

Draft version

## **INTRA-HOUSEHOLD BARGAINING POWER AND CHILD NUTRITIONAL STATUS IN MADAGASCAR**

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### 1. INTRODUCTION

Madagascar is one of the poorest countries in the world, with 70 percent of the population living below USD 1,25 a day, and 90 percent below USD 2 a day. The fertility rate is five children per woman and the probability of dying under age five years (under-five mortality rate) is 142 per 1000 births. Of the children under age five 42 percent are underweight [UNDP, 2009]. Whether the child is underweight or not is closely related to his or her family. The household is the standard unit of socio-economic analysis but this issue needs to be investigated in terms of intra-household resource allocation. There is a wealth of empirical evidence suggesting that when women control resources this affects the household's spending priorities, which in turn may have positive effects on child health, education etc. Understanding intra-household bargaining patterns is crucial when formulating policy, since policy effects may differ depending on the intra-household relations. The models can be analysed within a bargaining model of the household. What factors influence the bargaining power within the household? In particular, what factors empower women in Madagascar? And what role does this play for the nutritional status of children? The purpose of this paper is to clarify the links between the mother's bargaining power and the nutritional status of her children. Special attention is paid to the role of holding individual land rights, which might improve welfare directly via increased food security or income, and indirectly via greater empowerment.

There are very few studies applying an intra-household bargaining model to the Malagasy context. However, there are some studies which reach interesting conclusions. Glick [April/Avril 2009] investigate the determinants for HIV knowledge and condom use among women in Madagascar, which can be considered as a sign of bargaining power, and find that more educated and wealthier women have better knowledge about HIV/AIDS and are more likely to use a condom. Moreover, in a cross-country analysis study of the relationship between child nutrition and the mother's empowerment Smith et al. [2003] show that child nutritional status is improved with mother's empowerment. Malagasy women in general have less access to and control over productive resources than men. See for instance Jarosz [1994] for a study of women's control over land in agricultural production. Regarding land rights, although there are no legal restrictions on women's possibilities to own land, traditions and customary rules have given women in Madagascar very weak land rights. In some regions, according to patriarchal rules women cannot own or inherit land OECD [2009], and women often have only secondary rights via their husbands or fathers ILC [2007]. An ongoing land reform has the potential to strengthen women's land rights.

The hypothesis that the mother's intra-household bargaining power is affecting the child health and nutritional status can be tested empirically. I use household

survey data from the Measure Demographic and Health Surveys for Madagascar 2003-2004 to analyse this with econometric methods. Preliminary results indicate that some of the empowerment indicators used in the analysis have a positive effect on child nutritional status, while other have no significant effect. In particular, when a woman controls land the risk of her children being underweight is reduced.

In the next section I present the conceptual framework including theories of intra-household bargaining and empirical results from similar studies. In the third section data and descriptive statistics are presented. In the fourth section I discuss the econometric model which is work in progress. Therefore, the results that are presented in the fifth section are still very preliminary. I conclude the paper with a discussion on how to strengthen the analysis, and a discussion on possible implications of the results.

## 2. CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

In the economic literature on intra-household decision making, the decision process is formulated as if the individuals in the household have different preferences and are maximizing their individual, and/or joint utility. Despite the major simplifications this could be a useful tool to analyze the complexities in household relations and decision making power. The traditional unitary model assumes that the household acts as one single decision-making unit, and is rejected in both developed [Lundberg et al., 1997] and developing countries [Quisumbing and Maluccio, 2003]. Bargaining models on the other hand are used to analyze intra-household decision making and allocation of resources. The main approaches are Pareto-efficient models (see for example Browning and Chiappori [1998], cooperative bargaining models (see McElroy and Horney [1981]), and non-cooperative bargaining models (see Lundberg and Pollak [1993]). Udry [1996] has formulated a model for agricultural households in Africa. In all these models there is some kind of bargaining process going on, the outcome of which determines the allocation of resources within the household. A lot of attention has been paid to what factors influence the bargaining power of the individuals in the household, with a particular focus on the potential for empowerment of women.

