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"United We Stand Divided We Fall"

Maternal Social Participation and Children's Nutritional Status in Peru

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Abstract

In previous literature, social capital has been hypothesized as a substitute for other forms of capital, such as physical and human capital. This paper contributes to this literature, studying the association between mothers' access to social capital via participation in community organizations and their children's nutritional status at 1 and 5 years. Using the Peruvian sample of the *Young Lives* project, this study suggests that, where human capital is scarce, social capital might have important implications for child development. Maternal social capital is positively associated with height at 1 year old for those children whose mothers have no formal education. No significant association is found at 5 years of age.

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"United We Stand Divided We Fall" Maternal Social Participation and Children's Nutritional Status in Peru[1]

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1. Introduction

A growing part of development economics literature supports the idea that differences in health outcomes, cannot be explained entirely by differences in human and physical capital (Macinko and Starfield, 2001; Almedom 2005) and argues that the absence of social capital is one of the major impediments to economic development (Subramanian et al., 2002; Putnam et al., 1993; Woolcock, 1998; Dasgupta and Serageldin, 2000; Grootaert and van Bastelear, 2002). This paper contributes to this literature, by studying the association between mothers' access to social capital via participation in community activities and their children nutritional status at 1 and 5 years.

In previous studies, social capital has been hypothesized as a substitute for other forms of capital, such as physical and human capital (Kunitz, 2004). The hypothesis is that maternal social participation exacerbates a lack of human and physical resources. I suggest that social participation is particularly effective in improving child nutritional status when the mother's human capital (measured by her education) and physical capital (measured by family economic resources and assets) are limited. In developing countries or within poor communities social capital might act as a protective factor. In the absence or shortage of public good provision, community organizations may mobilize members to provide missing public goods and facilitate the access to services and information (Durlauf and Fafchamps, 2004; Campbell et al., 1999).

For the empirical analysis, I use the Peruvian sample of the *Young Lives project* (YL), which is a longitudinal dataset following children at two points in time, at age 1 and 5, and gathering information on child nutritional status and maternal social capital. Notably, Peru is an interesting context to study the association between social capital and child health, given the high rate of both child malnutrition and social participation.

In order to test if social capital is substitutable or complementary to human and physical capital, I allow for heterogeneous effects of maternal social capital on child nutritional status for different levels of maternal education and household wealth status. I find evidence of the substitutability between social and human capital. Maternal social capital is positively associated with 1 year old children's height-for-age for those children whose mothers have no education.

Consistent with Cunha and Heckman's (2007) criticism of the assumption of perfect substitutability between investments made at different ages, I find that early investments are more effective during the first year of life than in later childhood. Indeed, I do not find evidence for an association between maternal social participation and nutritional status at 5 years of age.

This paper contributes to the debate from an empirical perspective, addressing three gaps in the literature on social capital and health. First, most of the literature focuses on adult health and uses mainly data from developed countries (for reviews, see Macinko and Starfield, 2001; Almedom, 2005).

Second, several empirical analyses ignore the potential reverse causality issue arising when looking at maternal social capital and child health. Plausibly, poor child health might prevent mothers from participating actively in community life or conversely, might encourage mothers to participate in order to have access to health services and advices. On the other hand, maternal

social capital might affect child nutritional status, as hypothesized here. In this paper, the reverse causality issue is overcome using longitudinal data which help in disentangling the temporal order. Specifically, maternal participation is measured before child's nutritional indicators.

Third, the decision to participate might be endogenous given that becoming a member of any organization is a voluntary decision. More generally, a mother's unobservable characteristics might drive both the decision to participate and the child nutritional status. I test for potential unobserved heterogeneity using fixed effects at community level.

In the present analysis, social participation is shown to be an effective instrument against children's undernourishment in the first year of life for those children born to uneducated mothers. However, less clear, are the mechanisms beyond the potential positive effect of maternal social participation. I explore the hypothesis that social participation facilitates access to additional resources by increasing the likelihood of receiving support. Even if receiving support has been found to be positively associated with nutritional status at 1 year, it is not a channel through which maternal participation affects child nutritional status. Unfortunately, due to data limitations, it is not possible to test the other two main pathways suggested in the social capital literature, i.e. the "information pathway" and the "empowerment pathway". The first one is the provision to mothers of essential information about child care and health which they did not acquire by formal education (Durlauf and Fafchamps, 2004). The second pathway suggests that social participation might increase maternal aspirations and their ability to plan the future by learning from the positive experiences of others (Macours and Vakis, 2008).

2. Social Capital in the Literature

In previous studies social capital has been defined in different ways. The more exhaustive definition of social capital includes two main components: *structural social capital* and *cognitive social capital* (Putnam et al., 1993). Structural social capital reflects the connectedness of individuals within a given community (*bonding social capital*) in the form of active participation. Cognitive social capital reflects the feeling of a sense of community in the form of trust, social cohesion, norms and perceptions of reciprocity. The relationship between social and cognitive capital is particularly complex because it is not clear how they affect each other.[3]

In the empirical literature social capital has mostly been measured using the two components separately. Looking at health outcomes, several empirical studies find a positive association between structural social capital and physical health (Harpham, 2003; Yamamura, 2011; Rose, 2000; Poortinga, 2006; Giordano and Lindstrom, 2010), and between cognitive social capital and mental health (Veenstra 2005; Lindstrom et al. 2001; De Silva and Harpham, 2007).

In this paper I consider maternal structural social capital and measure it by looking at their voluntary participation in one or more community organisations. However, I also take into account the cognitive dimension as a determinant of social participation. I am expecting that, if the mother

[3] For example it might be that social participation affects trust (Putnam, 2001; Coleman, 1990) but also the reverse relation is plausible (Brehm and Rhan, 1997).

feels as part of the community and feels that people can be trusted, she will be more likely to engage in community life.

2.1 Measures of child nutritional status

Sadly, it is recognized that children living in deprived areas or in poor households with low levels of physical and human capital are exposed to a higher risk of under nutrition, malnutrition, higher mortality and morbidity. A common empirical finding from studies of both high and low-income households is that a mother's education is the more critical determinant of a child's health. Maternal education is expected to improve child nutrition by altering individual and household preferences and resource allocation, increasing a mother's empowerment and also improving child care practices (Thomas et al., 1991; Cleland, 1990).[4]

Social capital can be conceptualized as one of three assets over the life cycle together with human and physical capital. Just as any other form of capital, social capital facilitates productive activities (Coleman, 1988). Where physical and human capital are lacking, social capital might act as a buffer against social-economic disadvantage, mitigating the effects of a lack of resources (Campbell et al., 1999). The potentiality of social capital is stronger in the context of extreme deprivation (Kunitz, 2004).

According to Durlauf and Fafchamps (2004), the pathways through which social capital might affect child health can be grouped in three main categories: information sharing, group identity and explicit coordination. These pathways refer to the benefits produced by both individual and community social capital. First, maternal participation in community life raises her chance of obtaining health related information. Similarly, living in a community with close social relations reduces the cost of health information. Second, beyond increasing information sharing, maternal participation contributes to increasing the cohesion within society. Cohesive societies have a higher incentive to avoid environment-damaging behaviors, to enforce health-friendly social norms and ensure reciprocity. Third, in terms of explicit coordination, social participation facilitates cooperation and create some kind of informal institutions which provide support and care services daily or in case of negative shocks.[5]

As De Silva and Harpham (2007) effectively sum up, maternal participation in social networks, enables mothers: "to know more, to think differently and to do things differently". Maternal social participation might provide uneducated mothers with information they have not obtained through schooling, the *information pathway*. More knowledge and better information might in turn affects mothers' parenting behavior or preferences in terms of human capital investment such as better nutrition or hygienic condition (De Silva and Harpham 2007; Anderson et al. 2004).

Furthermore, being a member of a community organization might ease the access to services and

[4] Empowerment is defined as "the process of enhancing an individual's or group's capacity to make effective choices, that is, to make choices and then to transform those choices into desired actions and outcomes"(Alsop et al., 2006, p.10).

