The University of Manchester

Economics Discussion Paper

EDP-0614

Women's Organisations and Social Capital to Reduce Prevalence of Child Malnutrition in Papua New Guinea

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June 2006

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Women's Organisations and Social Capital to Reduce Prevalence of Child Malnutrition in Papua New Guinea [1]

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May 2006

Abstract

Drawing upon the survey data in 2000, the present study analyses capabilities of women community-based organisations in rural Papua New Guinea comparing autonomous organisations with those that receive external support. The induced institutional innovation hypothesis is tested; are capabilities of women organisations reflecting 'structured social capital' positively associated with improved child nutritional status? The Heckman Sample Selection Model shows that autonomous Mothers' Groups are more efficient in improving nutritional conditions in weight-for-age measure than those externally supported and higher capabilities of the Mothers' Groups lead to lower underweight. The Propensity Score Matching Model is also used to confirm the former.

Key words: South Asia, Nepal, Poverty, Child malnutrition, Social capital, Women's Organisation, Heckman Sample Selection Model, Propensity Score Matching Model

JEL codes: C31, I12, I32, Z13

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[1] This paper draws on the original contributions by Abel Rajaratnam, Ganesh Rauniyar, Fabrizio Felloni, and Shrekantha Shetty. We appreciate the comments from participants in seminars at University of Manchester.

I. Introduction

Poverty is still a predominantly rural phenomenon in developing countries. Despite significant progress in income diversification of rural households, agriculture is still the principal activity of households in rural areas. While a recent study shows that moving out of agriculture is correlated with poverty reduction (Dercon, 2006), little is known about the mechanism whereby poor households escape from the vulnerable situation with low-productivity livelihoods.[2] *A priori,* those more able, more possibility of entrepreneurial leave. However, when income poverty is combined with non-income poverty, with malnutrition, possibilities are further thwarted of engaging in entrepreneurial advancement, permitting raised productivity with ultimate entry into non-agricultural employment. Relying on markets and economic growth alone to address poor nutrition means it will take more than a generation to solve the problem (World Bank 2006: 21).

With high thresholds for entry into non-agricultural employment for the current generation (Chaudhuri 2006), it is critical to design interventions that permit the children to become better endowed. Children are likely to become chronically malnourished or stunted when mothers are exposed to multi dimensional risk from food insecurity and diseases, accentuated by illiteracy and gender inequality (Alderman et al. 2002). Once stunted, children face likelihood of impaired cognitive and motoric impairment, leading to reduced school achievement and significantly lower adult productivity. Conversely, less stunting prevalence contributes to higher physical work capacity, cognitive development, school performance and health,

[2] It should also be noted that agriculture plays a key role in improving nutritional conditions in the low-income countries, which are dependent on agricultural sector (IFPRI 2006).

(World Bank 2006). These factors in combination raise probability of entry for the next generation into non-agricultural employment.

Local institutions and "friendly" societies may reduce vulnerability in the face of multidimensional risk. Exposure to risk, especially covariate, contributes to inferior returns even when assets are owned, keeping the poor behind. Informal mutual support associations provide insurance by mobilizing savings and providing credit. Women's membership in informal village level associations represents an instrument for insurance, for mutual protection. Such organisations are found in most rural societies in developing countries. *A priori*, they become particularly important instruments for vulnerability reduction when government capability for direct interventions and income support remains minimal.[3] They empower members, mobilise savings for consumption smoothening and facilitate co-operative solutions towards improved livelihood systems. However, too little is known of strengths and weaknesses of such organisations in addressing vulnerability. More knowledge is called for about their mechanisms in reducing food and nutrition insecurity.

To search for answers we look at voluntary village level associations in Papua New Guinea (PNG) and their context of vulnerability. Our preferred proxy for vulnerability, for non-income poverty, is the prevalence of malnutrition for children less than 5 years of age. We apply Heckman Sample Selection Models and the Propensity Score Matching Model to the survey data PNG in 2000 to investigate the extent to which social capital, measured by capability index of Women's Organisations contributes to reducing prevalence of child malnutrition. The rest of the paper is organised as follows. The next section provides a background and literature reviews focusing on how social capital improves child nutritional conditions.

[3] An increasingly common intervention is to provide cash grants to enroll out–of-school children in primary education; a precondition is a minimally effective government administration.

