amount in the group account at the end of the round. This could be you!

Are there any questions?

In the envelope, which you received you will find a sheet of paper with the numbers of token that you can extract from the group account (*show envelop*). Please, indicate the number of token that you would like to extract in the envelope.



**Treatment 1:** see the star, that is in which round you will receive you receive the group money. I put a mark by drawing paper, like this for everyone (*perform drawing from 1 to 4 from my hand*).

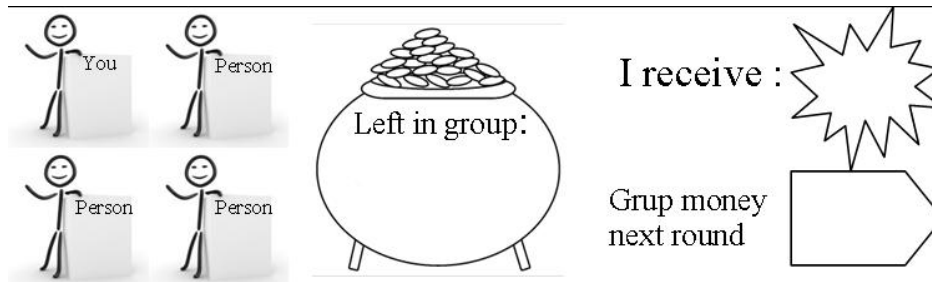


For example, if you want to extract 2 tokens, you mark the 2 tokens on the sheet.



You then close the envelope and hand the envelope to my assistant.

I will count and informed about the contributions of all group members and how much token there are left in the group account with the following sheet (*show sheet*):



The people box tells you the what you and people in your group took. The pot, is money left. The star is what you get this round. And the arrow box tells you the group next round is still 20 tokens or 12 when the threshold is not reach.

Are there any questions? Then we will now show you some examples to help you gain understanding of the game.

*(Act out example, in front of the classroom with the chosen people)*

In example one member extract 4 and the other three members extract 1. This means that there are 13 tokens left in the group account and that the threshold is reached. One member receives 13 tokens, and the next round starts again with 20 tokens.

Is this clear? Are there any questions?

After playing the game 4 times, the total amount of token that you earned will be converted and we will pay this amount to you in real money. So, if you, for example, you have earned 20 token you are paid 60000 rupiahs. You will only receive your money in the end, i.e. after the game is played 4 times. We will keep a record of your earnings to make sure you receive the correct amount.

If you have any remaining questions, please raise your hand. I will ask each of you a couple of questions.

#### Control Questions

1. There are 20 tokens in the group account. How much can you maximally extract? How much can you minimally extract? (Answer: 5, 0)
2. Who receives the amount left in the group account? (Answer: at the end/the sheet)
3. If you extract 3 tokens from the group account, will the threshold be reach? (Answer: that depends on what the others do)

So, we will now start the game. Please be silent. If you have any questions, please raise your hand and we will come to you.

## ANNEX

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### PUBLICATIONS

#### Book chapter

**Napitupulu, L.**, M. Guèze, V. Reyes-García. Sharing in a Context of Rural Development. A study among a Contemporary Hunter-gatherer society in Indonesia. In Pyhälä, A. and Reyes-García, V., (Editors) *Hunter Gatherers in a Changing World*. Springer, 2016. doi: 10.1007/978-3-319-42271-8\_8

M. Guèze, and **L. Napitupulu**. Trailing Forest Uses Among the Punan Tubu of North Kalimantan, Indonesia. In Pyhälä, A. and Reyes-García, V., (Editors) *Hunter Gatherers in a Changing World*. Springer, 2016. doi: 10.1007/978-3-319-42271-8\_8

#### Peer-reviewed journal

Reyes-García, V., M. Guèze, I. Diaz-Reviriego, R. Duda, A. Fernández-Llamazares, S. Gallois, **L. Napitupulu**, Orta, M., and A. Pyhälä. “The adaptive nature of culture. A cross-cultural analysis of the returns of Local environmental knowledge in three indigenous societies”, *Current Anthropology* 57, 2016, doi:10.1086/689307