[5] A small part of the literature hypothesized negative consequences of social capital which include exclusion of outsiders, restrictions on individual freedoms, and heavy burdens on those actively participating when reciprocity is required by other members (Portes, 2000).

assets either because membership give them access to additional resources or because being a member increases the maternal social network enhancing the likelihood of getting external support from other community members, the *support pathway*.[6]

Finally, social dynamics might play an important role in changing and shape mothers' aspirations. As discussed by Appadurai (2004) and Ray (2006), poverty is often strongly associated with low aspirations. Escaping poverty might not be considered a feasible option because of their own experiences and the experiences of those that are close to them. An active participation to community organizations and their initiatives might constitute a unique opportunity to learn about the positive experiences of other members. Social interactions might make mothers feel like they are able to control their own lifes and plan their own future and the future of their children, the *empowerment pathway* (Macours and Vakis, 2008).

Past studies generally fail to estimate a causal relationship between social capital and health and provide descriptive evidence on this relationship. A considerable number of studies point to an association between individual social capital and various aspects of own physical and psychological health (Hyyppa and Maki, 2001; Lindstrom, 2004; Mohseni and Lindstrom, 2007; Pevalin and Rose, 2003; Rose, 2000; Kawachi et al., 1997; Veenstra, 2000; Lindstrom et al., 2001; Hurtado et al., 2011). But just few of them look at maternal social capital and the child health.

Nobles and Frankenberg (2009) using data from Indonesia find a positive association between maternal participation and child health only for children from relatively disadvantaged backgrounds. Carter and Maluccio (2003) explore the role of household social capital as a protective factor against idiosyncratic economic shocks in South Africa. Those households with stronger ties in the community are more likely to be able to cope with economic/financial losses and this reflects on children nutritional status. Kanaiaupuni et al. (2005) look at mothers' social networks in Northern Mexico and find that social interactions help sustain healthier children especially among economically marginalized families.

Some previous work has been done using YL to study the association between maternal social capital and child health. Moestue et al. (2007) and Galab and Lives (2006), using the Andhra Pradesh sample find a positive association between a child height-for-age z-score and the size, and the literacy rate of the maternal network. Harpham et al. (2006), explore the association between maternal social capital and child physical and mental health in Vietnam. Consistent with the findings of the present analysis, they find stronger relations between maternal social capital and the health of 1 year old children than 8 year old children.

None of these papers using YL exploits the longitudinal setting of the data to study the causal effect of maternal participation. Furthermore, there are no papers on individual social capital and child health using the Peruvian sample. To the best of my knowledge, the only paper related to individual social capital in Peru (Cueto et al., 2005) analyzes the association between cognitive and structural capital measured at the community level and children's educational progress and achievement. The only positive association they find is between cognitive social capital and children's educational progress. They find that cohesive communities which experience more trust

[6] However, the opposite might also occur: those who have a wider network might also be more likely to be involved in any community organization.

in their social relationships are more likely to have children who are in the correct school grade for their age.

3. The Peruvian Context

According to the last National Households Survey (2010), Peru is a country where 35 percent of the population is poor and 10 percent is extremely poor.[7] There are important geographical disparities across regions and between urban and rural areas. In 2010, about 54 percent of rural population were living in poverty against 19 percent of urban population. Similarly looking at the three climatic zones, in the Amazonian jungle (*selva*) the poverty rate was 37 percent, and in the highlands (*sierra*) 49 percent of the population were poor and 20 percent were extremely poor. The poverty rate was 18 percent in the Pacific Coast (*costa*), which is the richest part of the country, where just 2 percent of the population were extremely poor. Poverty is highly correlated with a low level of education. In 2010, more than 55 percent of the poor population had no education or just primary education.

As expected, poverty particularly affects the most vulnerable segments of population and in particular children. In the period 2000-2009 about 8 percent of newborns had a low birth weight and 30 percent of Peruvian children under 5 years old were stunted (WHO, 2010) with strong disparities between rural (44 percent) and urban areas (16 percent) (INEI, 2008).[8]

The Peruvian context is particularly interesting to study social capital. The country has a long-standing tradition of social participation. The bloody wave of terrorism by the armed group called "Shining Path" (*Sendero Luminoso*), which shook up the country in the 1980s, boosted the rise of spontaneous organizations at the community level, especially but not exclusively, in rural areas where terrorism was stronger (Wiig, 2005). In this period which lasted over 10 years, the "Committees of Self Defence" (or *rondas*) was created to defend communities from the threat of terrorism. When the terrorism ended, it left behind an infrastructure of community organizations and a strong sense of community together with the instinctive response to draw together in times of crisis. Subsequently, diverse social grass-roots organisations start emerging to fight poverty or tackle other issues. Most of those organizations were and still are run by women. In the sample used for the present analysis, the average age of the mothers is about 27 years old. At the peak of terrorism they were around 10 years old, and their mothers cooperated during the war, and after they had to organize the reconstruction and reconciliation within the communities. Their mothers were involved in the first community organizations after the terrorism and they were able to pass onto them the value of solidarity and cooperation within the community.

During the years of terrorism and the subsequent economic crisis many health centers were closed

[7] In 2010 the poverty line is estimated to be about 264 Nuevos soles (about 98 US dollars) per month per capita and extreme poverty is considered under 149 Nuevos Soles (about 55 US dollars) per month per capita. For more details about the definition of poverty and extreme poverty, see the website of the Peruvian National Institute of Statistics (INEI), http://www.inei.gob.pe/

[8] According with the World Health Organization (WHO), a child has a low birth weight if the birth weight is lower than 2.5 kg. A child is stunted if it has a weight-for-age or a height-for-age less than -2 standard deviations of the WHO Child Growth Standards median) among children aged 0-5 years (http://www.who.int).

and those remaining were only able to offer poor quality services. After the end of the terrorism government made efforts to involve the community in the realization of different development objectives. The main objective was to improve the quality and the coverage of basic health services. The creation of community-managed and publicly-financed health committees (*CLAS*) are an example of the effort to experiment with new ways of providing services involving the community in all phases of planning, administration, management, and supervision of public resources. Government's initiatives were complementary to those initiatives promoted by spontaneous community organization and were based on the high level of social participation in Peru.

4. Data and Variables

The YL project collects longitudinal data in four developing countries (Peru, Ethiopia, India and Vietnam) and for two cohorts of children.[9] The survey includes two waves: the first phase of data collection took place in 2002, when the youngest cohort of children were aged 6-18 months and the oldest 7-8 years. The second wave was collected between the end of 2006 and the beginning of 2007, when children were aged 4-5 and 11-12 years, respectively. The attrition rate between waves is quite low (3.1 percent of the children in the youngest cohort). In the present analysis, I use the youngest cohorts which from here onward will be referred to as "1 year old cohort" at wave 1 who turns to be 5 years old at wave 2.

The YL sample for Peru gathers information for approximately 2,000 households with an over-sampling of poor areas; therefore these data are not nationally representative. The sample is spread over 20 areas (clusters) in different geographical regions.[10] Each cluster has to include 100 1-year-old children and thus it might be spread over several districts, towns and villages and might include both rural and urban areas. For this reason, within each cluster one or more communities can be identified. In total the YL includes people living in 82 communities.

The YL survey contains information about the socio-economic status and the composition of the household, the mother's characteristics and social capital, the child health and nutritional status among the others. Most sections of the questionnaire, included the social capital section, have been administered to primary caregivers. The primary caregiver is defined as "the person in the household who can best answer questions about the [sampled] child. This will usually be the mother except where the child has been adopted/fostered or is being bought up by other family members".[11] For the purposes of this study, the sample is restricted to primary caregivers who are biological mothers. These represent more than 95 percent of total cases.

4.1 Measures of alnutrition

Anthropometric measures are often used to determine the extent of malnourishment among

[9] For India, the sample is limited to the state of Andhra Pradesh.
[10] These includes 3 clusters in the department of Lima, and 17 in Amazonas, Ancash, Apurimac, Arequipa, Ayacucho, Cajamarca, Huánuco, Junín, La Libertad, Piura, Puno, San Martín and Tumbes.
[11] Young Lives, *Fieldworker Instruction Handbook*, pag. 17

children. The indicators most frequently used are height-for-age, weight-for-age and weight-for-height. These indicators are standardized according with age and gender specific child growth standards provided by WHO and are universally comparable.[12]

An insufficient height-for-age (or being stunted) or an insufficient weight-for-height (or being wasted) indicate acute malnutrition. Conversely, weight-for-age is a measure of underweight. In this study, I use height-for-age as an indicator of a child nutritional status standardized by age and sex according to WHO growth standards (henceforth HAZ). The reason is that HAZ is a better indicator of long term health. Indeed, it is an indicator of cumulative deficient growth and it is proved to be associated with diet, hygiene, infection and feeding practices. Conversely, weight-for-age is likely to be severely affected by temporary shocks due to morbidity and illnesses.