The section III sets out the context specific to the PNG as well as the data. Methodologies are discussed in the section IV to be followed by summary of econometric results in the Section V. The final section concludes.

II. The Literature on Women's Organisations and Social Capital

The literature on the theory and practice on induced institutional innovations seeks to explain the emergence of organisations to provide services of benefit to the community (Kikuchi and Hayami 1980: 21-36). The induced institutional innovation hypothesis reflecting Hayami-Ruttan's contributions postulates that members in a community are induced to participate in collective action to ensure availability of relevant technology and related services.[4] Knowledge uptake is understood as an essential associated part of collective action. The latter serves to filter, "uncode" and disseminate the information received to generate useful knowledge for community members. This theory can be applied for collective actions of women in Mothers' Groups to improve child nutritional conditions.

Trust is a fundamental prerequisite of efficient social exchange in the public domain and *a priori* limited general trust in society contributes in driving

[4] Regarding 'Induced Institutional Innovation', see Hayami (2001: 16-21). Hayami modelled induced technological innovation as an outcome of producers' cost-minimising behaviour in agrarian economies and extended the idea to institutional innovation as a more general case. The collective action to facilitate the innovation is assumed to be organised in both cases if aggregate social profit from the action exceeds its cost. He argues that the collective action through mutual 'trust as a social capital' in a community supports economic development by correcting the failures of the market and the state (285-291).

participation in voluntary associations.[5] Generalized trust in a society is distinguished from interpersonal trust (Fafchamps 2005). *A priori*, a low level of the former is associated with imperfect formal institutions, unstable majority coalitions, and restricted collective action. Unstable, shifting political majority coalitions restrict agreements about tax-expenditure solutions. Moreover, with limited generalized trust in society, with contracts that are not honoured, with inadequate sanctions, with information asymmetry, outreach of formal financial institutions is restricted in serving broader segments of rural populations.

Willingness to become a member of a voluntary association, not supported by external agents, reflects interpersonal trust combined with members' perception that membership is associated with net benefits for them. Voluntary associations that provide net benefits to their members, improve their organisational capabilities, and learn to access external scientific knowledge that they, receive, "uncode", adapt and apply (Grootaert and van Bastelaer 2002).

Yet, mere interactions between external agents and communities do not necessarily induce social mobilisation, knowledge uptake and sustainability. Rural elites may capture external support (e.g. Binswanger and Aiyar 2003). *A priori*, such diversion of resources is made easier when external agents form voluntary associations from scratch, *i.e.* when intra-group dynamics have not been built up. The element of initial interpersonal trust is then negligible relative to members' expectation of receiving net benefits in some form. Interpersonal trust remains

[5] Grootaert and van Bastelaer (2002: 11). Proxy indicators for social capital comprise membership in local associations and networks (structural social capital), indicators of trust and adherence to norms (cognitive social capital), and indicators of collective action (an output measure).

negligible if groups created are so large that members neither socially interact, nor perceive members' behaviour (e.g. Alkire and Deneulin 2002; Kameda et al. 1992.).

Overall, though, recognition is found for the view that development cannot be seen as coming only from within. Group leaders need to access external knowledge. More advanced associations that market farm produce combine knowledge and resources of group leaders and outsiders.[6] But a shift to higher efficiency for the organisation may be gained at the cost of less direct participation for members; "groups needed to sacrifice at least in part members' participation to the group's administration." (Bianchi 2002: 124). *Designing external support so as to avoid compromising the participation that is a precondition for sustainability remains an issue to pursue*. Harell-Bond (1986), comparing agency administered refugee settlements with autonomous settlements, found that the former type erodes true participation: such schemes are likely to be less sustainable compared those where refugees themselves remained in control. It remains that analysts more rarely explore differential effects of reduced participation for organisations receiving external support, for instance resource mobilisation (see below), comparing them with the characteristics of autonomous ones.

For women to form their own separate associations is rational. In traditional male dominated societies, women have reason to form their own groups (Agarwal 2002). Building a critical mass of empowered poor rural women takes time. Women need to be gradually empowered, learn to participate, and eventually graduate to become leaders. Women that organise themselves into producer and micro-credit societies meet less social resistance compared to other forms of empowerment in many male-dominated societies (Binswanger and Aiyar 2003).

[6] A further question is whether with external support, structures are too easily created that are not sustainable without continuing subsidy.

