Durable Goods and Child Nutrition in the Bolivian Amazon

Submitted by

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Abbreviations and Acronyms

BMI	Body-mass index
Bs	Bolivianos
OLS	Ordinary Least Squares
LogBMI	Natural logarithm of Body-mass index
UNICEF	United Nations Children's Fund
WAZ	Weight-for-age Z score
ZAM	Z score of upper arm muscle
ZSF	Z score of skin folds

Executive Summary

Aim: Living in relative isolation until recently, the Tsimane Amerindians are gaining increased access to formalized markets and modern durable goods. This study hypothesizes that ownership of key durable goods can impact nutritional status by smoothing consumption and changing behaviors within the household. According to this hypothesis, this study analyzes how ownership of key durable goods associate with the nutritional status of children 6 – 59 months old, a subgroup whose nutritional indicators that are highly sensitive to environmental changes (Frisancho 1990) and that illustrates high levels of malnutrition (Foster et al. 2005).

Subjects: The study utilizes data on the Tsimane Amerindians, contemporary pre-industrial society of approximately 8000 people situated in the Bolivian lowlands. Drawing on data from the 2004 annual survey of the Tsimane that sampled 236 households, 172 households with children between 6 – 59 months of age (n=289, 149 girls and 140 boys) were selected for analysis. Expenditures on durable goods were aggregated at the household level by asking adults in households with children to list the durable goods they purchased in the last year.

Methods: The logarithm of child body-mass index (BMI) was regressed against (a) expenditures on key durable goods, (b) own characteristics, (c) parental- and household-level characteristics, and (d) and village-level variables. Durable goods are assigned to one of three categories: tools, hygiene, or luxury. Child BMI is substituted with child Z-score of skin folds (ZSF), Z-score for age and arm muscle (ZAM), and weight for age Z-score (WAZ) to give the analysis added robustness, and to detect durable goods that impact multiple anthropometric indicators.

Results: Expenditures on tools (specifically rifles) and hygiene goods (specifically plates and pails) show positive significant impacts on at least two anthropometric indicators. We find that for every $1 Boliviano (Bs) spent on rifles, plates, and pails, child BMI increases by 0.002%, 0.344%, and 0.073%, respectively. Expenditure on rifles also show statistically significant positive associations ($p<0.05$) with child ZAM and WAZ, increasing the standard deviations of both indicators by 0.0005 for every 1 Boliviano spent. Every $1 Bs spent on plates significantly ($p<0.10$) increases the standard deviation of child ZSF by (0.024). Similar expenditures on pails significantly ($p<0.05$) increase child WAZ by 0.009. The magnitudes of the estimated coefficients are not of sufficient magnitude to noticeably impact child nutritional status, consistent findings suggest that an association between rifles, plates, and pails and child nutritional status exists.

Conclusions: Expenditures on tools (particularly rifles) and hygiene goods (particularly plates and pails) are positively associated with child nutritional status. Although regression coefficients are small, the results are consistent across multiple nutritional indicators, indicating that ownership of key durable goods *may* improve child nutritional status. Small coefficients may also be the product of measurement error which introduces bias into the econometric model. Further investigations regarding the impact of modern durable goods on nutritional status that pay closer attention to actual ownership of good and the behavior associated with its use are recommended.

1.0 Introduction

Child malnutrition among the Tsimane Amerindians population, a contemporary pre-industrial society in the Bolivian Amazon, is widespread, indicated by high levels of growth-stunting (Foster et al. 2005). Malnutrition in children increases mortality (Horton 1986), impairs cognitive ability (Ibid), and leads to greater morbidity (Lichter 1997) and reduced productivity in adulthood (Strauss and Thomas 1998). Studying child malnutrition among the Tsimane, whose access to formal markets is nascent and slowly increasing, provides a unique chance to observe the impacts of market access on child nutritional status (Foster et al. 2005).

Among the Tsimane, indicators of increased market access take many forms: sale of rainforest goods, presence of wage-based employment and access to modern durable goods. Though the sale of rainforest products and wage based labor have been studied empirically (Pendelton & Howe 1998; Foster et al. 2005; Godoy & Jacobson 1999), little attention has been given to the impacts of modern durable goods. This is especially relevant as access to markets increases consumption possibilities, allowing for a greater range of durable goods to be purchased. Determining what goods affect child nutritional status can provide increased insight into the impacts of the market economy on contemporary pre-industrialized societies.

The study of durable goods affords an opportunity to identify changes in household productivity and behavior that are prompted by ownership of physical objects. Understanding why people purchase particular durable goods and how durable goods impact households' ability to smooth consumption and care for children has wide implications for the developing world and public policy. Broadly speaking, this study suggests that people's actions are dependent upon the goods that they own, and that these actions can have unintended impacts on the health and nutrition of children.

The following study incorporates household durable good ownership into a model of child nutritional status. Ordinary Least Squares (OLS) regression analysis will be used to infer causality between durable good ownership and changes in short-term nutritional indicators. A discussion theorizing the potential impacts of key durable goods follows as well as recommendations for follow-up research of durable goods.

2.0 Hypotheses

The question posed in this study is simple: "Does ownership of modern durable goods affect the nutritional status of Tsimane children?" The idea that modern durable goods that influence behavior and consumption smoothing can have an impact on child nutrition is intuitive, and has far-reaching implications as goods markets expand. For households in the developing world, durable goods can act as a form of savings or investment (Filmer & Pritchett 1998), improve household productivity (Pendelton & Howe 2006), and change behaviors by altering the household's environment (Armar-Klemesu et al. 2000). Links between child nutritional status and household conditions (Engle & Menon & Haddad 1999) prompt an investigation into factors that alter a household's environment or the behaviors practiced within it. Durable goods are on

such factor that can shape household consumption and environment, potentially influencing the nutritional status of children.

This paper will test the following three hypotheses:

1. Increased investment in tools will increase child nutritional status by increasing a household's productivity and ability to smooth consumption.

2. Increased investment in modern hygienic products will increase child nutritional status by reducing incidence of infection.

3. Increased investment in luxury goods will decrease child nutritional status by diverting resources away from basic needs.

An examination of household tools ownership may accurately capture the productivity of the household, and reflect long-term food consumption and security. Direct measures of household productivity and consumption already exist[1], but are limited in their scope and time frame.

While tools impact household production and consumption, one can assume that ownership of hygienic goods positively impact household behavioral patterns. Behavioral changes related to eating, dress, and disease prevention can be directly dependent upon ownership of the appropriate good, and can have impacts on child nutritional status by reducing the incidence of infection.

Due to the subsistence nature of the Tsimane, it is likely that expenditures on non-essential luxury goods negatively impact child nutritional status. Luxury goods are costly, and divert limited resources away from a household's basic needs, such as food and shelter. This fact may compromise household food security and limit a household's productive potential.