The non-cooperative model seems to be most appropriate for analysing bargaining power and the effect on child nutrition. The reasons for treating household decision-making as noncooperative instead of cooperative are classical economic arguments of asymmetric information, enforcement problems and inefficiency. For a convincing discussion see Katz [1997] who cites empirical evidence that shows that there are information asymmetries between members of the same household. It is common that a person is not fully informed about his or her partner's earnings, assets and time use. The enforcement problem is that the conjugal contract is informal and as such difficult to enforce. Finally, Katz [1997] states that the solution to non-cooperative bargaining models is generally not characterized by Pareto-efficiency, as opposed to cooperative models where inequitable outcomes are assumed to be consistent with maximizing household surplus. However, evidence from non-cooperative bargaining models shows that "the male privilege is not only unjust but also inefficient" [Katz, 1997]. Furthermore, the role of external factors for intra-household bargaining power is stressed by for instance Agarwal [1997]. Non-cooperative bargaining models have the potential of taking endogeneity of intra-household power relations into account. The social context, with its

social norms, in which the household is situated affects the intra-household allocation of resources, and the social norms can in turn be reinforced or challenged by intra-household power relations.

The following model of non-cooperative bargaining with child nutritional status is taken from Smith et al. [2003]. I have chosen this particular model because it explicitly models qualitative factors. Also, it includes extra-environmental parameters. The model consists of three individuals in the same household: a man, a woman and a child: let's assume that they are the parents of the child.<sup>1</sup> There may also be other people living in the household, but they are not assumed to influence the decisions explicitly.

The woman, indexed  $f$ , and the man, indexed  $m$ , maximize their respective utility functions

$$U^i(N, X_O^f, X_O^m, T_l^f, T_l^m).$$

where  $i = f, m$ ,  $N$  is the nutritional status of the child,  $X_O^i$  are goods directly consumed,  $T_w^i$  is the time spent in wage-generating activities, and  $T_c^i$  is the time spent in caring-activities benefiting the other household members. The individuals maximize their individual utilities subject to three restrictions each. The first restriction concerns the nutritional status of the child:

$$N(X_N^f, X_N^m, T_c^f, T_c^m, \Omega),$$

where  $\Omega$  is a vector of characteristics:

$$\Omega = (\Omega_{ch}, \Omega_{hh}, \Omega_p, \Omega_{co})$$

$\Omega_{ch}$  are the characteristics of the child, including age and sex;  $\Omega_{hh}$  are the characteristics of the household, including household size and age-sex composition;  $\Omega_{ct}$  are the characteristics of the child's parents, including education and age;  $\Omega_{co}$  are the characteristics of the community in which the household is situated, including location and cultural norms. These characteristics,  $\Omega$ , together with goods used for nutritional inputs,  $X_N^i$ , and the time spent in caring-activities by the woman and the man,  $T_c^i$ , affect the child's nutritional status.

The second restriction is

$$T_w^i + T_c^i = T^i - T_l^i, \text{ and,}$$

( $i = f, m$ ), which tells us that the time spent by the individual in income generating activities and caring-activities must equal the total time available for the individual,  $T^i$ , less the time for leisure,  $T_l^i$ .

The third restriction is a budget restriction

$$p_O^i X_O^i + p_N^i X_N^i = w^i T_w^i + E^i \pm t$$

where  $p_O^i$  and  $p_N^i$  are the prices for the respective goods,  $w^i$  is the wage,  $E^i$  is income from exogenous sources, and  $t$  is a transfer of money between the man and woman.<sup>2</sup> The budget restriction tells us that the total expenditure on goods directly consumed and goods used for nutritional inputs must equal the total income of the individual.

The couple then bargains over the time that each of them will spend in leisure,  $T_l^i$ , and over the amount of the transfer  $t$ . The decisions of the woman will be

<sup>1</sup>For a discussion on heteronormativity in household economics see for instance Danby [2007].