Women may join rotating savings and credit associations (Roscas) also to protect household income from husband's preferences to satisfy immediate consumption (Anderson and Baland 2001). Cultural context differs, but there is much evidence that husbands in their final analysis view women's participation in savings and credit groups as beneficial to them. Members initially seek mutual insurance to protect household against unforeseen outlay in connection with sickness and emergencies and to this end take loans for income generation (Mahmud 2001). Women voluntary associations that operate with savings mobilisation and management of group funds are still likely to generate non-economic outcomes that surpass those that emerge from membership in farmer organisations focused on cash crop production. In such women groups, "non-economic gains, such as increased self-esteem, enhanced agency, mutual support, etc, can create the social environment for other development interventions to work better" (Mahmud 2001: 225).

Several studies demonstrate benefits, especially income generated, when women participate and own group based village level banking activities. Borrowing for income generation through women's participation in village-level micro finance groups is often associated with raised gender equality. Moreover, better nutritional status of children will result through their mother's greater access to information, control of household resources, less degree of time constraints, and better access to health services. Where women's status has its strongest positive effect on child nutritional status, it has been found to have its strongest positive effect on the nutritional status of women themselves and on caring practices for children that are vital to their growth and development (Smith et al. 2003). Evidence suggests that women build their associations on their shared values in rearing, nourishing, protecting their children; in turn this preference may well be associated with a longer-term view of the value of nurtured interpersonal exchange relative to that of men; this

may translate into high level of interpersonal trust, active member participation, and little tolerance of free riding.[7]

A priori, the importance of mothers' voluntary associations (or Mothers' Groups) in most rural societies for empowerment, for uptake of knowledge, capabilities, and socio-economic advancement with which to reduce malnutrition is acknowledged. Several studies demonstrate the dominant power when mothers themselves learn to diagnose, identifying children that are stunted, this knowledge in turn drives behaviour that reduces prevalence (Christiaensen and Alderman 2001; Eklund et al. 2006). Across the tropics, vast numbers of rural women and their organisations remain ignorant how to diagnose nature and extent of their children's malnutrition; contributing is that for the untrained eye prevalence of stunting is invisible. External agents and donors in spite of widely available knowledge as to the costs of this neglect of stunting, in terms of foregone productivity and life time earnings, typically pay little attention to the need of assisting mothers to themselves diagnose type of child malnutrition, learn causes, seek local solutions to promote growth, and monitor. Far more knowledge is necessary for us in learning about the capabilities of voluntary women organisations, their behaviour and impact in reducing child malnutrition, given their potential role in reducing vulnerability, empowering "nutrition-illiterate" rural women. Rigorous studies of different types of women's organisations and the extent to which they are associated with raised nutritional well being are justified.

[7] Women's behaviour may reflect a view that sees personal exchange as an infinite series of events, in the area of game theory, approximated by the so-called Folks theorem, in contrast to a shorter-term finite planning horizon for men (personal communication from Yujiro Hayami).

III. Survey Areas and the Data

PNG's extensive mineral deposits (gas, oil, gold, copper) and other natural resources (forests, fisheries) should have provided a firm foundation for prosperity. Yet, its 2005 GDP per capita at USD 578 remains far inferior the USD 1000 attained 20 years ago. Wealth created from extractive industries has been unequally shared. Income inequality, at a Gini coefficient of 50.9 in 1996, is very high for the region. Close to 40% of the population in 1996 lived below a poverty line of USD 350 per year. About 85% of its current 5.5 million people rely on subsistence agriculture and fishing for survival. Exposure to natural hazards, drought, and polluted habitats in vicinity of extractive operations accentuate vulnerability.

Health, education, transportation and information services are limited: much of the rural infrastructure has been in gradual decay since PNG gained independence in 1975. The population has doubled over the same period; contributing to natural resource degradation, declining soil fertility and higher labour inputs, especially for women who mostly in vain seek to maintain previous livelihood standards. Non-monetary indicators confirm extent of persistent vulnerability. The UNDP 2005 Human Development Index ranked PNG 137th of 177 countries surveyed, lower than any other country in the Pacific. Life expectancy at birth in PNG is 55.3 years; the infant mortality rate is 69 per 1,000 live births, and maternal mortality 300 per 100,000 live births. Mere 57% of adults are literate; half of all children have access to primary schooling. Prevalence of child chronic malnutrition in 1982/83 was as high as 43%; at the turn of the century it remained at this level (World Bank 2006).[8] [9]

[8] Most recent estimate for prevalence of child underweight is 29,9%.