3.0 Literature Review

There are no studies at the time of this writing that examine child nutritional status as a product of durable good ownership. There are studies, however, which stress the importance of durable goods in the household, and view durable goods as an indicator of household wealth and preferences. In the literature reviewed below, durable goods have been analyzed (1) via the creation of wealth indices, (2) as a means consumption smoothing, and (3) as a means of showing status. Though results on many studies are mixed, the inclusion of durable goods and assets into household-level analysis illustrates their importance to studies undertaken in developing countries.

Household studies in the developing world often equate durable goods with wealth and savings (Nathan et al. 2004; Filmer & Pritchett 1998; Arimond & Ruel 2004). This practice is logical as

[1] Variables measuring productivity in the analyzed data set include kilograms of wildlife caught in the past two weeks, kilograms of rice harvested last season, value of food consumed in past two weeks)

households in developing countries often have few savings and investment options, and accumulate durable goods in order to amass wealth. While wealth is often treated as a control in household studies, Filmer and Pritchett (1998) test whether household wealth is a determinant of child enrollment in school in India, Indonesia, Nepal, and Pakistan. They construct a household wealth index based on "ownership of consumer durables"[2], "characteristics of the household's dwelling", and "household landownership" (Ibid: 117). They assigned households to socio-economic groups depending on their index score, and compare enrollment rates between different socio-economic groups. To illustrate the wealth index's accuracy, Filmer and Pritchett (1998) conduct the same analysis using consumption expenditures. They found that wealth index is a better predictor of "educational outcomes" than consumption expenditures, and that the probability of a child being enrolled in school significantly increases as a household's socio-economic class increases.

Durable goods are also used by households as a means of smoothing consumption (Rosenzweig & Golpin 1993; Block & Webb 2001; Godoy et al. 2005). Rosenzweig and Golpin (1993) examine the use of bullocks (young bulls) by rural Indian households as a means of savings, income-generating, and consumption smoothing. Their study found that households sold bullocks to smooth income when other income sources were unpredictable. As bullocks were primarily an insurance item, households periodically underinvested in bullocks despite the large increases in agricultural productivity they stood to gain. Block and Webb (2001) investigate consumption smoothing by analyzing income diversification and assets in Ethiopian households. Examining Ethiopian households at two points in time (shortly after the 1989 famine and again in 1994), Block and Webb hypothesize that well-being in 1994 is a function of past income diversification (1989) and durable asset holdings. They found that households with well diversified income sources in 1989 maintained their level of income diversification through 1994, and were able to increase income flow and asset wealth (Block & Webb 2001, 348). Therefore, greater income diversification enabled households to smooth consumption, leading to increases in both income and assets. Godoy et al. (2005) provide the only example wherein ownership of specific goods impacts one's nutritional status. Specifically, they examine the impacts of human capital and technology on nutritional status of Tsimane adults. Durable goods, such as "bows, canoes, fishhooks, fishnets, rifles, and shotguns" are viewed as "wealth in foraging technology" (Ibid: 156), and are believed to increase consumption of bush meat and increase income. Human capital and ownership of foraging technology show a joint impact on household wealth in domesticated animals and adult nutritional status. In essence, this study suggests that ownership of the proper technology and the ability to use it effectively are positively associated with wealth accrual and nutritional status.

In addition to wealth and consumption smoothing, recent studies have examined durable goods' ability to signal social status. Heffetz (2004) examined expenditures on "conspicuous" (highly visible) goods in the United States, hypothesizing that an individual's purchase of specific goods satisfies both direct (utility) and in-direct (social) needs. By creating a scale that places consumer goods into categories of visibility, Heffetz was able to estimate expenditure elasticities of demand by visibility category, seeing if spending patterns were influenced by the visibility of the good purchased. Though Heffetz found mixed results, his findings suggest that a household's

[2] Consumer durables included in Filmer and Pritchett's (1998) wealth index are a "clock/watch, bicycle, radio, television, bicycle, sewing machine, refrigerator, [and] car".

social economic status dictated its expenditures on conspicuous goods. While Heffetz's study does not relate directly to nutritional status, it suggests that households of different socio-economic groups may have different preferences that guide their spending on durable goods.

Though the literature above regards durable goods in varying lights, it shows that ownership of durables has definite impacts on household productivity and behavior. This study aims to build on the literature by examining several durable goods separately and determining which particular goods are responsible for changes in productivity and behavior that influence child nutritional status.

4.0 Methods

4.1 People & Sample

The Tsimane are a contemporary pre-industrial society of approximately 8000 people situated in Bolivian lowlands. The Tsimane have had limited contact with outsiders until the 1970's when settlers began moving into the lowlands (Foster et al. 2005), expanding trade and goods markets. Despite increased exposure to settlers, the Tsimane maintain a largely subsistence society today, with "goods bought in the market [accounting] for only 3% of the total value of household consumption" (Godoy et al. 2005). The relative isolation of the Tsimane from the market economy facilitates this analysis, as greater market interdependence would make attributing causality to particular modern durable goods difficult.

The following analysis uses data from the 2004 annual survey of the Tsimane, which collected information on 1433 individuals in 236 households. As this study examines child nutritional status, a sub sample consisting of 289 children (girls=149 and boys=140) from 172 different households was used for the multivariate analysis. Children aged 6 – 59 months have been chosen as their nutritional indicators are more sensitive to environmental changes (Frisancho 1990) than those of adults. A six month minimum age was used as children aged 0-6 months are often exclusively breastfed, and are therefore marginally impacted by household level factors (WHO 1986). Children older than fifty-nine months (under five years) are restricted as they are considered less vulnerable to nutritional stresses and because child physiology begins changing at approximately 5 years of age (Ibid).

4.2 Rationale for Durable Goods selection

Durable goods included in the analysis are chosen based on their frequency and functionality. Goods purchased more than 10 times in the past year by adults in the entire surveyed population (N=236) are considered goods that could broadly impact Tsimane households. Though a cut-off of 10 purchases is arbitrary, it allows the analysis to be limited to "popular" durable goods. Of the 82 different durable goods purchased, 20 goods were purchased ten or more times in the year before the survey. Functionality was determined by the good's ability to fit into one of three categories; tools, hygiene, and luxury. Of the 20 frequently purchased goods, 13 goods identify with established categories. Table 1 shows durable goods that are included in the analysis, the frequency in which they were purchased, and the percentage of expenditures on each good for the entire sampled group (N=236).