<sup>2</sup>In the model by Smith et al. [2003] it is treated as a transfer from the man to the woman, but I assume that it could also go in the other direction.

conditional on the choices of the man, and vice versa which gives the indirect utility functions:

$$V^i(p, w, E^f, E^m, \Omega, t, T_l^f, T_l^m).$$

$i = f, m$  Finally, the couple maximizes

$$[V^f(t, T_l^f, T_l^m) - \phi^f] * [V^m(t, T_l^f, T_l^m) - \phi^m]$$

subject to  $(V^i - \phi^i) > 0$ ,  $i = f, m$ , where  $\phi^i$  are the fall-back positions. The fall-back positions, or threat-points, are the outside options of the household member if he or she would leave the household. The idea is that the household member with the most favourable fall-back position has the most influence over who controls time and income in the household. There is a discussion on how to treat the threat-points in intra-household bargaining models since the most obvious threat-point divorce might not be a credible threat. In non-cooperative bargaining models the “non-cooperative solution” is not considered as the fall-back position, but rather as one of the factors determining the actual allocational outcomes. For instance, in the model in Lundberg et al. [1997] the fall-back positions are modelled as separate spheres within the marriage.

The final reduced form equations for child nutritional status is

$$N^*(p_O, p_N, w^f, w^m, E^f, E^m, \alpha^f, \alpha^m, \Omega)$$

where  $\alpha^i$  are non-monetary factors affecting the individual’s fall-back positions, which often are referred to as “extra-household environmental parameters”. According to Smith et al. [2003] power differentials can influence child nutrition in four different ways simultaneously. Firstly, the direct link of who can influence the allocation of resources to nutrition inputs. Secondly, in who has influence over resource control distribution among the household members. Thirdly, who has voice in what decisions. And finally, by affecting the degree of gender inequality at societal level.

Among the factors that have been used in empirical estimations of bargaining power of women are wage rates, unearned income, shares of income and inherited assets (for a summary see Quisumbing and Brière [2000]). However, only a few studies look at the effect of the empowerment on the nutritional status of the children. The importance of securing property rights for women in general, and land rights in particular has been advocated by for instance Agarwal [1994], who claims that in developing countries arable land is the most important form of property, and improving women’s social and economic status is dependent on having independent land rights. Land rights are particularly important when studying the outcome of the bargaining process on child nutritional status as they might improve welfare directly via increased food security or income, and indirectly via greater empowerment. A few studies use land rights explicitly as an indicator of bargaining power, for instance Allendorf [2007].

Furthermore, when estimating the non-economic factors affecting bargaining power, there are firstly variables reflecting human capital, like education. Age, and age at marriage. Among these indicators there are also relative variables, focusing on the difference in age and education of the woman and the man. Secondly, variables reflecting social capital, for instance measured as living close to one’s relatives [Smith et al., 2003]. Katz [1997] also discusses the issue of extending the intra-household models to include more than two household members, which

is particularly relevant in developing countries where the extended family often plays an important role. However, these models are difficult to derive theoretically and to test empirically. Finally, there are so called extra-household environmental parameters, that can be estimated using for instance indicators for the degree of gender equality in the society.

An important conclusion from empirical studies is that increasing women's share of resources can have beneficial social and economic effects, see for instance Fafchamps et al. [2009], on child nutrition and education. Moreover, Allendorf [2007] shows that promoting women's land rights empower women and benefit young children's health in Nepal. The measures for child nutritional status that is used in this and other articles are underweight (low weight to age ratio), stunted growth (low height to age ratio) or wasting (low weight to height ratio).

### 3. DATA

In this section the dataset and descriptive statistics are presented. Data from the Measure Demographic and Health Survey, DHS, for Madagascar is used. The survey data was collected in 2003-2004 by Institut National de la Statistique, IN-STAT. The data is designed to be representative for the population. There is a household questionnaire and an individual questionnaire answered by women (age 15-49) which is connected to indicators for her children if they are under the age of five (0-59 months). The nutritional status of these children is described in terms of height and weight data. One of the constructed variables is intended to signify underweight and is expressed as the weight for age standard deviations away from reference median. The limit for being underweight is two standard deviations away from the reference median. 39 percent of the children in the sample are underweight according to the definition of the weight being two standard deviations lower than the median weight, whereas the figure given in UNDP [2009] is 42 percent (for the years 2000-2007), so the sample seems to be representative. There are 52 percent girls, 48 percent boys in the sample. The age distribution of the children is shown in Table 1<sup>3</sup>. The households in the sample are located both in the coun-

TABLE 1. Child characteristics

underweight	current age of child					Total
	0	1	2	3	4	
0	661	434	390	462	455	2,402
1	179	384	328	341	284	1,516
Total	840	818	718	803	739	3,918

tryside and in cities in all the six regions of Madagascar, as can be seen in Table 2. There are no monetary indicators of income or expenditure in the dataset. There is however a wealth index which is "a composite measure of the cumulative living standard of a household. The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles, materials used for housing construction, and types of water access and sanitation facilities. Generated with a statistical procedure known as principal components analysis, the Wealth Index places individual households on a continuous scale of

<sup>3</sup>Differences in sample size between the tables are due to missing values in some of the variables.