Reyes-García V, A. Pyhälä, I. Díaz-Reviriego, R. Duda, Á. Fernández-Llamazares, S. Gallois, M. Guèze, **Napitupulu, L.**, Schooling, Local Knowledge and Working Memory: A Study among Three Contemporary Hunter-Gatherer Societies. *PLoS ONE* 11(1): e0145265, 2016, doi:10.1371/journal.pone.0145265

Reyes-García, V., I. Diaz-Reviriego, R. Duda, A. Fernández-Llamazares, S. Gallois, M. Guèze, **L. Napitupulu**, and A. Pyhälä. “Peer evaluation is a reliable method to measure local ecological knowledge”, *Field Methods*, Feb 26, 2016, doi:10.1177/1525822X16629912

**Napitupulu, L.**, Bouma, J. & Reyes-García, V. Can government development policies shape voluntary cooperation? Results from a framed field experiment among the Punan Tubu, Indonesia. manuscript in preparation to be submitted to *Development & Change*.

**Napitupulu, L.**, Bouma, J. & Reyes-García, V. The things we share: Sharing in daily life and experiment settings among Punan hunter-gatherer, Indonesia. manuscript in preparation to be submitted to *Ecological Economics*.

## Policy Brief

Reyes-García, V., I. Díaz-Reviriego, R. Duda, A. Fernández-Llamazares, S. Gallois, M. Guéze, **L. Napitupulu**, P. Perez, A. Pyhälä, “Lessons from the Field: what can the knowledge society learn from the study of local environmental knowledge?” in *LEK Project Policy Brief #1*

M. Guéze, I. Díaz-Reviriego, R. Duda, A. Fernández-Llamazares, S. Gallois, **L. Napitupulu**, P. Perez, A. Pyhälä, V. Reyes-García, “A Biocultural approach to conservation: What can conservationist learn from forest use by contemporary indigenous peoples?” in *LEK Project Policy Brief #2*

Reyes-García, V., I. Díaz-Reviriego, R. Duda, A. Fernández-Llamazares, S. Gallois, M. Guéze, **L. Napitupulu**, P. Perez, A. Pyhälä, “Local perception of wellbeing. Insights from the Global South” in *LEK Project Policy Brief #3*

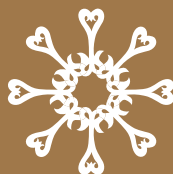
## Outreach effort

By the end of the fieldwork, I participated in the dissemination and giving back to the communities for their participation in the study. Two main activities, that I undertook together with the team:

**Punan literacy book.** I participated in the writing of a literacy book, titled “*Mengenal huruf Bersama Punan Tubu*” (Getting to Know Letters with Punan Tubu). The book aimed to invite children to recognize letters through everyday culture in Punan Tubu, Tubu district, Malinau Regency, North Kalimantan. The book is made in dual language, Punan Tubu language and the national language Bahasa Indonesia for children in several levels of reading (starting from the starters to the more advanced). Since the schools are thought in the national language it was seen that not only was reading a problem, but the introduction to the national language was also a barrier to acquire level of reading and understanding. The book was distributed in not only to the Punan Tubu villages in the Tubu District, also in the resettlement villages of the Punan Tubu, local library, government agency, and was widely accepted. The book can be find at <http://icta.uab.cat/Etnoecologia/lek/>



**Workshops with villagers, village official and representative of Malinau local government.** The workshop I organized together with the team, was held to share some descriptive result and other observation about the villages I studied and work with. One workshop was held up river with the Head of the District of Tubu river area (*Kecamatan Tubu*), villagers and Heads of Village of the villages I studied and work with. Second workshop was in Malinau city, the central of the Malinau Regency where the Tubu District is located. The meeting includes invitation to government official in many different office (forestry office, planning agency, etc), also with the officials of Punan Tubu in the city (elders, representative of the Punan for the government, etc.). The discussion was moderated by a member of the house of representative (law maker).



# Behaving Sociably.

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