Goods are placed into categories to facilitate the analysis and determine if investments in particular goods have joint effects on child nutritional status. Goods are allocated to the tools category if they are used in hunting, foraging, or agricultural activities. Goods are included in the hygiene category if they *may* reduce the incidence of infection or disease. Watches and radios are viewed as luxury goods because they are not *essential* items to a contemporary pre-industrialized society, and account for large portion of household expenditures (Deaton & Muellbauer 1980; Godoy et al. 2006).

Table 1: *Frequency of purchase and percentage of key durable good expenditures*

Item	**Frequency of purchase** (N=236)	**% of total expenditures** (N=172)
Tools		
Machete	149	9.41
Axe	18	2.62
Rifle	11	18.89
Shovel	16	0.80
Shotgun	13	9.54
Hygiene		
Mosquito Net	69	9.52
Plate	64	1.59
Pail	34	1.94
Shoes	68	9.79
Metal Spoon	33	0.52
Bedspread	19	2.58
Luxury		
Watch	14	2.44
Radio	70	30.36

Noticeably, machetes, radios, mosquito nets, shoes, and plates are the most frequently purchased goods[3]. As prices between goods vary considerably, high frequencies of purchase does not translate into larger percentages of total expenditures. Percentage of total expenditures on key durables goods is calculated by summing expenditures on the thirteen selected goods for the sampled households independently, and dividing the expenditures on good *x* by total expenditures. The percentage enables an approximation of how households with children spend their money on "popular" durable goods that have identifiable functionality.

Of key tools, spending on rifles accounted for 18.9% of key durable expenditures. Expenditures on machetes and shotguns each make up approximately 9.5% of key durable expenditures, and

[3] Frequency of each good represents how many different times a good was purchased in the past year, not the quantity of goods purchased.

axe and shovel spending cover 2.6% and 0.8%, respectively. Of hygiene goods, expenditures on mosquito nets and shoes each account for 9.5% of the key expenditures. Expenditures on bedspreads constitute 2.6% of total expenditures, and plates, pails, spoons, each account for under 2.0% of total spending. Expenditures on radios account for the largest percentage (30.4%) of total spending on the examined goods. Watch expenditures account for only 2.4% of total key expenditures. Only radios show high frequency and large percentage of total key expenditures. This suggests that of frequently purchased goods, households with children are inclined to allocate substantial resources towards the purchase of radios.

4.3 Approach

This model used in this study is based on UNICEF's (1990) conceptual model of child nutrition. In the UNICEF model, "… child survival, growth, and development are influenced by three underlying factors: food security, health care and a healthy environment, and care" (Engel et al. 1999: 1310). The UNICEF conceptual model varies from traditional household production functions (Strauss & Thomas 1998; Behrman & Skoufias 2004) by viewing food security *and* care as determinants of child nutritional status. Durable goods are assumed to impact both household food security and child care by smoothing consumption and changing behavioral patterns. Tools, in particular, are assumed here to impact household food security by increasing productivity and smoothing consumption, enabling households to have more consistent access to food sources. Ownership of hygiene goods refers to the care given to the child and the behaviors practiced within the household that reduce incidence of infection and disease. In addition, ownership of hygiene goods can alter a child's environment by preventing the spread of communicable diseases from other members in the household. Luxury goods are believed to compromise household food security by diverting spending away from durable goods with greater utility and productive potential. This is particularly relevant to a subsistence society such as the Tsimane who have limited financial resources.

Equation 1 represents the conceptual model utilized in this analysis. In this equation, child nutritional status is viewed as a function of household ownership of specific durable goods, individual-level characteristics, parental and household characteristics, and community level characteristics.

$$\text{Chile Nutritional Status}_{it} = f(\text{Durable Good Ownership}_{it}, \text{Own Characteristics}_{it}, \text{Parental \& Household Features}_{it}, \text{Community Characteristics}_{jt}) \quad (1)$$

Child nutritional status is represented by the short-term nutritional indicators body-mass index (BMI), Z-score of skin folds (ZSF), Z-score for age and arm muscle (ZAM), and weight for age Z-score (WAZ). BMI, expressed as its natural logarithm, is discussed at length as its results are easily interpretable and show percentage change.

Durable good ownership is measured in expenditures on key durable goods in the past year. Expenditures, rather than actual ownership, are used because data on good ownership is less comprehensive (i.e. represents a smaller number of durable goods) than expenditure data. Other independent variables draw on features shared by the UNICEF model, addressing causality at the individual, household, and community levels. Own characteristics account for individual-level features such as age, sex, or recent illness that may influence nutritional outcomes. Household-level variables include household size, total years of schooling of parents, household income and wealth, and expenditures on food. Village level dichotomous variables are included to account for village fixed effects.

4.4 Limitations to Approach

Representing durable good ownership via expenditures increases the scope of the analysis, but also introduces measurement error. First, the study assumes that durable good purchased in the year before the survey were not owned previously. Second, the study assumes that all durable goods were owned for the same amount of time, when length of ownership could vary substantially. For example, it is unknown if households owned plates before the survey was taken. Of households that did purchase plates in the year before the survey, it is unknown how long the plates were owned. Length of ownership is important as the study essentially examines the cumulative impacts of durable goods on household consumption and behavior. Thirdly, it is unclear if durable goods were actually used by the children. To illustrate: mosquito nets are examined as they may reduce the incidence of malaria, but there is no data confirming if children slept under these nets. Shoes are also examined as they may reduce the incidence of parasites such as hookworm, but there is no evidence to suggest that the shoes were worn by children.

In addition, insufficient control variables may also introduce biases into the model. Factors relating to child feeding and care such as introduction of complimentary foods, frequency of feeding, and cleanliness of care giver (e.g. washing of hands) can influence child nutritional status (Ruel & Menon 2002). The absence of variables controlling for such factors could potentially bias regression estimates.