TABLE 2. Location

region	de facto place of residence			Total
	capital,	small city	countryside	
Antananarivo	521	402	356	1,279
Fianarantsoa	0	360	342	702
Toamasina	0	277	341	618
Mahajanga	0	220	235	455
Toliary	0	265	304	569
Antsiranana	0	122	173	295
Total	521	1,646	1,751	3,918

relative wealth”[DHS, 2004], as shown in Table 3 Among the factors included in the wealth index, there are some that are very closely connected to the health and nutritional status of the household members, like types of water access and sanitation facilities. The next set of variables are the characteristics of the mother. In

TABLE 3. Wealth

wealth index	Freq.	Percent	Cum.
poorest	759	19.37	19.37
poorer	533	13.60	32.98
middle	685	17.48	50.46
richer	714	18.22	68.68
richest	1,227	31.32	100.00
Total	3,918	100.00	

Table 4 we see that the average age of the women in the sample is 29 years. There is a variable indicating what relation the respondent has to the household head. In 303 cases the respondent, i.e. the mother, is the household head (in a majority of these cases she is divorced or widowed and does not live with a man.) Hence, there is no bargaining of the type described in the model going on in these households. In a first stage I have therefore chosen to exclude these women from the sample. Also, in this first stage, I do not address the issue of whether there is more than one respondent from the same household. This is a very small share of the total sample, and some of the cases are in women-headed households. Hence, this neglect should not affect the results. I intend to add complexity to the model in a later stage. When turning to the economic indicators, in Table 4 we see that a 54 percent of the women work in the agricultural sector, 25 percent have other types of jobs, for instance in manufacturing or services. About a fifth of the women are not working outside the household. Of the women who are working a third get paid in cash. It is worth noting that about two thirds of the women working in agriculture work on their own land. There are however large regional differences, in Fianarantsoa a large majority of the women work on their own land, whereas in Antsiranana it is the opposite. Moreover, there are women who do not work in agriculture just because they do not have access to land. Finally, there are variables for decision-making power, described in Table which to a certain extent can be understood as being equal to bargaining power. In particular to have a big influence

TABLE 4. Mother's characteristics

relationship to household head	Freq.	Percent	Cum.		
head	303	7.18	7.18		
wife	3,302	78.23	85.41		
daughter	415	9.83	95.24		
daughter-in-law	100	2.37	97.61		
grand-daughter	28	0.66	98.27		
mother	1	0.02	98.29		
sister	27	0.64	98.93		
other relative	32	0.76	99.69		
adopted/foster child	9	0.21	99.91		
not related	4	0.09	100.00		
Total	4,221	100.00			

  

Variable	Obs	Mean	Std. Dev.	Min	Max
age	3918	28.56534	6.92608	15	49
age_part	3506	34.45237	8.830768	16	80
educ_yrs	3918	4.699847	3.797767	0	17
educ_yrs_p~t	3649	5.387503	4.203502	0	17
age_marr	3735	18.31539	3.831566	10	41

over decisions regarding one's own health care, on making large household purchases and on visits to family and friends are likely to indicate a higher bargaining power. On the contrary, to have the final say on making purchases for the daily needs of the household and on what food to be cooked every day, can also be interpreted as living in a household with traditional gender roles where the woman is responsible for caring-activities. I have also included a variable indicating the need for family planning variable which categorizes women according to whether they have an unmet need or not to space or to limit their future births. In Table we see that more than one fourth of the women would have preferred to have fewer children or to have longer time interval between births.