I study HAZ during early childhood. Focusing on early malnutrition is important because empirical evidence suggests that nutritional status during early childhood is a major predictor of health conditions and economic outcomes in further stages of life (Case et al., 2005; Gertler and Boyce, 2001). This is the reason why early policy interventions during childhood have been found to be particularly cost effective, with higher rates of return than later interventions (Heckman, 1995 and 2000).

4.2 The risk factors of child malnutrition

Empirical evidence suggests that child malnutrition is caused by a lack of physical and human resources. There is a growing literature supporting the idea that social capital can act as a protective factor against socio-economic disadvantages. In this section I discuss the main risk factors associated with child malnutrition and define how they are measured in this study.[13] Table A1 in the Appendix shows descriptive statistics of the variables used in the empirical analysis.

Maternal social capital

The YL survey contains a module to measure multiple aspects of maternal social capital. It is based on the *Short Adapted Social Capital Assessment Tool* (SASCAT) which is a shortened version of the *Adapted Social Capital Assessment Tool* (A-SCAT) by Harpham et al. (2002) developed specifically to measure social capital in low-income countries. The SASCAT tool measures both the individual structural social capital and cognitive social capital.

In the present analysis, the mother's social participation is used to measure structural social capital. It is defined as a dummy equal to 1 if the mother in the previous 12 months was a member of at least one of the following community organizations: work-related groups or trade unions, religious groups, community associations, cooperatives for saving or housing/credit/funeral

[12] See WHO Child Growth Standards report (www.who.int/childgrowth/en) for a detailed description on the methods used to construct the standards for height-for-age, weight-for-age and weight-for-height.

[13] Notably, the term "risk factors" is adopted from epidemiologic literature and describe only associations and not causal relations. The "risk factors" analysis substantially differs from "analysis of determinants" which in turn investigates causal relationships.

groups, women's groups, communal kitchens or mothers' clubs, sports groups, peasants organizations, groups for irrigation, security committees or political parties/groups. Maternal participation is measured at both wave 1 and wave 2. Given that children are on average 1 and 5 years old, respectively, maternal participation occurs before the child was born or during the first months of life and when the child is about 4 years old.

In both cases I define the maternal social capital as a dummy instead of using a continuous measure of the number of memberships in different organizations.[14] The main reason is that the continuous variable has been derived from summing up the different kinds of organizations she reported being a member of. In wave 2 about 20 percent of those mothers reporting membership of at least one organization do not specify which organizations they are member of and thus the continuous variable for membership would be missing.

Beside maternal social participation (defined by maternal membership as specified above), the SASCAT tool also includes a measure of a civic participation and cognitive social capital (Harpham et al., 2002). In the present analysis both are used as factors associated with maternal membership. Maternal civic participation is measured by an ordered variable taking value 0 if the respondent in the past 12 months never joined with others in the community to address a particular issue and or have contacted the local authority about problems in the community. Otherwise, it takes value 1 or 2 if just one event or both events took place.

The cognitive social capital (CSC) is a combination of the responses to the questions on whether the caregiver feels as part of the community, whether she feels people in general can be trusted, whether she feels people generally get along with each other, and whether she thinks people would try and take advantage of her if they could. The variable is constructed by summing together the four questions and it takes a value between 0 and 4.

Physical capital

The household physical capital is measured by a wealth index developed by the World Bank and Macro International for UNICEF (2000). The wealth index is the simple average of three factors: housing quality, consumer durables and services. The housing quality component is based on the number of rooms per person in the household and the main materials used for the walls, roof and floor. The consumer durable component is based on the number of assets owned by the household (e.g. radio, refrigerator, bicycle, television, car etc), excluding productive assets. The services component is based on whether or not the dwelling has electricity, whether or not drinking water is piped into the dwelling, the type of toilet facility (private or shared with other households) and the main type of fuel used. The wealth index for each household is a score between 0 and 1.

Furthermore, I use a dummy measuring if the household has suffered at least one shock (such as natural disasters, death in the family or crop failure) which resulted in a reduction in the economic welfare of the household before the mother knew she was pregnant.

[14] To check the robustness of the empirical results to changes in the definition of social capital, I also carry out some sensitivity analyses. All the results in the empirical analysis are substantially confirmed defining membership as a continuous variable or using as cut point two instead of one membership, i.e. considering members those mothers who are members of at least two community groups.

Given that there are large rural-urban inequalities in physical, human and community capital, with rural women being poorer, less educated, and with less access to services, I distinguish between households in rural and urban areas.

Human capital

In the present analysis I use mother's education as a proxy of human capital. Maternal education is widely recognized to be a key tool to address child malnutrition in developing countries (Handa, 1999; Glewwe, 1999; Currie and Moretti, 2003; Thomas et al., 1991). Maternal education is measured as the highest level of schooling reached by the mother. It is a categorical variable distinguishing four levels of education: no formal education (or incomplete primary education), primary education (or incomplete secondary education), secondary education, and more than secondary education. In the final sample around 7.5 percent of mothers have no education, 37 percent has primary education, 38.5 percent secondary education and 17.5 percent more than secondary education.

A number of studies in developing countries show that no "threshold" level of maternal education needs to be reached before it starts having a positive impact on child health. Even low level or small increases of a mother's education, improves child survival rate, birth weight and nutritional status (Hobcraft et al., 1984). However, empirical evidence suggests that the direct marginal contribution of maternal schooling on child nutrition is declining after the completion of primary education. I allow for non linear effects entering education measure, as a set of four dummies (no formal education, primary, secondary and more than secondary education).

Paternal education is also an important determinant of child nutritional status. Nevertheless, unlike the effects of a mother's education, it is believed to affect child health mostly indirectly through its effect on household income (Mosley and Chen, 1984). I control for father's education defined in the same way as maternal education.

Genetic inherited characteristics

An important determinant of child health is the child health endowment at birth as a function of genetic inherited characteristics. Empirical evidence shows that in a deprived context, variations in a child's height can be mostly attributed to environmental factors and variations due to genetics are quite small (Martorell and Habicht, 1986). Martorell and Habicht (1986) and Duflo (2000) argue that genetic factors (ethnic group, gender and phenotype) become important in adolescence while growth retardation in the early years of life is mostly due to environmental factors.

I add a variable for child birth weight and maternal height. Birth weight captures the detrimental effect of potential poor health conditions of the mother during pregnancy and more generally the initial health condition of the child, which is known to strongly affect future physical development (Conley et al., 2003). Maternal height captures many aspects of the mother's background, unobserved family background and to some extent, genetic predisposition. As I argue for child height, maternal height reflects accumulated investments in health and inputs she was exposed to during her lifetime (Duflo, 2000).

Other confounding factors

The degree to which the mother is integrated into the community may affect both her access to community organizations and to health services and resources. For this reason, I control for how long the mother has been resident in the same community using two dummies. The first one is equal to one if either the mother has migrated during the last 5 years or she is living in the same community where the child's grandmother was born, and it is equal to zero otherwise. The second is a dummy equal to one if the mother speaks the most common language used in the community and equal to zero otherwise.

To control for other determinants of children's nutritional outcomes, I add a variable for the length of breastfeeding[15] and a set of variables for household composition (the household size, the number of household members younger than 5 and 14 years old and whether the mother is the only parent living in the household).

Additionally, I control for maternal depression. YL administer a self-report module of twenty questions about caregivers' depression and anxiety. This instrument has been introduced by the WHO specifically for low income countries. Respondents are asked 20 yes/no questions relating to symptoms of depression and anxiety that they have experienced in the past 30 days. In previous literature, social participation has been considered as a confounding factor in child development via parental psychological well-being and overall family functioning. Mothers participating in voluntary community organizations are less frequently depressed, are happier and have higher self-esteem (Thoits and Hewitt, 2001). Plausibly, maternal depression can either affect the likelihood of actively participating in community life or social participation may affect depression. In the present analysis, maternal depression is measured after she becomes a member, thus it is more likely to be a product of social participation, unless it is a chronic condition.