5.0 Variables

Table 2: *Variable Descriptions and Summary Statistics*

Variable Name	Description	Obs.	Mean	Std. Dev.
Dependent Variables				
BMI	Body-mass index (kgs/meters^2)	287	17.17	1.75
LogBMI	Natural logarithm of Body-mass index	300	2.83	0.09
ZSF	Sum of two skin fold Z-score	188	-0.09	0.98
ZAM	Age-sex Z-score of arm muscle	240	-0.62	0.94
WAZ	Weight-for-age Z-score	287	-0.79	1.14
Household Annual Durable Good Expenditures in Bolivianos (Bs)				
Machete	Bs spent on machetes	172	17.14	28.34
Axe	Bs spent on axes	172	4.76	16.20
Rifle	Bs spent on rifles	172	34.40	243.30
Shovel	Bs spent on shovels	172	1.45	6.10
Shotgun	Bs spent on shotguns	172	17.36	159.15
Mosquito	Bs spent on mosquito nets	172	17.33	36.31
Plate	Bs spent on plates	172	2.88	6.84
Pail	Bs spent on pails	172	3.52	15.67
Shoes	Bs spent on shoes	172	17.83	46.59
Spoon	Bs spent on spoons	172	0.95	3.05
Bedspread	Bs spent on bedspreads	172	4.70	19.42
Watch	Bs spent on watches	172	4.44	23.65
Radio	Bs spent on radios	172	55.29	118.61
Controls				
Age	Age in years	289	2.53	1.26
Male	Sex (Male=1, Female=0)	289	0.48	0.50
Beddays	Total number of bedridden days reported in the last two weeks	289	1.01	2.19
Momedu	Years of schooling of mother	285	1.16	1.41
Dadedu	Years of schooling of father	274	2.84	3.09
Income	Sum of wages, barter, and sale earning in the last two weeks	172	255.42	415.87
Valfood	Value in Bs of all foods consumed by household in last 7 days	172	584.75	262.63
Totalwealthhh	Bs value of traditional and modern assets and animals owned by household	171	2974.71	2319.74
Hhsize	Number of members in the household	172	7.34	2.61
Village	Dummy variable for each village (13 villages)	289	--	--

Descriptions and summary statistics of all variables used in the regression analysis are presented in Table 2. Statistics presented are compiled at the individual-level (n=289) and household-levels (N=172) where appropriate. From the table, we observe that an average child in the sample population has a BMI of 17.2 and anthropometric z-scores below zero. The average child is approximately 30 months (2.5 years) old and has been bedridden one time in the past two weeks. On average, children's fathers have approximately 1.7 years more schooling than their mothers. Households earned about 255 Bolivianos (Bs) in the two weeks prior to the survey, and consumed approximately 585 Bs worth of food the week prior. The average household has approximately 2975 Bs in modern and traditional assets (e.g. canoes, bikes, pots, mills, and animals).

Means and standard deviations of expenditures on durable vary considerably as goods have differing qualities and values. Mean annual household expenditures on durable goods range from approximately 1 Bs (for spoons) and 55 Bs (for radios). It is worth noting that expenditure values are zero if the household did not purchase the good, lowering mean values and increasing standard deviations. This is most notable in the large standard deviations of high cost goods such as rifles, shotguns, and radios, as the mean does not reflect accurately the average cost of purchasing the good.

5.1 Bivariate Statistics

Bivariate statistics help reveal basic relationships and lend credence to *a priori* expectations and chosen methods. Pearson's R, T-test, and ANOVA results will be discussed in order to identify key differences and associations between dependent and independent variables.

Pearson's correlations for child anthropometrics and all durable goods expenditures (see Appendix A) show strong positive relationships between child BMI and expenditures on plates (0.204) and shoes (0.126). Between durable goods, the strongest relationships are observed between expenditures on plates and shoes (0.280), plates and spoons (0.278), mosquito nets and bedspreads (0.372), machetes and radios (0.277), and plates and radios (0.259). The strongest correlations between durable goods expenditures are found in the hygiene category. This may suggest that households purchase certain hygiene goods in tandem, or considered hygiene-related market goods desirable. Correlations of control variables against child anthropometrics are mixed, showing a negative relationship between age and BMI (-0.256) and positive relationship with age and ZSF (0.214). Relationships between other controls and child anthropometrics are weak. Correlations between controls are below 0.8 dismissing any concerns of multicolinearity (see Appendix B).

T-Tests for differences in mean nutritional indicators for girls and boys are not significant, suggesting equality between male and female children (see Appendix C). ANOVA results show that a significant ($p<0.001$) difference in child mean ZSF, ZAM, and WAZ across villages (see Appendix D), suggesting that environmental differences play a role in child nutritional status. No significant difference in child mean BMI is found across villages.

5.2 Econometric Model

Equation 2 illustrates the principle model used in the multivariate analysis. As mentioned above (see Methods), LogBMI is analyzed in greatest detail as its results are easily interpretable. Durable goods expenditures will be incorporated into the model by category, first in aggregate (summed by category), and then disaggregated by good. Examining durable goods expenditures in aggregate and disaggregated form will allow effects to be identified across categories and in regards to specific goods. Ordinary Least Squares (OLS) regression analysis is used to generate coefficient estimates.

$$\begin{aligned}\text{Nutritional Status} = {} & \beta_0 + \beta_1 \text{Durable Expenditures} + \beta_2 \text{Age} + \beta_3 \text{Male} + \\ & + \beta_4 \text{Beddaystot} + \beta_5 \text{Momedu} + \beta_6 \text{Dadedu} + \beta_7 \text{Hhwealth} + \\ & + \beta_8 \text{Hhsize} + \beta_9 \text{Income} + \beta_{10} \text{Valfood} + \beta_{11} \text{Village} + \varepsilon\end{aligned} \tag{2}$$

$$\text{Nutritional Status} = \text{LogBMI, ZSF, ZAM, WAZ}$$

6.0 Results

6.1 BMI as an Indicator of Child Nutritional Status

Table 3 shows regression results of durable goods expenditures on child BMI aggregated by category. For each case, regression coefficients are extremely small and not significant. R-squared values show that the independent variables explain between 17% -18% of the variation in child BMI, and change only marginally between models.

Table 3: *Regression Coefficients of Durable Goods Expenditures (aggregated by category) on child nutritional status*

Dependent Variable = LogBMI

	Regression Coefficients			
Variables	**Tools**	**Hygiene**	**Luxury**	**Complete Model**
Tools	0.0000	--	--	0.0000
Hygiene	--	0.0001	--	0.0001
Luxury	--	--	0.0000	0.0000
Constant	2.9311 ***	2.9305 ***	2.9323 ***	2.9304 ***
n	269	269	269	269
R squared	0.1727	0.1782	0.1714	0.1796

^P<0.1 * P≤0.05, ** P≤0.01, *** P≤0.001

Note: All regressions are OLS and run with robust standard errors. Variables Age, Male, Beddaystot, Momedu, Dadedu, Totalwealthhh, Hhsize, Income, Valfood, and Village, are included in the above regressions as controls.

Table 4 shows regression results of durable goods expenditures on child BMI disaggregated by category. Tests of joint significance (F-tests) are also performed for each group of durable goods to determine if they jointly explain the variation of the dependent variable, LogBMI.