TABLE 5. Mother's economic status

work	type of earnings for work				Total
	not paid	cash only	cash and	in kind o	
Agric_self	203	93	919	911	2,126
Other job	18	934	25	7	984
Total	221	1,027	944	918	3,110

  

type of land where resp. works	region						Total	Percent
	Antananar	Fianarant	Toamasina	Mahajanga	Toliary	Antsirana		
own land	335	339	272	169	229	74	1,418	67.14
family land	103	37	105	72	95	94	506	23.96
someone else's land	19	4	23	16	16	4	82	3.88
rented land	31	16	9	14	32	4	106	5.02
Total	488	396	409	271	372	176	2,112	100.00

  

portion of household expenditures   respondents earnings	who decides how to spend money					Total
	pay	respondent	respondent	respondent	husband/p someone e	
none, income is saved	8	5	0	0	2	15
almost none	35	33	1	9	1	79
less than half	107	129	5	37	4	282
about half	148	194	2	29	5	378
more than half	103	209	2	25	4	343
all	333	459	13	50	14	869
Total	734	1,029	23	150	30	1,966



TABLE 6. Decision-making

final say on own health care	Freq.	Percent	Cum.
respondent alone	1,045	26.67	26.67
respondent and husband/partner	2,087	53.27	79.94
respondent and other person	77	1.97	81.90
husband/partner alone	469	11.97	93.87
someone else	235	6.00	99.87
decision not made/not applicable	5	0.13	100.00
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Total	3,918	100.00	
final say on making large			
household purchases	Freq.	Percent	Cum.
-----			
respondent alone	548	13.99	13.99
respondent and husband/partner	2,406	61.41	75.40
respondent and other person	88	2.25	77.64
husband/partner alone	592	15.11	92.75
someone else	280	7.15	99.90
decision not made/not applicable	4	0.10	100.00
-----			
Total	3,918	100.00	
final say on visits to family or			
relatives	Freq.	Percent	Cum.
-----			
respondent alone	460	11.74	11.74
respondent and husband/partner	2,669	68.14	79.88
respondent and other person	134	3.42	83.30
husband/partner alone	371	9.47	92.78
someone else	240	6.13	98.90
decision not made/not applicable	43	1.10	100.00
-----			
Total	3,917	100.00	
final say on making household			
purchases for daily needs	Freq.	Percent	Cum.
-----			
respondent alone	2,216	56.57	56.57
respondent and husband/partner	1,157	29.54	86.11
respondent and other person	81	2.07	88.18
husband/partner alone	202	5.16	93.34
someone else	258	6.59	99.92
decision not made/not applicable	3	0.08	100.00
-----			
Total	3,917	100.00	
final say on food to be cooked			
each day	Freq.	Percent	Cum.
-----			
respondent alone	2,894	73.92	73.92
respondent and husband/partner	558	14.25	88.17
respondent and other person	105	2.68	90.86
husband/partner alone	136	3.47	94.33
someone else	219	5.59	99.92
decision not made/not applicable	3	0.08	100.00
-----			
Total	3,915	100.00	
unmet need	Freq.	Percent	Cum.
-----			
unmet need to space	541	13.89	13.89
unmet need to limit	526	13.50	27.39
using to space	714	18.33	45.73
using to limit	581	14.92	60.64
desire birth < 2 yrs	1,214	31.17	91.81
no sex, want to wait	269	6.91	98.72
infecund, menopausal	50	1.28	100.00
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Total	3,895	100.00	

## 4. EMPIRICAL APPROACH

To answer the question of what the links are between the mother's bargaining power and the nutritional status of her child I make use of econometric estimations. I apply the non-cooperative bargaining model presented in Section 2, and it is thus assumed that the intra-household bargaining process takes place between two individuals, the respondent and her partner. The results for Madagascar from the cross-country study on the importance of women's status for child nutrition in developing countries [Smith et al., 2003] are based on data from 1997. That dataset did not include any direct variables for decision making power, like the "final say"-indicators in the dataset used in this study. It will therefore be interesting to study the same indicators and then compare the decision making index in constructed Smith et al. [2003] with the new "final say"-indicators.

The econometric model is still work in progress. The final model is intended to include an index for bargaining power as well as control variables for child characteristics and extra-household environmental parameters. The challenge is to isolate the effect of the mother's bargaining power on the child nutritional status, since her other characteristics are also likely to affect the child's nutrition. For instance, there is unambiguous evidence that children of better educated mothers have better nutritional status, and that better education is positive for bargaining power. In other words, there are problems of endogeneity that we have to deal with. Another dimension of endogeneity is that the bargaining power, or empowerment, of the woman may have resulted in that she can work outside the home, get paid in cash when working, have been able to get more education, choose to marry at a higher age etc. See Doss [2006] for a critical discussion on the problems of using income as a measure of bargaining power.