Another potential confounding factor is mothers' labor market participation, which increases the opportunity cost of participating in community life and may also affect participation via increased income. I define a dummy equal to one if she is employed full time, i.e. if she is paid to work outside the household for 6 or 7 days per week, and zero otherwise.

Finally I control for the usual demographic characteristics, such as gender, age of the child (in months) and of both parents (in years) and the mother's ethnic group (white, mestizo or others).

[15] Because of data limitations it is not possible to distinguish between complementary and exclusive breastfeeding.

5. Maternal Social Capital and Child Malnutrition: Preliminary Evidence

5.1 Maternal social capital

Table 1 presents some descriptive statistics for maternal participation. About 21 and 19 percent of mothers report being a member of at least one organization in the year prior to the first and the second interview, respectively.[16] Furthermore, mothers participate in more groups when the child is 1 year old than when she is 5 years old (Table 1). Among members, about 21 percent of mothers are involved in multiple groups when the child is 1 and only 10 percent of them has multiple memberships when the child is 5 years old.

Table 1 Maternal Social Participation

Maternal membership of community groups (N 1,962)			
		Membership at wave 1	Membership at wave 2
Members		0.21	0.19
		(N 404)	(N 375)
Among members:			
Number of memberships	1	0.79	0.90
	2	0.17	0.09
	3 or more	0.04	0.01
Membership by association type			
Work related/trade union		0.01	0.09
Community association/co-op		0.27	0.04
Women's group/Commonal kitchen/Mothers club		0.35	0.55
Political parties or group		0.08	0.02
Religious group		0.29	0.11
Co-op for Saving/Housing/Credit/funeral group		0.01	0.01
Sports group		0.06	0.01
Other groups*		0.18	0.25

Note: Maternal membership is defined by maternal participation at one or more community organization. The "other groups" category includes peasants organizations, groups for irrigation, assistance against deliquencies etc.

[16] The analysis of transition is not reported in Table 1. 17 percent of mothers who are not a members of any group when the child is 1 year old decide to participate after the child's birth or later on and are members when the child is 5 years old. Conversely, 72 percent of mothers who are members at wave 1 do not participate in wave 2. Because of data limitations, it is not possible to know when their membership starts or ends and how long it lasts.

Community groups can be divided in two categories: those who are devoted mainly to the welfare of the community (such as community associations, neighbourhood organizations, self-defence committees) and those which more directly affect child health and household's welfare (such as communal kitchens and mothers' clubs).[17] In both waves the highest rate of maternal participation is for women's groups and religious groups which promote a variety of both community oriented and people-focused initiatives. Among those mothers who are members of at least one organization when the child is 1 year old, 35 percent are members of either a women's group, communal kitchen or mothers' club and 29 percent of a religious group. Similarly, when the child is 5 years old, the maternal participation rate for either a women's group, communal kitchen or mothers' club is around 55 percent and the rate for religious groups is 11 percent.

It is worth noting that participation is voluntary and that none of these groups is specifically geared toward improving children's health. However, poor mothers might decide to participate if they expect that the initiatives promoted by the group might give them access to more resources and services (Nobles and Frankeberg, 2009). For example one of the initiatives of the mothers' groups is the *Glass-of-milk* committees, which are composed entirely of the mothers of the community. This is a welfare programme launched with the objective of delivering milk and oats to the most vulnerable people in the community, such as children, senior citizens, and pregnant and nursing mothers. Another initiative is the *Wawa Wasi* day-care programme, which is a nursery for children under 3 years old. The mothers in the community receive training in health care and nutrition and take turns at running it.

Table A2 in the Appendix reports estimates of the mother's likelihood of being a member at wave 1 and wave 2. After controlling for all socio-demographic characteristics and for a fixed effect at community level, the likelihood of being a member is higher for mothers with higher education relative to those with no or primary education. Conversely, the likelihood of being a member is higher within poor households and the most vulnerable to economic shocks.[18]

The presence of other children and adolescents in the household is negatively associated with maternal membership which might be due to a substitution between childcare time and mother's free time for extra activities in the community. Additionally, having higher level of civic participation and cognitive social capital is positively associated with the probability of being a member. Surprisingly, maternal participation when the child is 1 year old is lower if the mother's first language matches to the main community's language.

5.2 Child nutritional status

This section presents some descriptive statistics about health condition at birth and child nutritional status at 1 and at 5 years of age. Children whose mothers are lowly educated (with either no formal education or just primary education) and those who have either secondary or

[17] Communal kitchens are run by mothers who join to prepare the meal for the community and make it available for everyone. The mothers' clubs mainly offer support to the initiatives of other community organizations, NGOs or government but they also organize activities within the community in favor of abandoned children and young mothers.

[18] Notably, at wave 1 the wealth index does not significantly affect the likelihood of being a member.

higher education are considered separately. Reasonably, maternal social capital might be differently correlated with child nutritional status depending on maternal human capital endowment measured by a mother's education. In particular, maternal membership might be more effective in improving the health condition of children whose mothers are uneducated. This is because being a member might provide them with essential information which they have not acquired by formal education, it might increase their aspirations by learning from the positive experiences of others and ease their access to resources and services. In this case social and human capitals would be substitutes. Conversely, maternal social and human capital would be complementary if the potential effect of social participation was higher for mothers with higher education, perhaps because more educated mothers are more effective in exploiting the inputs received through their participation at the community life.

In Table 2, I report the average value of some indicators of child health at birth and the *t*-test for differences in mean between children whose mothers are members or those whose mothers are not, distinguishing between low educated mothers and those who have more than primary education. Firstly, note that children of educated mothers have higher birth weight independently of maternal membership.[19] Secondly, those children whose mothers are members are bigger. It is not possible to know when mothers join an organization and if they do so immediately before or after the child is born. In the first case, maternal participation might have been improving maternal health during the pregnancy and thus her child nutritional status at birth. In this case, birth weight might already capture part of the effect of maternal social participation. A model estimating the nutritional status at 1 (or 5 years old) controlling for birth weight underestimates the "true" effect of membership on child nutrition.

Table 2 Anthropometric indicators *of child nutritional status at birth, by maternal membership and education.*

	No education or primary					**More than primary**				
	No member		**Member**			**No member**		**Member**		
	(N 694)		(N 177)		t-test	(N 852)		(N 227)		t-test
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	pvalue	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	pvalue
Birth weight (kg)	3.07	(0.020)	3.23	(0.050)	(0.003)	3.25	(0.017)	3.35	(0.036)	(0.014)
Length at birth in cm	49.3	(0.150)	48.7	(0.383)	(0.142)	49.48	(0.132)	49.7	(0.258)	(0.433)

Note: Maternal membership is measured at wave 1. Average values; standard deviation in parentheses. T-test for differences in mean.

Looking at child nutritional status at 1 year and 5 years of age (Table 3), children with better-educated mothers are always healthier than children whose mother are low educated.[20] This

[19] For members and non-members, the birth weight and the length at birth of those children whose mothers have higher education are statistically significantly higher (t-test for differences in mean between the two samples is not reported but is statistically significant at the 95% confidence level).

[20] The difference in mean value is found to be significantly different from zero at the 1% significance level for most nutritional indicators used (results not reported).

confirms that human capital is positively associated with child health.

Table 3 Anthropometric indicators *of child nutritional status at 1 and 5 years old, by maternal membership and education.*

	No education/ primary education					Higher education				
	No member (N 694)		Member (N 177)		t-test	No member (N 852)		Member (N 227)		t-test
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	pvalue	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	pvalue
At 1 year old										
HAZ	-1.3	(0.048)	-1.2	(0.107)	(0.386)	-0.37	(0.042)	-0.49	(0.081)	(0.172)
Stunted	0.29	(0.017)	0.24	(0.032)	(0.090)	0.09	(0.010)	0.08	(0.018)	(0.924)
At 5 years old										
HAZ	-2	(0.038)	-2	(0.076)	(0.426)	-1.05	(0.035)	-1.15	(0.069)	(0.192)
Stunted	0.50	(0.019)	0.47	(0.038)	(0.547)	0.17	(0.013)	0.19	(0.026)	(0.457)

Note: Maternal membership is measured at wave 1. Average values; standard deviation in parentheses. T-test for differences in mean.