[9] A Government Report in 2004 candidly summarised past performance. "Our previous development strategy, 1997-2002, did not address the public sector's inadequate implementation and administrative capacity…Our economy contracted in real terms and service delivery

Chronic malnutrition in PNG from the earliest studies has been considered related to the low protein and energy content of the typical PNG diet., i.e. related to quality of diet, reflecting socio-economic status, mother's knowledge and location rather than food insecurity *per se*.[10]

Trust within society is likely to be lower with high inequality; an inferior public sector performance adds mistrust. A recent World Bank study demonstrated better governance scores for PNG, from 1998 to 2004, for 'political stability', 'rule of law', 'control of corruption', and 'government effectiveness'. In contrast, the score for 'voice and accountability' showed little improvement (Kaufmann et al. 2005). With little general trust in society, the importance of voluntary associations in providing their own 'insurance' against vulnerability is raised.

In this setting, revisiting data on informal women organisations and members' nutritional status obtained in year 2000 as part of an IFAD evaluation sheds light on potential contributions of such groups in addressing their vulnerability (IFAD 2000). The present study uses survey data on women voluntary community based organisations (CBOs) randomly chosen in East Sepik and Simbu provinces; data were collected at CBO, household and individual levels, including anthropometric data of children under five.

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deteriorated. We entered the new Millennium with declining levels of household income and social indicators that were poor by regional standards" (Hon. Sir Moi Avei, KBE, MP Acting Minister for National Planning and Monitoring, Budget Speech, November 2004, Government of PNG).

[10] Mueller (2001: 421)"The bulkiness of the root crops, from which up to 80% of the total dietary energy is derived, may make it difficult for the consumption of sufficient volume for energy, protein or other nutrient requirements to be satisfied."

In PNG, genuine participation by civil society in community development has been limited. Government and donor interventions in PNG had created little social capital, or trust and "bonding". Most donor interventions remained sector specific and physical output oriented. At the time of the survey, it was difficult to find relevant interventions supporting community participation.[11]

The Northern Simbu Rural Development Project (NSRDP) funded by IFAD exemplifies difficulties involved. Women groups and other associations were formed to support communities in pursuing self-reliance. Nevertheless, social mobilisation for micro credit delivery and community owned development did not take off. Instead of exploring prevailing groupings, project staff formed new groups**.** A process would have been required with which to identify voluntary associations, empower them, develop skills, and generate the trust within groups prior to credit delivery. These empowerment processes are exacting, skill demanding in design and execution; they did not materialize.[12]

The survey mission interviewed CBO leaders and members in 31 CBOs in Simbu and 36 CBOs in East Sepik. While the cross-sectional data covered 142 households in Simbu and 168 households in East Sepik in 2000, only the data for 222

[11] One factor thwarting genuine community participation has been labelled the "cargo cult"; the rural elite with community leaders since long had been used to expect to receive free community services with no strings attached as to required self-help contributions. Most women groups at the rural community level were not supported, excepting interventions by AusAid, IFAD and Save the Children (East Sepik). Yet, even in these cases, the support remained sector specific without introducing a step-wise process of training for women to assume leadership roles.

[12] The NSRDP Project management team in year 2000 endorsed the need of changed modalities for an expected further phase, the evaluation team recommended continuation with emphasis on voluntary women associations, yet IFAD unexpectedly discontinued its assistance to PNG.

households (142 in Simbu and 80 in East Sepik) are used as the full set of variables is available only for these households. As some households have more than one child, we have first constructed the data for 389 children under 60 months old. Then, we have clustered all the samples at household level so that samples *within* a household are dependent on each other and those *across* different households are independent.

Mothers' Groups are spontaneously born to address local problems. Other CBOs may be created by external agencies, for example by a Government-supported program, by missionaries or by an NGO. In Simbu and East Sepik, the single largest category of CBOs visited belonged to the traditional Mothers' Groups, about 40% and 50%, respectively. In Simbu, about 15% of credit groups received support from the NRSDP. In Simbu and East-Sepik, about 20% of the CBOs met with belonged to the NGO category. Church groups, most of which are autonomous groups, created by religious organisations, represent respectively 21% and 26% of CBOs in Simbu and East Sepik.