In order to establish the less problematic connections, on the one hand regarding the respondent's bargaining power, and on the other hand regarding child nutrition, I start by running some simple regressions. Firstly, a simple econometric model of bargaining power can be described as

$$\text{Bargainingpower} = \alpha + \beta_m X + \beta_p P + \beta_h H + \beta_e E + \varepsilon$$

where *Bargainingpower* is the outcome variable, which could be either a single indicator, for instance whether the woman has the final say in decisions regarding her own health, or a weighted average or index of different such indicators.  $\beta_m$  is a vector of coefficients for the mothers characteristics in vector  $X$ . The mother's characteristics include her occupation, type of earnings, land ownership, her age and age squared, age at marriage, educational attainment and religion. Next, we have the coefficient,  $\beta_p$ , for the partner's characteristics,  $P$  and the differences in age and education between the man and woman. The household characteristics in the vector  $H$ , with coefficients  $\beta_h$ , included in this model are wealth index and the woman's relation to the household head. Further,  $\beta_e$  is a vector of the coefficients for external factors  $E$ : in what region the household is situated and whether it is a rural or urban area.

Secondly, an econometric model of the child nutritional status can be expressed as

$$\text{Underweight} = \alpha + \beta_{ch} C + \beta_m X + \beta_{BP} BP + \beta_h H + \beta_e E + \varepsilon$$

where *Underweight* is a dummy variable indicating whether the child's weight to age ratio is more than two standard deviations below the reference median.  $\beta_{ch}$  are

the coefficients for the child's characteristics,  $C$ . These characteristics include the child's age, sex and number in birth order. Since the focus of this study is whether the empowerment of the mother is important for the child's nutritional status, I only control for a few basic characteristics of the child. The household characteristics in the vector  $H$ , with coefficients  $\beta_h$ , included in this model are wealth index, number of children under age five and number of household members. Similar to the model for bargaining power  $\beta_e$  is a vector of the coefficients for external factors  $E$ , which indicate in what region the household is situated and whether it is a rural or urban area. Finally,  $\beta_{BP}$  is the coefficient for  $BP$  which is an indicator for the woman's bargaining power. There are several possibilities on how to construct this indicator, as discussed in relation to the explicit formulation of *Bargainingpower* variable above.

## 5. RESULTS

In this section I present the results from the estimations of the preliminary versions of the econometric models described in the previous section. I run simple OLS and logit-regressions, and since both types of models give the same significant results I will only present the results from the OLS-regressions.

In Table the results for the regression with final-say in health care as the outcome variable are presented. As we saw in the descriptive statistics, the variable so the value increases with decreasing influence over the decision, which is interpreted as lower bargaining power. The results indicate that the bargaining power increases with age (at a decreasing rate as shown by the significance of the squared age). Grand-daughters, sisters and adopted children (very few observations though) of the household head have stronger bargaining power than if the respondent is married to the household head, which is the reference category. Moreover, when the man is older than the woman this decreases the bargaining power of the woman. The variable  $share_{exp}$  is statistically significant and negative, which implies that if her income pay a larger share of the household's expenditure she is more likely to have the final say in her own health care. Moreover, the decision making power of women in Toliary region is significantly lower than in all the other regions (the reference category is the capital region Antananarivo). The negative statistically significant coefficient for the wealth index implies that when the respondent lives in a wealthier household her decision making power is on average higher. Since these are very preliminary results, I choose not to address the magnitude of the effects, but will only state whether the results are statistically significant. In Table the results for the regression with the outcome variable "who decides how to spend money". This variable is constructed the same way as the final-say variable, hence, it takes a lower value the more influence the respondent has over how money is spent. For most of the variables, the same results as in the previous regression emerge. However, there is a difference in the significance of the regions. Moreover, the educational level of the woman is negatively significant, as opposed to when the decision regards health care. Also, the difference in age between the man and the woman is no longer statistically significant.