Comparing members and non members within the two samples of lowly educated and higher educated mothers, being a member at wave 1 is negatively correlated with the likelihood of being stunted for those 1 year old children with lowly educated mothers. There are no differences in nutritional indicators measured at age 5 for children whose mothers were members or were not when they were 1 year old.[21] This suggests that, if there is any casual relation between membership and child health, there might be a positive effect only in the short run and among children of lowly educated mothers.[22]

6. The Empirical Framework

The present empirical analysis focuses on one dimension of child nutritional status, HAZ, which is a measure of long-term nutrition. The *contemporaneous specification* relates child HAZ score to contemporaneous inputs and maternal social capital (Todd and Wolpin, 2007).[23]

Contemporaneous specification: homogeneous effect specification

First, let's start with the simplest specification and assume that maternal social capital has, if any, a

[21] Notably, if the same comparison is repeated using maternal membership measured at wave 2, being a member is associated with a lower likelihood of being stunted at 5 years old and a higher value of HAZ for the sample of children with higher educated mothers (results not reported).

[22] This is explored later on in Section 7.2.

[23] As discussed by Todd and Wolpin (2003), the assumptions behind the contemporaneous specification are that "only contemporaneous inputs matter to the production of current achievement" or these "inputs are unchanging over time, so that current input measures capture the entire history of inputs" (Todd and Wolpin, 2003, pp. 16). I assume independence between the contemporaneous inputs and the potential unobserved endowment conditional to the control variables (in particular birth weight) (Todd and Wolpin, 2003).

homogeneous effect on all children regardless of their endowment of other forms of capital. Let HAZ_{ijt} be the HAZ score of child i living in community j at time t.[24] This model is estimated both at time $t = 1$ when the child is 1 year old (Model 1) and at time $t = 2$ when the child is 5 years old (Model 2). The nutritional status of the child is assumed to be a function of maternal membership M_{it}, a vector of dummy variables for mother's education Ed_i, a vector of time-invariant Z_i characteristics and a vector of time-variant characteristics X_{it}. In the contemporaneous specification maternal participation M_{it} and the vector of time variant variables X_{it} are measured at the same time as the dependent variable (Todd and Wolpin, 2003).[25]

I assume that child HAZ is linear in the inputs and in the explanatory variables and I estimate two separate regressions for 1 year old and 5 year old children respectively.

$$HAZ_{ij1} = \gamma^{HO} X_{i1} + \alpha_0^{HO} M_{i1} + \varphi^{HO} Ed_i + \delta^{HO} Z_i + u_{ij1}^{HO} + v_{j1}^{HO} \quad (1)$$

$$HAZ_{ij2} = \theta^{HO} X_{i2} + \beta_0^{HO} M_{i2} + \lambda^{HO} Ed_i + \vartheta^{HO} Z_i + u_{ij2}^{HO} + v_{j2}^{HO} \quad (2)$$

where u_{ij1}^{HO} and u_{ij2}^{HO} are idiosyncratic errors while v_{j1}^{HO} and v_{j2}^{HO} are community effects at age 1 and 5, respectively. The X_{it} vector includes child's age and age squared, some parental characteristics (mother and father's age and age squared, mother's employment status, maternal psychological wellbeing, permanent residence in the community and language), household characteristics (size, presence of members with disability, wealth index, living in rural/urban area, suffered a negative shock in the past year) and composition (a dummy for single parent, only child, number of children younger than 2, between 2 and 5 and between 5-14 years old). The Z_i vector includes some time invariant characteristics such as gender, ethnicity, birth weight, mother's height (in centimeters), father's education, mother's cognitive social capital and civic participation and the duration of breastfeeding.[26]

Contemporaneous specification: heterogeneous effect specification

In a second specification I relax the assumption that social capital has a homogeneous effect across children and I test the hypothesis that maternal social capital might be more important for those children with limited resources, i.e. those children whose maternal human capital and family physical capital are scarce.

[24] The "community level" refers to the "cluster" as defined by YL and described in the Data section.

[25] One potential issue is the potential reverse causality between poor child health conditions and maternal membership. It might be the case that poor health conditions push mothers to participate in community organization to get access to health services. Conversely, because of poor health conditions, mothers might need to care for the ill child and not have time to be involved in other activities. However, maternal participation refers to the 12 month period before child height is measured which helps to address this concern.

[26] Mother's cognitive social capital and civic participation are available only at wave 1.

Model (3) takes account of the potential complementarity or substitutability between different forms of capital (henceforth "*heterogeneous effect specification*"). It includes the interactions between maternal membership and dummies variables for education (as a proxy for maternal human capital) and between maternal membership and the household wealth index (which is used as a proxy for household physical capital). Given that mother's education is a categorical variable, I include the multiplicative terms between the dummy variable for maternal membership and 4 mutually exclusive and exhaustive categories for education (no education, primary education, secondary education and more than secondary education). This approach effectively *partitions* the effect of membership on the dependent variable for the 4 categories of education. In other words it allows for a heterogeneous effect of membership across mother's education.[27]

I included similar interactions of maternal membership with physical capital in an initial specification. However, while the vector of interactions between social and human capital was jointly significant, the interaction between social and physical capital was never significant. Therefore I dropped it from the final specification reported in this paper.

As before, I estimate the contemporaneous specification at both age 1 (Model 3) and age 5 (Model 4) allowing for heterogeneous effect of maternal participation across different educational levels:

$$HAZ_{ij1} = \gamma^{HE} X_{i1} + \alpha_0^{HE}\left(Ed_{i0} * M_{i1}\right) + ,...,+ \alpha_3^{HE}\left(Ed_{i3} * M_{i1}\right) + \varphi_1^{HE} Ed_{i1} + \varphi_2^{HE} Ed_{i2} + \varphi_3^{HE} Ed_{i3} + \delta^{HE} Z_i + u_{ij1}^{HE} + v_{j1}^{HE} \quad (3)$$

$$HAZ_{ij2} = \theta^{HE} X_{i2} + \beta_0^{HE}\left(Ed_{i0} * M_{i2}\right) + ,...,+ \beta_3^{HE}\left(Ed_{i3} * M_{i2}\right) + \lambda_1^{HE} Ed_{i1} + \lambda_2^{HE} Ed_{i2} + \lambda_3^{HE} Ed_{i3} + \vartheta^{HE} Z_i + u_{ij2}^{HE} + v_{j2}^{HE} \quad (4)$$

Community fixed effect and endogeneity issues

Models (1) and (2) such as in models (3) and (4) include an idiosyncratic error and a community-specific unobserved heterogeneity component, u_{ijt} and v_{jt} respectively. The time-invariant community fixed effect v_{jt} include omitted community characteristics, such as disease environment and the availability of health facilities, among others.

In Model (5), I deal with the error term at community level v_{jt} accounting for across-communities unobserved heterogeneity in both the homogeneous and the heterogeneous

[27] This approach is equivalent to include the "main effect" dummy variable for membership and the multiplicative terms between membership and all dummies except one for mother's education categories. These two methods are equivalent but have different interpretations. In particular the interaction terms between each mother's education category and membership dummy represent the differential effect of being a member within each group of education.

specifications. For sake of simplicity, I report here only the heterogeneous effect specification for child HAZ at age 1: [28]

$$HAZ_{ij1} = \gamma^{FE} X_{i1} + \alpha_0^{FE}(Ed_{i0} * M_{i1}) + ,...,+ \alpha_3^{FE}(Ed_{i3} * M_{i1}) + \varphi_1^{FE} Ed_{i1} + \varphi_2^{FE} Ed_{i2} + \varphi_3^{FE} Ed_{i3} + \delta^{FE} Z_i + \lambda_j^{FE} F_j + u_{ij1}^{FE} \quad (5)$$

F_j is a dummy variable which takes value 1 if the child lives in community j and 0 otherwise.[29] However, even after controlling for across-communities unobserved heterogeneity maternal membership might still be potentially correlated with unobserved individual characteristics. In order to identify causal relationship between maternal participation and child HAZ, the omitted factors u_{ij1}^{FE} has to be orthogonal to maternal membership, i.e. $Cov(M_{i1}, u_{ij1}^{FE}) = 0$. This condition is not satisfied if there are individual unobserved factors which persist over time and affect both the maternal decision to become a member and child nutritional status. For example, mothers with higher cognitive ability might be more likely to actively participate in community life and they might adopt better child rearing practices.[30] If any of these unobserved factors is left out, i.e. subsumed into the residual, the estimated coefficient cannot be interpret as the effect of that regressor since it also captures part of the effect of the omitted variables.