The survey explored in depth the capabilities of CBOs. The survey pursued eight dimensions of capabilities for local organisations: (i) need assessment, (ii) organisation, (iii) quality of leadership, (iv) training, (v) resource mobilisation, (vi) management, (vii) sanctions and regulations and, finally, (viii) monitoring and evaluation for re-orientation of actions.[13] In turn, these eight dimensions were translated into a set of modules with questions administered to group leaders. Based on commonly agreed criteria and according to group leaders' responses, interviewers would grade CBOs with a discrete 5-grade ranking system. For each dimension, CBO would thus receive ranks from 1 (lowest degree of capability) to 5 (highest

[13] A matrix of the extended Shrimpton's approach is reported in Appendix 1 (Shrimpton 1995).

degree of capabilities). The ranking obtained would reflect the degree of autonomy of the CBO vis-à-vis external agents in performing its functions.

The analysis generates a comparison by CBO type, for: (i) church-related groups; (ii) Mothers' Groups; and (iii) others, a residual category comprising CBOs created by NGOs, Government Agencies and IFAD-sponsored NSRDP.[14] The average scores for the eight dimensions of organisational effectiveness are presented in Table 1.

The first finding is the absence of appreciable differences across the three categories of CBOs: we obtained a value of 2.67 for church groups, 2.67 for autonomous Mothers' Groups and 2.41 for those externally supported because most of the church groups are essentially autonomous groups. Second, church and Mothers' Groups tended to yield approximately the same average across the eight dimensions, with exceptions of 'sanctions and regulations' and 'training'. The average score was higher for church groups, given the existence of sanctions embedded in the respective religious doctrines.

Third, church and Mothers' Groups had higher averages for need assessment, resource mobilisation and monitoring and evaluation of results than those externally supported.[15] Thus, church and Mothers' Groups are better prepared to understand needs and scarcity of resources at the community level; they also are more active and flexible in the collection and mobilisation of funds (through fees or savings) for their own activities, even though total resources mobilised (including external sources)

[14] Categories (i) and (ii) in Table 1 clearly represent CBOs that received little or no external assistance.

[15] Differences for resource mobilisation and assessments, evaluation and monitoring are statistically significant.

were not necessarily higher than in CBOs externally supported. Finally, they are also keener on evaluating the effectiveness and modify their activities accordingly.

Table 1 Indices of CBO Capabilities

Capability Dimension	(a) Autonomous Mother's Groups (average)	(b) Church Groups (average)	(c) Externally Supported Groups (average)	t test for difference of (a) & (c) *	t test for difference of (b) & (c) *
1. Need Assessment	**2.31**	**2.35**	2.17	Insignificant	Insignificant
2. Organisation	3.30	3.28	3.21	Insignificant	Insignificant
3. Leadership	3.37	3.13	3.25	Insignificant	Insignificant
4. Training	1.57	1.82	1.71	Insignificant	Insignificant
5. Resource Mobilisation	***2.77***	***2.66***	**1.79**	**7.16****	**6.55****
6. Management	2.81	2.78	2.87	Insignificant	Insignificant
7. Sanctions & Regulations	2.31	2.57	2.57	Insignificant	Insignificant
8. Assessment: evaluation/monitoring:	***2.67***	***2.67***	**2.41**	**1.63 †**	**1.71 †**
OVERALL AVERAGE	2.67	2.67	2.41	Insignificant	Insignificant

Note: **= significant at 1% level. * = significant at 5% level. †= significant at 10% level.

IV. Methodologies

A. Hypotheses to be Tested

In our econometric analyses, we will highlight the effectiveness of women's voluntary community based organisations (CBOs) in improving child nutritional status by (1) comparing Autonomous Mothers' Groups and CBOs externally supported and (2) analysing the effects of the capability index, the average score of eight different components, on child nutritional indicators. More specifically, the following hypotheses are tested by the Heckman Sample Selection Model and the Propensity Score Matching Model. Statistical comparison can be made by the latter between the average difference of children's nutritional indicators (or Z scores) of Mothers' Groups and that of those externally supported. While we could compare the average of Z scores of all the children whose mothers belong to Mothers' Groups and that for CBOs externally supported, the simple comparison of averages may suffer

from the endogeneity problem if, for example, the outside interventions are not randomly distributed across different households due to their specific policy objectives, such as, poverty reduction.[16] Heckman Sample Selection Model and the Propensity Score Matching Model are employed in the present study to take account of the endogeneity problem.