TABLE 7. Decision-making health

Linear regression						Number of obs =	1752
						F( 18, 1729) =	.
						Prob > F =	.
						R-squared =	0.1301
						Root MSE =	.86437

  

dec_health	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age	-.062433	.0248626	-2.51	0.012	-.1111968	-.0136691
age2	.0009992	.0003899	2.56	0.010	.0002344	.001764
age_marr	.003935	.0057257	0.69	0.492	-.007295	.015165
daughter	.098324	.180455	0.54	0.586	-.255609	.452257
daughter-in-l	.3165591	.1731963	1.83	0.068	-.0231372	.6562554
grand-daughte	-.7628082	.1123053	-6.79	0.000	-.9830768	-.5425395
sister	-1.35057	.098458	-13.72	0.000	-1.54368	-1.157461
other related	.4936118	.5689828	0.87	0.386	-.6223552	1.609579
adopted	-1.15827	.0728856	-15.89	0.000	-1.301223	-1.015317
not related	-.1298644	.0728756	-1.78	0.075	-.2727979	.0130692
educ_yrs	.0020944	.008034	0.26	0.794	-.013663	.0178519
educdiff	.0041548	.0079436	0.52	0.601	-.0114252	.0197349
agediff	.0095695	.003646	2.62	0.009	.0024184	.0167206
Fiantarantsoa	-.083867	.0698426	-1.20	0.230	-.2208519	.053118
Toamasina	-.1700354	.0539666	-3.15	0.002	-.275882	-.0641887
Mahajanga	-.3004747	.0666254	-4.51	0.000	-.4311495	-.1698
Toliary	.4838974	.0925555	5.23	0.000	.302365	.6654299
Antsiranana	-.2762163	.1075457	-2.57	0.010	-.4871498	-.0652829
share_exp	-.0953017	.0188881	-5.05	0.000	-.1323476	-.0582558
rural	-.02698	.0536602	-0.50	0.615	-.1322257	.0782658
religion	-.0357011	.0193822	-1.84	0.066	-.073716	.0023139
wealth	-.0805952	.0229284	-3.52	0.000	-.1255655	-.035625
_cons	3.551271	.4117164	8.63	0.000	2.743757	4.358786

TABLE 8. Decision-making money

Linear regression						Number of obs =	1750
						F( 18, 1727) =	.
						Prob > F =	.
						R-squared =	0.0735
						Root MSE =	.79936

  

decision	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age	-.0477251	.0241369	-1.98	0.048	-.0950658	-.0003845
age2	.0006995	.0003754	1.86	0.063	-.0000369	.0014359
age_marr	.0031849	.0059467	0.54	0.592	-.0084787	.0148484
daughter	.0345031	.1610793	0.21	0.830	-.281428	.3504341
daughter-in-l	.0766987	.1252169	0.61	0.540	-.168894	.3222914
grand-daughte	-.618291	.1088538	-5.68	0.000	-.83179	-.4047919
sister	-1.240405	.0983325	-12.61	0.000	-1.433268	-1.047541
other relat.	.006765	.5422252	0.01	0.990	-1.056722	1.070252
adopted	-.7512634	.0659084	-11.40	0.000	-.8805321	-.6219946
not related	.1241562	.0666284	1.86	0.063	-.0065246	.2548371
educ_yrs	-.0215303	.0075979	-2.83	0.005	-.0364325	-.0066282
educdiff	.0042175	.0074141	0.57	0.570	-.010324	.018759
agediff	-.0039639	.0034573	-1.15	0.252	-.0107447	.002817
Fiantarantsoa	.0197441	.0634204	0.31	0.756	-.1046448	.144133
Toamasina	-.1069113	.0558739	-1.91	0.056	-.2164989	.0026763
Mahajanga	-.0102765	.0586822	-0.18	0.861	-.1253722	.1048191
Toliary	-.0989408	.0754826	-1.31	0.190	-.2469877	.0491061
Antsiranana	.2992551	.1081202	2.77	0.006	.0871948	.5113155
share_exp	-.0370683	.0170393	-2.18	0.030	-.0704881	-.0036485
rural	.0482363	.0490994	0.98	0.326	-.0480642	.1445369
religion	-.0260305	.0183572	-1.42	0.156	-.0620352	.0099742
wealth	-.0712886	.02086	-3.42	0.001	-.1122022	-.030375
_cons	3.122994	.3879083	8.05	0.000	2.362174	3.883813