Although controlling for a large set of individual characteristics and for unobserved heterogeneity across-communities alleviates the potential endogeneity issue, it does not eliminate it. This analysis does not seek to establish causality but allows for identifying how maternal social participation is associated to child nutritional status.

Heterogeneous long-term effect specification

Finally, I estimate the long-term heterogeneous effect of maternal membership using social participation at age 1 $(t = 1)$ and child HAZ and the other time-variant variables at age 5 $(t = 2)$, as following:

$$HAZ_{ij2} = \theta^L X_{i2} + \beta_0^L(Ed_{i0} * M_{i1}) + ,...,+ \beta_3^L(Ed_{i3} * M_{i1}) + \lambda_1^L Ed_{i1} + \lambda_2^L Ed_{i2} + \lambda_3^L Ed_{i3} + \vartheta^L Z_i + \lambda_j^L F_j + u_{ij2}^L \quad (6)$$

This model answers to the question of whether maternal social participation during the first months of life is associated with child nutritional status at age 5 net of the effect meditated through

[28] Nevertheless, the same model has been estimated for both the homogeneous and the heterogeneous specifications and for children at age 5 too.

[29] The standard errors are clustered at community level given that they are not independent within communities.

[30] It is worth noting that I am controlling for breastfeeding practices (number of months the children were breastfed) and mother's depression, which is at least a proxy of her psychological wellbeing.

the observed variables.

7. Empirical Results

7.1 Maternal social capital and 1 year old child HAZ

Table 4 reports the estimates of child HAZ using Ordinary Least Squares (OLS). Both child HAZ and maternal social capital are measured at wave 1. In the first specification I control only for mother's membership and education and the household wealth index. In the second I use the full set of controls as previously described. In the last model I add a community fixed effect to control for community-specific unobserved heterogeneity.[31] In these models I assume that the potential effect of the membership is homogeneous across individuals. Regardless of the specification used, I do not find any significant correlation between membership and 1 year old child HAZ.

Table 4 Child HAZ at Age 1: Homogeneous Effect Specification

Child HAZ at Age 1: Homogeneous Effect Specification

	(1)	(2)	(3)
Maternal Membership	-0.052	-0.065	-0.087
	(0.069)	(0.077)	(0.096)
M.educ.: primary	0.681***	0.489***	0.267
	(0.109)	(0.139)	(0.169)
M.educ.: secondary	1.353***	0.612***	0.291
	(0.108)	(0.153)	(0.177)
M.educ.: more than secondary	1.560***	0.604***	0.355
	(0.121)	(0.175)	(0.234)
N	1935	1295	1295
R-squared adjusted	0.13	0.36	0.38
Naïve model	Yes	No	No
All controls	No	Yes	Yes
Community fixed effect	No	No	Yes

Note: Significant at * 0.1, ** 0.05, ***0.01 level. Child HAZ at age 1 has been estimated by OLS. Model (1) or Naive model includes only maternal memberhip and education. Model (2) includes all controls. Model (3) includes all controls and community fixed effect. Standard errors in parenthesis (clustering at community level). Mothers with no formal education as reference category. Both membership and child's HAZ, and the other controls are measured at wave1. Controls: paternal education, cognitive social capital, wealth index, child's age and age squared, birth weight, gender, ethnicity, maternal and paternal age and age squared, mother's height, maternal employment status, maternal depression, rural/urban, negative economic shocks, breastfeeding length, migration background, language, single parent, only child, household size and age composition, household member with disability).

[31] The Hausman test, which compares the estimated coefficients for the fixed and random effect models, suggests that there are systematic differences between the two set of estimates, in favour of the fixed effect model. The same has been found for all the specifications estimated.

I then relax the assumption of homogeneous effects to test whether maternal membership is more effective for child development in the context of scarce human and physical capital (Table 5). I add a vector of interactions between maternal social capital and the 4 dummies for different levels of maternal education.[32]

Table 5 Child HAZ at Wave 1: Heterogeneous Effect Specification

Child HAZ at Age 1: Heterogeneous Effect Specification			
	(1)	(2)	(3)
No education* member	0.089	0.693**	0.458**
	(0.289)	(0.347)	(0.195)
Primary* member	0.042	-0.074	-0.083
	(0.112)	(0.125)	(0.149)
Secondary* member	-0.164	-0.141	-0.160
	(0.111)	(0.115)	(0.115)
> Secondary* member	-0.051	-0.042	-0.055
	(0.167)	(0.173)	(0.235)
M.educ.: primary	0.679***	0.588***	0.347*
	(0.118)	(0.148)	(0.194)
M.educ.: secondary	1.395***	0.724***	0.389*
	(0.117)	(0.161)	(0.187)
M.educ.: more than secondary	1.578***	0.693***	0.430
	(0.132)	(0.184)	(0.254)
N	1935	1295	1295
R-squared	0.13	0.37	0.38
Naïve model	Yes	No	No
All controls	No	Yes	Yes
Cluster fixed effect	No	No	Yes

Note: Significant at * 0.1, ** 0.05, ***0.01 level. Child HAZ at age 1 has been estimated by OLS. Model (1) or Naive model includes only the vector of interaction between maternal memberhip and education. Model (2) includes all controls. Model (3) includes all controls and community fixed effect. Standard errors in parenthesis (clustering at community level). Mothers with no formal education as reference category. Both membership and child's HAZ, and the other controls are measured at wave1. Controls: paternal education, cognitive social capital, wealth index, child's age and age squared, birth weight, gender, ethnicity, maternal and paternal age and age squared, mother's height, maternal employment status, maternal depression, rural/urban, negative economic shocks, breastfeeding length, migration background, language, single parent, only child, household size and age composition, household member with disability).

I expect to find that social capital matters more for those children whose mother has low education.

[32] As reported above, I drop the vector of interactions between maternal membership and different levels of household wealth index found to be jointly not statistically different from zero.

This heterogeneity seems to be sizeable. Maternal social participation is particularly effective in increasing child HAZ in context where the human capital is scarce, and specifically for those children whose mothers have no formal education. The association between maternal membership and child HAZ for these children remains robust even after controlling for unobservable characteristics at community level (column 3). Compared to the corresponding estimates in column 2, the inclusion of community fixed effects tends to lower the point estimates in the child HAZ equation. This suggests some role for unobserved community heterogeneity in explaining child nutritional status and possibly maternal social participation and its association with child HAZ.

Note that, after adding the interactions terms, mothers' education is still predicting a better nutritional status for their children. Mothers with higher education have healthier children and the effect of their education on child health is quite large.[33] According to *WHO Child Growth Standards*, one standard deviation of an 11 month old child's height corresponds approximately to 2.5 centimeters.[34] The results reported here indicates that the average child aged 11 months old whose mother has no education is shorter by 0.8 centimeters up to 0.9 centimeters than a comparable child whose mother has completed primary education and secondary education, respectively. Similarly, the same child whose mother has no formal education but is a member of at least one community organization is 1.1 centimeters taller than a child whose mother has the same educational level but does not participate in any community groups.

Among the other confounding factors, household composition matters. Controlling for the household size, living in a household together with other children and adolescents significantly reduces child nutritional status, which presumably indicates that it reduces the availability of per capita resources. Mother's height and child's birth weight are positively associated with child HAZ. Additionally, those children whose mothers are employed full time have higher HAZ which suggest that the positive income effect is compensating the potential negative effect of less time spent together.

7.2 Maternal social capital and 5 years old child HAZ

All results reported in Table 6 refer to the estimates of HAZ at 5 years as a function of maternal membership measured either at wave 1 or wave 2. In the first column I report the previous estimates for 1 year old child HAZ as a benchmark. In the second column, I report the long-term association between maternal memberships measured at wave 1 on HAZ at 5 years. In the third column, both maternal membership and child nutritional status are measured at age 5. This last model is analogous to the contemporaneous specification reported in the first column but at a later stage of child's life.

[33] Remarkably, a father's human capital has almost no association with child HAZ. Only those fathers with more than secondary education contribute positively and in a statically significant amount to child nutritional status (not reported). Presumably, given the high correlation between father's education and household's wealth index, most of paternal education effect goes through income.