Table 4: *Regression Coefficients of Household Expenditures on Durable Goods (Disaggregated) on child (6 - 59 month old) nutritional status*

Dependent Variable = LogBMI

	Regression Coefficients			
	[a]	[b]	[c]	[d]
Variables	**Tools**	**Hygiene**	**Luxury**	**Complete Model**
Machete	0.0002	--	--	0.0002 ^
Axe	0.0001	--	--	-0.0001
Rifle	0.0000 ^	--	--	0.0000 *
Shovel	0.0007	--	--	0.0000
Shotgun	0.0000	--	--	0.0000
Mosquito Net	--	-0.0001	--	0.0000
Plate	--	0.0031 *	--	0.0034 **
Pail	--	0.0007 **	--	0.0007 **
Shoes	--	0.0001	--	0.0001
Spoon	--	-0.0039	--	-0.0041 ^
Bedspread	--	0.0002	--	0.0003
Watch	--	--	0.0002	0.0002
Radio	--	--	0.0000	-0.0001
Constant	2.9305 ***	2.9324 ***	2.9333 ***	2.9409 ***
n	269	269	269	269
R squared	0.1844	0.2266	0.1735	0.2455
Joint Test (f-test)	F(5, 242)	F(6, 241)	F(2, 245)	F(13, 234)
	2.2 *	2.65 **	0.37	2.95 ***
			Tools	F(5, 234)
				3.06 *
			Hygiene	F(6, 234)
				3.25 **
			Luxury	F(2, 234)
				1.54

^P≤0.10, *P≤0.05, ** P≤0.01, *** P≤0.001

Note: All regressions are OLS and run with robust standard errors. Variables Age, Male, Beddaystot, Momedu, Dadedu, Totalwealthhh, Hhsize, Income, Valfood, and Village Dichotomous variables are included in the regressions as controls.

Though regression coefficients for durable goods expenditures remain small, some goods show statistically significant associations with child BMI. For tools [a], rifles show a significant ($p<0.1$) positive association with child BMI, increasing BMI by 0.002% for every $1 Bs spent. When hygiene goods alone are inserted into the model [b], significant associations between child BMI and plate ($p<0.1$) and pail ($p<0.01$) expenditures are observed. A marginal increase in plate

and pail expenditures increases child BMI by 0.31% and 0.07% respectively. No significant associations were found for luxury items [c] when inserted separately to the model. Joint tests of significance for the three separate models [a – c] show that tools ($p<0.05$) and hygiene goods ($p<0.01$) significant explain the variation in the child BMI.

When all durable goods are included in the model together [d], significant positive coefficients for tools are seen for expenditures on machetes ($p<0.1$) and rifles ($p<0.05$). Every $1 Bs spent on machetes and rifles associates with an increase in child BMI by 0.02% and 0.002%, respectively. Coefficients for hygiene expenditures on plates and pails are shown to be positive and significantly ($p<0.05$) associated with child BMI, with $1 Bs increase on plate and pail expenditures increasing BMI 0.34% and 0.07%, respectively. Contrary to *a priori* expectations, expenditures on spoons have significant negative relationship ($p<0.1$) with child BMI, decreasing BMI by 0.42% for every $1 Bs spent. Expenditures on luxury goods were shown to be not significantly related to child BMI. Tests of joint significance in the complete model show that expenditures on tools ($p<0.05$) and hygiene goods (0.01) significantly explain the variation in LogBMI of children.

R-squared goodness of fit statistics shows that the hygiene specific model [b] and the complete model [d] explain 22.6% and 24.5% of the variation in LogBMI, respectively. Notably, the hygiene specific model explains between 4 - 5% more of the variation in LogBMI than the tools [a] and luxury [c] models.

6.2 ZSF, ZAM, and WAZ as indicators of Child Nutritional Status

Anthropometrics such as ZSF, ZAM, and WAZ are also indicators of short-run nutritional status. Table 5 shows regression results for the complete model using LogBMI, ZAM, ZSF and WAZ as dependent variables.

Noticeably, significant coefficients are observed for tool and hygiene expenditure variables. For the three models of interest here [b – d], expenditures on rifles, machetes, shotguns, plates, and pails show significance. Using ZAM [b] as the dependent variable, expenditures on rifles show a significant positive estimate ($p<0.05$), associated with a 0.0005 increase in the standard deviation of ZAM. Using ZSF [c] as the nutritional indicator, expenditures on machetes ($p<0.05$) and plates ($p<0.1$) display significant coefficients, with every $1 Bs associated with a 0.0072 and 0.0240 increase in the standard deviation ZSF, respectively. Expenditures on rifles ($p<0.05$) and pails ($p<0.01$) demonstrate a positive and significant relationship with child WAZ [d], with every $1 Bs spent associating with a 0.0005 and 0.0091 increase in the standard deviation, respectively. Expenditures on shotguns ($p<0.01$) display a significant negative relationship with child WAZ, relating to a decrease in the standard deviation of 0.0010 for every $1 Bs spent.

A**s** with estimates for LogBMI, coefficients for the anthropometric Z scores are small and have no practical impact on child nutritional status. Despite this fact, consistencies in sign and significance of regression coefficients across models [a – d] support *a priori* expectations, suggesting that tools and hygiene goods are positively associated with child nutritional status. Specifically, regression estimates for expenditures on *rifles*, *plates*, and *pails* have the same sign and are significant for at least two different anthropometric indicators.

Table 5: *Regression Coefficients of Household Expenditures on Durable Goods (Disaggregated) on four measurements of child (6 - 59 month old) nutritional status*

Dependent Variables = LogBMI, ZSF, ZAM, WAZ

	Regression Coefficients			
	[a]	[b]	[c]	[d]
Variables	**LogBMI**	**ZAM**	**ZSF**	**WAZ**
Tools				
Machete	0.0002	-0.0021	0.0072 *	-0.0003
Axe	-0.0001	0.0023	-0.0008	0.0018
Rifle	0.0000 *	0.0005 *	0.0000	0.0005 *
Shovel	0.0000	-0.0034	0.0160	-0.0089
Shotgun	0.0000	0.0001	-0.0001	-0.0010 **
Hygiene				
Mosquito Net	0.0000	0.0002	0.0001	0.0006
Plate	0.0034 **	-0.0111	0.0240 ^	-0.0061
Pail	0.0007 **	-0.0002	0.0020	0.0091 **
Shoes	0.0001	0.0009	0.0005	-0.0023
Spoon	-0.0041 ^	-0.0072	-0.0137	-0.0210
Bedspread	0.0003	0.0016	0.0046	-0.0023
Luxury				
Watch	0.0002	0.0005	0.0000	0.0026
Radio	-0.0001	0.0000	-0.0005	0.0004
Constant	2.9409 ***	0.4204 ***	-0.2771	-0.6938 ^
n	269	230	178	269
R squared	0.2455	0.324	0.4553	0.1824
Joint Test (All)	F(13, 234)	F(13, 195)	F(13, 143)	F(13, 234)
	2.95 ***	0.69	0.94	3.11 ***
Joint Test (Tools)	F(5, 234)	F(5, 195)	F(5, 143)	F(5, 234)
	3.06 *	1.34	1.65	2.89 **
Joint Test (Hygeine)	F(6, 234)	F(6, 195)	F(6, 143)	F(6, 234)
	3.25 **	0.32	0.89	3.36 **
Joint Test (Luxury)	F(2, 234)	F(2, 195)	F(2, 143)	F(2, 234)
	1.54	0.02	0.47	0.87

^P≤0.10, * P≤0.05, ** P≤0.01, *** P≤0.001

Note: All regressions are OLS and run with robust standard errors. Variables Age, Male, Beddaystot, Momedu, Dadedu, Totalwealthhh, Hhsize, Income, Valfood, and Village, are included in the above regressions as controls.