More specifically, the following hypotheses are tested:

Hypothesis A: Autonomous Mothers' Groups more effectively operate than CBOs with external support in raising child nutritional status.

Hypothesis B: Autonomous Mothers' Groups with higher level of capabilities (or social capital) more effectively operate than Autonomous Mothers' Groups with lower level of capabilities in raising child nutritional status.

Hypothesis A is tested by both Heckman Sample Selection Model and Propensity Score Matching Method. Hypothesis B is tested only by the Heckman Model.

B. Heckman Sample Selection Model

First, the capability index, our proxy for social capital of CBO is estimated by OLS.

$$S_i = f_i (A_i, H_{1i}, L_i, D_i) \qquad (1)$$

where i denotes an individual child, Ai is the average age of group leaders, H_{1i} is the access to health services at community level, Li is whether the CBO is legally registered (used as an instrument), Di is the province dummy variable on whether a CBO is in East Sepik or in Simbu. The estimation is clustered at CBO level. The predicted capability index estimated by the equation (1) is used in the second stage of Heckman Model. The predictions of capability indices are used instead of their raw

[16] In our case, t test for the difference of average of Z scores of those two groups is statistically insignificant for both height-for-age and weight-for-age measures.

scores because the latter are likely to be endogenous in a sense that capabilities of CBOs are induced to be raised in response to lower children's nutritional status.

Then, we estimate the probability that each household belongs to Autonomous Mothers' Groups by probit model. In the first stage, the dependent variable is whether a household belongs to Mothers' Groups. This is estimated by the equation (2):

$$\Pr\{M_i = 1 | X_i\} = \Phi(h(X_i))$$

$$= \Phi(h(E_i, H_{2i}, D_i))$$

$$= X_i\beta + v_i \qquad (2)$$

where Ei is average schooling years of group leaders (used as an instrument), H_{2i} is the perceived trend of diarrhoea, and Di is a province dummy.

After controlling the first stage results, we estimate Z score for height for age or weight for wage in the second stage.

$$Z_i = h_i(\hat{S}_i, \hat{S}_i * D_i, D_i, a_i, H_{2i}) \qquad (3)$$

Here $\hat{S}_i$ is the capability index estimated for each CBO. Di is a province dummy (1 for East Sepik and 0 for Simbu). The interaction of $\hat{S}_i$ and Di, $\hat{S}_i$ *Di, is inserted to see any difference of the effects of capability on Z score in different provinces. a_i is a child's age in months and H_{2i} is the perceived trend of diarrhoea.

We assume that Zi in equation (3) is observed only if Mi =1 in the equation (2) where $M_i = 1$ if $M_i^* > 0$

$= 0$ otherwise

and $M^*_i = Y_i\gamma' + \varepsilon_i$ (2)'

M^* is the unobserved latent variable. $\varepsilon_i \sim N(0, 1)$.

We will estimate the following equation by the maximum likelihood.

$$E[Z_i | M_i = 1] = X_i\beta' + \rho\sigma_\varepsilon\lambda(Y_i\gamma') \qquad (4)$$

In the first step, we estimate the probit model for the selection rule (2)' to produce the maximum likelihood estimates of γ. For each observation in the selected sample, we compute

$$\hat{\lambda}_i = \varphi(Y_i\hat{\gamma}) \ / \phi(Y_i\hat{\gamma})$$

In the second step, we simply estimate the regression equation.

$$E[Z_i | M_i = 1] = X_i\beta' + \beta_\lambda\hat{\lambda}_i + \nu_i \qquad (4)'$$

where $\beta_\lambda = \rho\sigma_\varepsilon$. We can test the 'Hypothesis A' by checking the significance of β_λ coefficient in the equation (4)', the coefficient for the estimated value of the degree of sample selection, λ. If β_λ is significant, we can conclude that there is a sample selection bias arising from affiliation of a child's mother with a Mothers' Group, *i.e.*, belonging to a Mothers' Group has a positive impact on Z score, our nutritional indicator for children. 'Hypothesis B' can be simply tested by checking the significance of the coefficient for $\hat{S}_i$, the predicted capability index in the equation (3).