The results for the regression on child nutrition are presented in Table . The negative coefficient for the child's age is an expected result, (see for instance Bhargava [2008]), children are more likely to be underweight when they are older. Moreover, we confirm the result discussed earlier, that the risk of the child being underweight decreases with the mother's increasing educational level. It is not possible to say anything about the underlying mechanism though. Moreover, the variable for fertility preferences is statistically significant, and indicates that when the mother have an unmet need for limiting or spacing births, the risk of her child being underweight is higher. Also, the wealth index of the household has a statistically significant positive effect on the nutritional status of the child. In this specification of the model the type of water access is not included, since it is one of the factors in the wealth index. The reference category, the capital region of Antananarivo, is significantly different from the other regions, the risk of the child being underweight is significantly higher than in all the other regions. The land variable is only significant at the 10 percent level, but the tendency confirms the hypothesis that the more control the mother has over the land, the less is the risk of her child being underweight.

TABLE 9. Child nutrition

Linear regression		Number of obs = 2108				
		F( 14, 2093) = 6.73				
		Prob > F = 0.0000				
		R-squared = 0.0394				
		Root MSE = .48948				
underweight	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age_ch	.0387101	.0073884	5.24	0.000	.0242208	.0531995
girl	-.0219001	.0214633	-1.02	0.308	-.0639918	.0201915
bord	.0012347	.004091	0.30	0.763	-.0067882	.0092576
num_children	.003012	.0128758	0.23	0.815	-.0222386	.0282627
fertilitypref	-.0103546	.0042751	-2.42	0.016	-.0187385	-.0019707
educ_yrs	-.0141912	.0044988	-3.15	0.002	-.0230139	-.0053686
land	.0259271	.0143839	1.80	0.072	-.0022812	.0541354
wealth	-.0251819	.0118016	-2.13	0.033	-.048326	-.0020377
rural	-.0200694	.0242783	-0.83	0.409	-.0676815	.0275426
Fiantarantsoa	-.0979973	.0361333	-2.71	0.007	-.1688583	-.0271363
Toamasina	-.0710913	.0342602	-2.08	0.038	-.1382789	-.0039037
Mahajanga	-.1001876	.0399099	-2.51	0.012	-.1784549	-.0219204
Toliary	-.1832842	.0376307	-4.87	0.000	-.2570817	-.1094866
Antsiranana	-.2301272	.0427048	-5.39	0.000	-.3138756	-.1463789
_cons	.618878	.0617778	10.02	0.000	.4977257	.7400303

When including other indicators for bargaining power, such as having the final say in decisions concerning one's own health care, I do not get any results that are robust enough to present at this stage. However, as previously mentioned, this is work in progress, and there are some interesting findings that will be investigated further.

## 6. DISCUSSION AND CONCLUSIONS

In this paper the relationship between mother's intra-household bargaining power and child nutrition is investigated, using econometric analysis. The data used are

detailed household data collected in Madagascar in 2003-2004. Preliminary results indicate that children in wealthier households, where the mothers have a relatively high level of education, and are able to control their fertility, are less likely to be underweight. However, the variable for fertility preference, is one example of a variable that may be endogenous. That is the number of children is often associated with the educational level of the mother and the wealth of the family. The issue of endogeneity is highly relevant in the understanding of the relationship between mother's intra-household bargaining power and child nutrition.

The econometric models presented in this paper will be further developed to be able to deal with this problem. It is nonetheless possible to conclude that the mother's level of education has a positive effect on child nutritional status and on her relative bargaining position within the household. Moreover, the results in the econometric estimations indicate that there are differences between the regions of Madagascar, both with regards to bargaining power and child underweight. These results will be explored further in the pursuit of this research project, when more qualitative analysis will be undertaken in an attempt to explain causal links.

In terms of policy-implications preliminary results point to the importance of women's educational attainment, which might in turn strengthen women's intra-household bargaining power. This is a general policy conclusion in the literature on intra-household bargaining and child nutritional status. I do however miss a discussion on the role of men in caring activities. Increasing men's responsibility for child care might also have beneficial effects for child nutrition and health status. If mothers' land rights are shown to have a significant effect on children's nutritional status, this has important implications for the on-going implementation process of the land reform in Madagascar.

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