7.0 Extensions

Thus far, the analysis has assumed that households are unitary, pooling resources and sharing preferences. Contrarily, differences in intra-household resource allocation have shown significant associations with child nutritional status in previous studies (Haddad & Hoddinott 1994). Intra-household analysis is particularly relevant to this study, as Godoy et al. (2006) have

found spending on different types of durable goods differed for men and women in the same surveyed population. To address these concerns, this section expands the analysis by 1) by comparing spending on durable goods by gender, and 2) estimating the impacts of male and female expenditures on child nutritional status separately.

7.1 Spending on durable goods by gender

To determine if males and females have different spending habits, comparisons of mean expenditures (using t-tests) are made. Comparisons of mean expenditures for the 172 surveyed households show if adult males and females that cohabitate with children have different preferences and spending habits on particular goods.

Appendix E shows the mean expenditures on all goods for females and males. Noticeably, mean expenditures on key durable goods reveal that men spent more Bs than women on all but three goods, plates, pails, and spoons. Significant differences are observed for machetes, axes, mosquito nets, shoes, bedspreads, watches, and radios. On average, men spent 161.79 Bs on all durable goods while women spent 20.32 Bs. This may suggest that Tsimane men have greater control of spending on durable goods. Expenditures on rifles, though not statistical different by gender, appear to be made primarily by males, suggesting that males control resources spent on hunting and foraging. Though the difference is not significant, it is notable that women spend more on plates and pails, which are show positive associations with child nutritional status. The lack of significant difference in expenditures on plates and pails by gender, however, may imply that men and women have similar spending habits on these goods.

7.2 Male and female expenditures and child nutritional status

Estimating the impacts of male and female expenditures separately reveals how different preferences and spending habits within the household relate to child nutritional status. Appendix F shows regression results for all durable goods expenditures related to LogBMI, ZAM, ZSF, and ZAM. As in the household-level analysis, regression coefficients are not of sufficient magnitude to influence child nutritional status. Therefore, only coefficients that show significance for at least two anthropometric indicators at the 90% confidence interval or greater are reported below.

For males, expenditures on *rifles* and *plates* show positive associations with child nutritional status. Specifically, every $1 Bs spent on rifles is associated with a 0.005 percent increase in LogBMI ($p<0.05$) [a] and a 0.0003 increase in the standard deviation of ZAM ($p<0.10$) [b]. A $1 Bs expenditure on plates associates with a 0.13 percent increase in LogBMI ($p<0.05$) [a] and a 0.023 increase in the standard deviation of ZSF ($p<0.10$) [c]. Expenditures on shotguns illustrate significant regression estimates with alternate signs, positively associated with LogBMI [a] and negatively associated with WAZ ($p<0.01$). As the signs vary for shotgun expenditures, no consistency relationship to child nutritional status can be determined.

For Females, every $1 Bs spent on pails is associated with a 0.10 percent increase in LogBMI ($p<0.05$) [e] and a 0.0123 increase in the standard deviation of WAZ ($p<0.05$) [h]. Contrary to *a priori* expectations, expenditures on spoons show a negative association with nutritional status,

with LogBMI ($p<0.10$) [e] decreasing by 0.6 percent and the standard deviation of ZAM ($p<0.001$) [f] decreasing by 0.0593 for every $1 Bs spent.

Contradictions to *a priori* expectations raise questions to the utility of certain durable goods. Why also are expenditures by females on plates positively associated with child nutritional status while expenditures on spoons have a negative association? Though no evidence offers suggestions the unanticipated relationships, differences in the utility of durable goods can offer potential explanations. Specifically, plates and spoons have differing utilities and are used for different purposes, and could presumably have different impacts on household hygienic conditions. Ownership of plates assumes more hygienic independent feeding, while ownership of spoons simply assumes eating with a cleaner utensil. This fact suggests that hygienic eating conditions may be secondary to issues of communal vs. individual eating behaviors.

Despite differences, similarities between the household and intra-household analysis of expenditures are apparent, with repeated significance on rifles, plates, and pails. Consistent sign and significance at both the household and intra-household level suggest that these items have credible links to child nutritional status, warranting further discussion.

8.0 Discussion

Despite small regression coefficients, the findings presented below are still meaningful as they support *a priori* expectations and show consistency across varying anthropometric measurements. Small coefficients may be attributed to measurement error and data limitations (see Methods), which restrict the model's ability to accurately test for good ownership. As stated earlier, the ability of durable goods to smooth consumption and change behaviors at the household level is logical, particularly in regards to the Tsimane who are just now gaining access to modern durable goods. The analysis above identifies tools and hygiene goods as potential influencers of child nutritional status, singling out rifles, plates, and pails as the most important goods. The role each good plays in the household will be addressed below, and specific examples of how each good could improve child nutritional status will be provided.

8.1 Rifles

The positive association between rifle ownerships and child nutritional status supports findings of Godoy et al. (2005), and indicates that rifles are an integral component of a household's "foraging technology" for the Tsimane. This is not surprising as hunting for game is extensively practiced by the Tsimane, and game is the primary source of protein for poor households in forested regions (Apaza et al. 2002). Ownership of durable goods, such as rifles, that facilitate the hunting process will logically improve a household's ability to secure food sources and may generate more productive hunting. Essentially, this finding implies that ownership of rifles increases the quantity of bush meat households acquire and subsequently feed their children.

In addition, ownership of rifles may influence child nutritional status by smoothing consumption via increased household income, as game can be sold or traded for goods and/or food. Though the model presented above controls for household income, it is possible that ownership of rifles

represents long-run income stability, which is not captured in short-term measurements of income.

8.2 Plates

The identification of plates as a covariate of child nutritional status lends itself to varied speculation related to the role of child feeding practices. Plates may improve child nutritional status by reducing the spread of infection during communal eating, or may enable parents to ensure children are given adequate portions, which are not guaranteed when eating is communal. In both cases, the use of plates could alter child feeding behavior, leading to improved child nutritional status. The potential association between "western" eating habits and nutritional status also suggests that certain types of acculturation may be beneficial to indigenous communities, and that newly introduced durable goods, such as plates, may have unintended impacts on disease and health.