[34] The average age in the sample is 11 month. One standard deviation of 11 months old children correspond to 2.52 and 2.33 centimetres for girls and boys respectively. See http://www.who.int/childgrowth/en/ for more details about how the height-for-age indicator is standardized.

The first relevant result is that in context of low human capital, mother's membership has a positive and significant impact on child HAZ in the short run (Model 1, Table 6) but that the association is not long-lasting (Model 2, Table 6). Being a member when the child is 1 year old does not have a significant direct effect on HAZ at age 5.

Concerning membership at later stage of child's life, there is no evidence of a statistically significant association with child nutritional status (Model 3, Table 6). Maternal participation is no longer beneficial when the child is 5 years old and might be detrimental. Notably, the correlation between maternal social capital and child nutritional status becomes negative, though is not statistically significant.

Thinking about the pathways through which maternal social capital might affect child nutritional status and the technology of child health formation, might help to explain why maternal social capital is more effective in improving child nutritional status during the first months of life. First, maternal participation into community may improve a mother's psychological and physical wellbeing and have positive spillover effects on the child nutritional status especially before the child is weaned (Harpham et al., 2006; Rahman et al. 1993).[35] Second, some of the community organizations might organize initiatives directly intended to help mothers with new born children. Third, early investments in child health have been found to be more beneficial than investments in later stages (Heckman et al., 2006; Hoddinott et al. 2008).

[35] It is reasonable to expect that a healthy mother is more likely to give birth to and raise a healthy child and that this effect is stronger during early childhood. Adequate breastfeeding practices (both in terms of length, complementary breastfeeding and mother's nutrients intake) have found to be efficient in preventing child nutritional problems.

Table 6 Child HAZ at 5 years old

Child HAZ at Age 5: Heterogeneous Effect Specifications				
		(1)	(2)	(3)
No education* member (age 1)		0.458**	0.045	.
		(0.195)	(0.171)	.
Primary* member (age 1)		-0.083	-0.051	.
		(0.149)	(0.072)	.
Secondary* member (age 1)		-0.160	-0.145*	.
		(0.115)	(0.074)	.
More than secondary* member (age 1)		-0.055	-0.172	.
		(0.235)	(0.187)	.
No education* member (age 5)		.	.	-0.147
		.	.	(0.111)
Primary* member (age 5)		.	.	-0.038
		.	.	(0.101)
Secondary* member (age 5)		.	.	0.010
		.	.	(0.087)
More than secondary* member (age 5)		.	.	0.066
		.	.	(0.114)
Lagged HAZ		.	.	.
		.	.	.
HAZ		w1	w2	w2
Maternal Membership	measured at	w1	w1	w2
Control variables		w1	w2	w2
N		1295	1294	1306
R-squared adjusted		0.38	0.39	0.38

Note: Significant at * 0.1, ** 0.05, ***0.01 level. In all models (1)-(3) child's HAZ is measured at age 5. (1) Contemporaneous specification: membership and child HAZ at 1 year old; (2) Long term effect of membership: membership at age 1 and child HAZ at age 5; (3) Contemporaneous specification: membership and child HAZ at 5 year old. Standard errors in parenthesis (clustering at community level). Mothers with no formal education is the reference category. All controls used (measured at w2). Controls: paternal education, cognitive social capital, wealth index, child's age and age squared, birth weight, gender, ethnicity, maternal and paternal age and age squared, mother's height, maternal employment status, maternal depression, rural/urban, negative economic shocks, breastfeeding length, migration background, language, single parent, only child, household size and age composition, household member with disability).

7.3 Pathways through which maternal social participation might affect child nutritional status

Identifying the pathways through which maternal social capital affects child nutritional status is a policy relevant question. There is a large literature examining how maternal education affects child health but little investigation of the pathways through which maternal social capital improves child nutritional status, apart from some theoretical speculations.

As discussed above, three main pathways might be identified: the support pathway, the information pathway and the empowerment pathway. Because of data limitations only the support pathways can be investigated for this empirical exercise. Specifically, the YL contains data about the support received in the past 12 months. Support is defined as "*any emotional help, economic help or assistance*" received from the group the mother is a member of (*internal support*)[36] or more generically from family, friends, neighbours, community leaders, religious leaders, politicians, NGOs, government officials, or any other individuals in the community (*external support*).[37] Being a member is the condition required to receive internal support; conversely membership is not required to receive external support.

Table 7 Internal and external support received by member mothers.

	Non-member			**Member**			**t-test**
	Mean	*Std. Dev.*	*N*	*Mean*	*Std. Dev.*	*N*	*pvalue*
Received support (either internal or external)	0.66	(0.012)	1,021	0.85	(0.018)	344	(0.000)
Received external support	0.66	(0.012)	1,021	0.78	(0.000)	317	
Who provided mothers with support?							
(a) Only external support	1	(0.000)	1021	0.36	(0.026)	125	
(b) Only internal support	.	.	.	0.08	(0.015)	27	
(c) Both internal and external support	.	.	.	0.56	(0.070)	192	

Note: Standard error in parenthises, T-test for differences in mean.

Table 7 shows there are positive associations between maternal social capital and receiving

[36] The original question is: "For each group the caregiver has been an active member of in the last 12 months: Establish if they received any emotional or economic help or assistance in knowing or doing things (advice/tips)".

[37] The original question is: "The caregiver has received any emotional or economic help or assistance in knowing or doing things (advice) from the people on the list in the last 12 months (family members, neighbours, friend who are not neighbours, community leaders, religious leaders, politician, government officials, charitable organization or others)".

support. In general, members are more likely to receive support than non-members. On average 85 percent of them received material or emotional support at least once in the past 12 months against 66 percent of non-members. Being a member increases the probability of receiving support because it makes it possible to receive internal support from the organization of membership, but also because it increases the probability of receiving external support. Indeed, about 78 percent of members against 66 percent of non-members received external support in the past year (Table 7). The external support is indeed the main source of help for members. Only 8 percent of the member mothers received support exclusively from their organisation in the past year. Most member mothers received both internal and external support (56 percent) and 36 percent only external support.

As reported in Table 8 maternal social capital is still positive and strongly significantly correlated with child HAZ even after controlling for the support received. Notably, after controlling for the support received, being a member is relatively more effective in improving HAZ for those children with uneducated mothers, which suggests that the support received is not a pathway, or at least is not a main one, through which maternal membership improved child HAZ. This finding provides suggestive evidence that the information and the empowerment pathway discussed above could be important. However, the data do not allow for further investigation in this direction.

Table 8 Pathway through which maternal social participation affects child nutritional status at age 1

Child HAZ at Age 1: Support Pathway		
	(1)	(2)
No education* member	0.458**	0.504**
	(0.195)	(0.182)
Primary* member	-0.083	0.009
	(0.149)	(0.173)
Secondary* member	-0.160	-0.055
	(0.115)	(0.150)
More than secondary* member	-0.055	0.051
	(0.235)	(0.241)
External Support	.	-0.204
	.	(0.127)
Internal Support	.	0.106*
	.	(0.057)
N	1295	1295
R-squared	0.38	0.38

Note: Significant at * 0.1, ** 0.05, ***0.01 level. Child HAZ at age 1 has been estimated by OLS. Model (1) and Model (2) includes all controls. Model (2) includes also the support received. Standard errors in parenthesis (clustering at community level). Mothers with no formal education as reference category. All variables are measured at wave1. Controls: paternal education, cognitive social capital, wealth index, child's age and age squared, birth weight, gender, ethnicity, maternal and paternal age and age squared, mother's height, maternal employment status, maternal depression, rural/urban, negative economic shocks, breastfeeding length, migration background, language, single parent, only child, household size and age composition, household member with disability).

8 Conclusions and Discussion

This study suggests that, where human capital is scarce, social capital might have important implications for child development. According to my findings an 11 months old child whose mother has no formal education but is a member of at least one community organization is 1.1 centimeters taller than a child whose mother has the same educational level but does not participate in any community group. This effect is quite sizable considering that it is equivalent to the effect of maternal education, which has been proved to be one of the main child development determinates.

Looking at maternal membership when the child is 5 years old, there is no evidence of a statistically significant association with child nutritional status. There are different alternative explanations which could justify this result. For example, it might be the case that maternal membership is more effective when the child is younger because some of the community organizations organize initiatives directly intended to help mothers with new born children. Alternatively, this result might be consistent with the theory that early investments in children are more effective than investments in later stages.