The literature regarding child feeding behaviors concentrates on breastfeeding, introduction of supplementary foods, feeding during illness, and frequency of feeding (Ruel & Menon 2002; Ruel et al. 1999), with little attention given to issues of communal vs. individual feeding practices. The transition from communal to individual feeding relates to feeding practices, as plates may enable parents to engage discriminatory feeding practices, favoring one child over another. Though the evidence reported here does not support discriminatory feeding practices by sex (i.e. boys and girls have statistically similar anthropometrics), further investigations into child-feeding behavior should be expanded, including plates into their analysis.

8.3 Pails

The link between pails and improved child nutritional status likely relates to water availability and cleanliness. Pails are used by the Tsimane principally for the transport and storage of water, and may improve access to water for drinking, hand washing, bathing, and cleaning food. Though pails cannot affect the quality of water from the source, they may improve the microbiological quality of water by reducing fecal contamination during storage and home use (Miller 1984). Features of modern water storage containers, such handles, spouts, and small openings, can also prevent contamination during storage, reducing an individual's exposure to water-born pathogens (Sobsey 2002). In addition, the ability to effectively clean pails may reduce biofilm formation and the growth of disease-causing bacteria and fungus (Ibid).

Ingestion of contaminated water causes diarrheal disease, which "remain[s] a leading cause of illness and death in the developing world" (Mintz, Reiff, & Tauxe 1995: 948; citing Bern et al. 1992). For this reason, any technology that enhances water quality should be thoroughly studied and tested for effectiveness. To date, several interventions aimed at improving water quality via modified water storage vessels have been implemented in various parts of the world, and have been shown to reduce infection rates (Mintz, Reiff, & Tauxe 1995). As the Tsimane traditionally rely on gourds, clay pots, and receptacles woven from palm leaves for fetching and storing water, it is plausible that small improvements in water-storage technology may improve child nutritional status by reducing incidence of infection.

For the Tsimane, whose isolation makes improvements in *source* water quality expensive and impractical, pails and other modern water-storage containers may represent an economically feasible, convenient, and achievable means of improving water quality. Further research into water-storage and -transport methods and behaviors is recommended in order to identify specific behavioral and spending patterns that improve household water quality.

9.0 Conclusion

The above study examines the impact of durable goods on child nutritional status among the Tsimane Amerindians in Bolivia. Frequently purchased tools, hygiene goods, and luxury goods, are considered potential covariates of child nutritional status as they can potentially impact households' ability to smooth consumption and affect behavioral practices. Multivariate analysis shows that tools and hygiene goods have joint effects on child nutritional status, and that luxury goods have no effect. Of tools, rifles show significant positive relationships with multiple anthropometric indicators, suggesting that households owning rifles are better able to smooth consumption presumably by providing a more reliable source of bush meat and/or food (via income) to their children. Of hygiene goods, plates and pails demonstrate significant positive associations with child nutritional status, suggesting that changes in child-feeding and water-storage behaviors influence child nutritional status. Though regression coefficients are small, consistency in sign and significance across anthropometric indicators suggest a strong association between durable ownership and child nutritional status.

Disaggregated by gender, we observe that males outspend females nearly 8 to 1, suggesting that men have greater control over day-to-day spending than women. Expenditures by males on rifles and plates show positive associations with child nutritional status, while expenditures on shotguns illustrate a negative relationship. Similarly, expenditures by females on pails are positively associated with child nutritional status while expenditures on spoons show a negative association. For rifles and pails, spending behaviors confirm observed behaviors where men traditionally manage hunting and women manage household water resources. While only expenditures on plates by males are significantly associated with nutritional status, spending habits appear similar between men and women. Unexpected signs for shotguns and spoons presumably address issues of durable good utility.

Overall, this study reveals that links between durable goods and nutritional status exist. For this reason, a greater understanding into how durable goods influence behaviors and consumption is needed to comprehend the impacts of market expansion. Further studies that relate durable goods to nutritional status should pay close attention to good ownership and use, as they may provide insight into how specific acculturation of the household relates to nutritional outcomes. Insight gained may assist in the identification of positively deviant behaviors, which can be used to promote certain goods or develop behavioral change communication programs.

As markets expand into the developing world, the objects one owns increasingly represent his/her capabilities and potential. Understanding which modern goods facilitate human development can shed light on how globalization impacts people in the developing world and how they themselves embrace change.

Appendices

Appendix A

Table 6: *Pearson's correlations between durable good expenditures and child (age 6 – 59 months) Anthropometrics*

	BMI	ZSF	ZAM	WAZ	Machete	Axe	Rifle	Shovel	Shotgun	Mosquito net	Plate	Pail	Shoes	Spoon	Bed spread	Watch	Radio
BMI	1.000																
ZSF	0.241	1.000															
ZAM	0.031	-0.293	1.000														
WAZ	0.256	0.016	0.481	1.000													
Machete	0.015	0.316	-0.131	0.041	1.000												
Axe	-0.026	0.145	-0.044	0.026	0.154	1.000											
Rifle	0.043	-0.033	0.144	0.092	-0.079	-0.047	1.000										
Shovel	0.071	0.028	0.014	-0.010	0.078	0.119	-0.035	1.000									
Shotgun	-0.067	-0.023	0.035	-0.079	0.007	-0.034	-0.015	-0.026	1.000								
Mosquito net	-0.011	-0.033	0.055	0.012	-0.031	-0.049	-0.072	0.004	0.034	1.000							
Plate	0.204	0.029	0.025	-0.025	-0.046	0.172	0.066	0.178	-0.042	-0.079	1.000						
Pail	0.085	0.139	-0.069	0.070	0.193	0.133	-0.031	0.059	-0.023	0.073	-0.013	1.000					
Shoes	0.126	0.000	0.111	-0.079	0.048	-0.006	0.021	0.117	-0.041	-0.037	0.280	-0.040	1.000				
Spoon	-0.049	0.037	0.097	0.009	-0.062	0.087	0.171	-0.075	-0.032	-0.070	0.278	-0.034	0.117	1.000			
Bed spread	0.026	0.142	-0.012	-0.010	0.060	0.089	-0.035	-0.062	0.134	0.372	0.051	0.060	0.002	0.035	1.000		
Watch	0.017	-0.043	-0.018	0.004	-0.025	-0.063	-0.027	-0.047	-0.020	-0.064	0.006	-0.010	0.006	-0.058	-0.048	1.000	
Radio	0.022	0.019	-0.049	0.038	0.277	0.057	-0.044	0.115	0.051	-0.017	0.259	0.135	0.204	0.043	-0.002	0.167	1.000

Appendix B

Table 7: *Pearson's correlations between child (age 6 – 59 months) anthropometrics and controls*

	BMI	ZSF	ZAM	WAZ	Age	Beddays	Momedu	Dadedu	Total wealthhh	Hhsize	Income	Valfood
BMI	1.000											
ZSF	0.241	1.000										
ZAM	0.031	-0.293	1.000									
WAZ	0.256	0.016	0.481	1.000								
Age	-0.256	0.214	0.047	-0.036	1.000							
Beddays	0.029	0.009	-0.052	-0.036	-0.032	1.000						
Momedu	0.018	0.035	0.036	0.005	-0.096	-0.051	1.000					
Dadedu	0.126	0.004	0.137	-0.083	-0.037	0.030	0.327	1.000				
Totalwealthhh	-0.056	0.139	0.108	0.078	0.080	0.051	-0.115	0.051	1.000			
Hhsize	-0.159	-0.040	-0.088	-0.079	0.044	0.069	-0.288	-0.155	0.346	1.000		
Income	-0.029	0.100	-0.016	0.004	0.038	-0.029	0.115	0.132	0.467	0.069	1.000	
Valfood	-0.124	-0.037	-0.022	-0.065	0.028	-0.030	-0.199	-0.028	0.364	0.508	0.054	1.000

Appendix C

Table 8: *Differences in means of Child Anthropometrics*

	Boys	**Girls**
BMI	17.31	17.04
	(140)	(140)
ZSF	-0.18	-0.02
	(89)	(99)
ZAM	-0.69	-0.56
	(117)	(123)
WAZ	-0.87	-0.71
	(140)	(147)

() show the number of observations
* $p<0.05$

Appendix D

Table 9: *ANOVA results of Child Anthropometrics across villages*

	N	**Partial SS**	**Degrees of Freedom**	**F Value**	**Prob > F**
BMI	287	19.800	12	0.53	0.897
ZSF	188	64.990	12	8.25	0.000
ZAM	240	46.390	12	5.27	0.000
WAZ	287	30.805	12	2.03	0.022

Appendix E

Table 10: *Comparison of mean expenditures by gender (N=172)*

Durable goods		**Females**	**Males**
Tools	**Machete**	2.41	14.73
	Axe	0.64	4.12
	Rifle	0.00	34.40
	Shovel	0.11	1.34
	Shotgun	0.10	17.26
Hygiene	**Mosquito Net**	4.76	12.56
	Plate	1.55	1.34
	Pail	1.92	1.60
	Shoes	0.72	17.11
	Metal Spoon	0.52	0.43
	Bedspread	2.26	2.43
Luxury	**Watch**	0.00	4.45
	Radio	5.29	50.00
Total		20.32	161.79

Indicates figures significantly different at $p<0.05$

Appendix F

Table 11: *Regression Coefficients of Male and Female Expenditures on Durable Goods (Disaggregated) on four measurements of child (6 - 59 month old) nutritional status*

Dependent Variables = LogBMI, ZSF, ZAM, WAZ

	Regression Coefficients							
	Male Expenditures				Female Expenditures			
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]
Variables	**LogBMI**	**ZAM**	**ZSF**	**WAZ**	**LogBMI**	**ZAM**	**ZSF**	**WAZ**
Tools								
Machete	0.0003	-0.0015	0.0072 *	0.0011	0.0008	0.0095	-0.0071	0.0232
Axe	0.0003	0.0009	0.0018	0.0019	-0.0007	-0.0014	-0.0135	-0.0059
Rifle	0.0000 *	0.0003 ^	0.0000	0.0004	--	--	--	--
Shovel	0.0008	-0.0036	0.0156	-0.0041	--	--	--	--
Shotgun	0.0000 ^	0.0002	-0.0001	-0.0011 **	0.0005	0.0159	-0.0157	0.0445
Hygiene								
Mosquito Net	0.0001	-0.0001	0.0004	-0.0004	-0.0003	0.0009	-0.0007	0.0015
Plate	0.0018 *	-0.0103	0.0230 ^	-0.0076	0.0044	-0.0075	0.0212	-0.0158
Pail	0.0006	0.0019	0.0095 *	0.0101	0.0010 *	-0.0052	0.0046	0.0123 *
Shoes	0.0002	0.0000	0.0006	-0.0036	0.0021	0.0234 *	0.0021	0.0268
Spoon	-0.0016	0.0716	-0.0315	0.0572	-0.0062 ^	-0.0593 ***	-0.0074	-0.0645
Bedspread	0.0003	-0.0016	0.0043	0.0002	0.0003	0.0068	0.0032	-0.0013
Luxury								
Watch	0.0002	0.0007	-0.0002	0.0027	--	--	--	--
Radio	-0.0001	-0.0003	-0.0007	0.0004	0.0000	-0.0029	0.0053	-0.0046
Constant	2.9505 ***	-1.7002 ***	-0.2998	-0.9553 *	2.9310 ***	-0.1490	-0.2075	0.2867
n	269	230	178	269	269	230	178	269
R squared	0.1999	0.3319	0.4555	0.1772	0.2385	0.3285	0.4242	0.1744
Joint Test (All)	F(13, 234)	F(13, 195)	F(13, 143)	F(13, 234)	F(13, 234)	F(13, 195)	F(13, 143)	F(13, 234)
	1.63 ^	0.91	1.02	2.82 ***	2.24 **	2.46 **	0.62	1.84 *
Joint Test (Tools)	F(5, 234)	F(5, 195)	F(5, 143)	F(5, 234)	F(5, 234)	F(5, 195)	F(5, 143)	F(5, 234)
	3.19 **	0.76	1.92 ^	2.94 **	1.02	0.51	0.88	0.84
Joint Test (Hygeine)	F(6, 234)	F(6, 195)	F(6, 143)	F(6, 234)	F(6, 234)	F(6, 195)	F(6, 143)	F(6, 234)
	1.06	0.62	1.25	2.07 *	2.91 **	3.80 ***	0.36	2.58 *
Joint Test (Luxury)	F(2, 234)	F(2, 195)	F(2, 143)	F(2, 234)	F(2, 234)	F(2, 195)	F(2, 143)	F(2, 234)
	1.18	0.11	0.78	0.96	0.05	0.61	1.12	1.10

^P≤0.10, * P≤0.05, ** P≤0.01, *** P≤0.001

Note: All regressions are OLS and run with robust standard errors. Variables Age, Male, Beddaystot, Momedu, Dadedu, Totalwealthhh, Hhsize, Income, Valfood, and Village, are included in the above regressions as controls.

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