Looking at the pathways through which social participation affects child HAZ, descriptive statistics suggest that social participation facilitates access to resources by expanding mothers' network and because being a member is a pre-requisite to access additional resources. However, the support received does not seem to be a pathway through which the association between maternal membership and child nutritional status flows. Alternative pathways involving no tangible elements such as the acquisition of useful information or a change in attitudes and investment behavior might play a crucial role in explaining the association between maternal social capital and child development, as suggested by previous literature. However, identify causality is difficult and data limitations do not allow for further exploration of this hypothesis.

This study represents a step forward in the comprehension of the role of social capital in child development. In fact, it is the first comprehensive study of the impact of social capital on child nutritional status using data from a developing country. Furthermore, from a methodological point of view it deals with multiple problems in a step-by-step manner, in an attempt to exploit as much as possible the longitudinal setting of the data. Even if the question of causality versus selection bias needs further investigation, this paper establishes the correlation between maternal social participation and child nutritional status, by using fixed effects to control for unobservable heterogeneity at the community level.

Finally, it draws interesting conclusions and has important implications for the designing of programs able to launch poor households on a sustainable pathway out of poverty. This analysis provides suggestive evidences that promoting individual participation to community initiatives might be the way to go to alleviate poverty among the poorest. Even in very deprived context characterized by scarce human and physical capital there is space for effective policy interventions in a relatively short term. Low educated mothers might be helped in growing up healthy children, facilitating the cooperation and association at the community level.

However, further research is required in the analysis of the mechanisms through which maternal social capital might affect child development. If the empowerment channel matters and social

participation is effective in reducing poverty because it promotes change in behavior and attitudes (Macours and Vakis, 2008), the sustainability of policy interventions might depend on their ability to facilitate social interactions. Following the CLAS experience in Peru, the effort to involve the local population in identifying and diagnosing their own problems, setting priorities and strategies for their resolution, may motivate and encourage such changes. In this sense social capital is the social infrastructure that enables other policies to be effective and it is a complement rather than a substitute for other instruments of policy analysis.

Appendix

Table A1 Descriptive characteristics of children at age 1 and age 5

	1-year old child		5-year old child	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*
Mother: member of at least one organization	0.21	(0.009)	0.19	(0.009)
Human capital				
Mother's educ.: No education	0.08	(0.006)	0.08	(0.006)
Mother's educ.: Primary	0.36	(0.011)	0.36	(0.011)
Mother's educ.: Secondary	0.39	(0.011)	0.39	(0.011)
Mother's educ.: > Secondary	0.16	(0.008)	0.16	(0.008)
Father's educ.: No education	0.02	(0.004)	0.02	(0.004)
Father's educ.: Primary	0.33	(0.012)	0.33	(0.012)
Father's educ.: Secondary	0.45	(0.012)	0.45	(0.012)
Father's educ.: > Secondary	0.19	(0.010)	0.19	(0.010)
Cognitive social capital				
Cognitive social capital	2.24	(0.022)	2.24	(0.022)
Civic participation	-0.05	(0.022)	-0.05	(0.022)
Physical capital				
Wealth index	0.46	(0.005)	0.51	(0.005)
Child characteristics				
Child's age (in months)	11.53	(0.079)	63.45	(0.106)
Birth weight (kg)	3.20	(0.012)	3.20	(0.012)
Gender	0.53	(0.011)	0.53	(0.011)
Ethnicity (Mestizo)	0.93	(0.006)	0.93	(0.006)
Ethnicity (White)	0.05	(0.005)	0.05	(0.005)
Ethnicity (Others)	0.03	(0.004)	0.03	(0.004)
Parental characteristics				
Mother: Age	26.87	(0.154)	31.13	(0.154)
Mother's height	149.98	(0.122)	149.98	(0.122)
Mother employed full-time	0.04	(0.004)	0.22	(0.009)
Mother depressed	0.70	(0.010)	0.14	(0.008)
Father: Age	30.98	(0.188)	35.15	(0.186)

Continue below

Continue from above				
Others				
Urban	0.65	(0.011)	0.55	(0.011)
Any negative shock	0.39	(0.011)	0.64	(0.011)
Breastfeeding length (months)	10.96	(0.083)	10.96	(0.083)
Living in the same community	0.40	(0.011)	0.40	(0.011)
Never migrate	0.26	(0.010)	0.21	(0.009)
Speak community language	0.91	(0.007)	0.91	(0.007)
Only child	0.39	(0.011)	0.22	(0.009)
Household size	5.71	(0.053)	5.50	(0.047)
N. of children aged <=2 in the hh	0.12	(0.008)	0.12	(0.008)
N. of 2<children aged<=5 in hh	0.45	(0.014)	1.14	(0.010)
N. of 5<children aged<=14 in the hh	1.06	(0.028)	1.30	(0.027)
Household member with disability	0.22	(0.009)	0.10	(0.007)
N	1,295		1,306	

Note: Average values; standard deviation in parentheses.

Table A2 Who is more likely to be member?

	Likelihood to be member			
	1 year old child		5 year old child	
	Coef.	*Std. Err.*	*Coef.*	*Std. Err.*
Human capital				
Mother's educ.: Primary	0.72***	(0.27)	0.18	(0.17)
Mother's educ.: Secondary	0.76**	(0.33)	0.46**	(0.22)
Mother's educ.: > Secondary	0.98***	(0.35)	0.63***	(0.24)
Father's educ.: Primary	0.58	(0.48)	-0.03	(0.37)
Father's educ.: Secondary	0.62	(0.45)	0.04	(0.36)
Father's educ.: > Secondary	0.45	(0.48)	0.04	(0.33)
Cognitive social capital				
Cognitive social capital	0.13**	(0.06)	0.05	(0.04)
Civic participation	0.26***	(0.04)	0.12***	(0.04)
Physical capital				
Wealth index	-0.24	(0.36)	-1.10***	(0.26)
Child characteristics				
Child's age (in months)	0.04	(0.08)	0.10	(0.24)
Child's age^2	-0.00	(0.00)	-0.00	(0.00)
Birth weight (kg)	0.27***	(0.09)	-0.06	(0.11)
Gender	-0.05	(0.08)	0.08	(0.06)
Ethnicity (White)	0.14	(0.14)	-0.18	(0.29)
Ethnicity (Others)	0.23	(0.42)	-0.06	(0.30)
Parental characteristics				
Mother: Age	-0.04	(0.07)	0.06	(0.06)
Mother: Age squared	0.00	(0.00)	-0.00	(0.00)
Mother's height	0.01	(0.01)	0.01	(0.01)
Mother employed full-time	0.00	(0.30)	-0.08	(0.11)
Mother depressed	0.03	(0.08)	-0.06	(0.11)
Father: Age	0.06*	(0.03)	0.19**	(0.08)
Father: Age squared	-0.00	(0.00)	-0.00**	(0.00)

Continue below

Continue from above				
Others				
Urban	-0.18	(0.23)	-0.11	(0.24)
Any negative shock	0.26***	(0.09)	0.15	(0.10)
Breastfeeding length (months)	-0.01	(0.02)	0.03	(0.02)
Living in the same community	-0.08	(0.05)	-0.11	(0.09)
Never migrate	-0.19	(0.12)	-0.10	(0.12)
Speak community language	-0.31**	(0.14)	-0.03	(0.14)
Only child	-0.15	(0.18)	-0.19	(0.12)
Household size	-0.00	(0.03)	-0.02	(0.02)
N. of children aged <=2 in the hh	-0.25**	(0.13)	0.08	(0.13)
N. of 2<children aged<=5 in hh	0.06	(0.10)	-0.21**	(0.08)
N. of 5<children aged<=14 in the hh	0.07	(0.06)	-0.07*	(0.04)
Household member with disability	-0.04	(0.12)	-0.17	(0.12)
N	1,298		1,313	
R-squared (adjusted)	0.17		0.09	

Note: Probit with fixed effect at cluster level. Marginal effects are reported for probit estimation. All variables are measured at (1) wave 1; (2) wave 2. Standard error in parentheses (clustering at cluster level). Significant at *0.1, **0.05, ***0.01. Reference category: mothers without formal education.

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