C. Propensity Score Matching Method

'Hypothesis A' is also tested by the propensity score matching model. This method first specifies a function matching the proximity of one household to another in terms of household characteristics and then households are grouped to minimize the distance between matched cases (Foster 2003). Applying an alternative estimation method is justified. First, the results of Heckman Sample Selection Model are sensitive to the specification, in particular the choice of instruments in the first stage. Second. the Propensity Score Matching Method does not require the linearity between the dependent variable or Z score and explanatory variables X in the Heckman Model.

Rosenbaum and Rubin (1983) proposed statistical matching using the propensity score, *i.e.* the predicted probability that an individual receives the treatment of interest (e.g. financial services, such as loans or savings in our case) to make comparisons between individuals with the treatment and those without. Methodological issues and programs for propensity score matching estimation are discussed in details by Becker and Ichino (2002). We will briefly summarise estimation methods for the propensity score matching based on Becker and Ichino.

The propensity score is the conditional probability of receiving a treatment (or of belonging to Mothers' Groups) given pre-treatment characteristics, X (or household characteristics).

$$p(X) = Pr\{D = 1 | X\} = E\{D | X\} \qquad (5)$$

where $D = \{0, 1\}$ is the binary variable on whether a household belongs to Mothers' Groups (1) or not (0) and X is the multidimensional vector of pre-treatment characteristics or time-invariant or relatively stable household characteristics in our context. It was shown by Rosenbaun and Rubin (1983) that if the distribution of Mothers' Groups is random within cells defined by X, it is also random within cells defined by p(X) or the propensity score.

The effect of Mothers' Groups can be estimated in the same way as in Becker and Ichino (2002) as:

$$\begin{aligned} \tau &\equiv E\{Z_{1i} - Z_{0i} | M_i = 1\} \\ &= E\{E\{Z_{1i} - Z_{0i} | M_i = 1,\ p(X_i)\}\} \\ &= E\{E\{Z_{1i} | M_i = 1, p(X_i)\} - E\{Z_{0i} | D_i = 0, p(X_i)\} | M_i = 1\} \end{aligned} \qquad (6)$$

where *i* denotes the *i-th* household, Z_{1i} is the potential outcome (as Z score) in the two counterfactual situations. Formally, the following two hypotheses are needed to derive (6) given (5).[17]

One possible procedure for statistical matching is *Stratification Matching* whereby the sample is split in *k* equally spaced intervals of the propensity score to ensure that within each interval test the average propensity scores of treated and control households do not differ. We did not use Stratification Matching as observations are discarded when either treated or control units are absent. Hence, we use other variants in matching estimators of the average effect of treatment on the treated, namely, *Nearest Neighbour Matching* and *Kernel Matching* (Becker and Ichino 2002)[18]. These two methods are explained in the Appendix 2.

V. Regression Results [19]

Table 2 presents the results for the equation (1). As expected, a higher educational level of the group leader leads to a higher capability index. If the CBO is far from the health-post, the capability index tends to be lower. Legally registered CBOs have higher capabilities. On average, CBOs in East Sepik have higher capability indices than those in Simbu.

[17] See Becker and Ichino (2002) for more details. Formally, two conditions called 'Balancing Hypothesis' and 'Unconfoundedness' have to be met (*ibid.*). Both conditions are met in our cases.

[18] We did not use *Radius Matching* as the results are sensitive to the predetermined radius.

[19] Descriptive statistics of the variables are found in Appendix 3.

Table 2 OLS Regression for Maturity Index

Dep. Variable: Maturity Index		
A_i: Age of the Group Leader	0.0178	(3.06) **
H_i: The distance (in walking time minutes) to nearest healthpost or clir	-0.0045	(-8.16) **
L_i: Whether the CBO is legally registered	0.4132	(3.18) **
D_i: Province Dummy (1= East Sepik and 0 = Simbu)	0.2125	(1.94) +
Constant	2.0386	(8.81)

Number of Observations =	300
Number of Clusters =	223
F(4, 222)=	32**
R-squared=	0.3328
Root MSE=	0.7086

Notes: 1.*Regression results are based on Huber-White Sandwich Estimator to obtain a robust variance estimate

2. ** =Significant at 1% level, * = Significant at 5% level, + = significant at 10% level.

Table 3 presents the results of Heckman Sample Selection Model. Case A (the first column) is the case where Z score of height for age is a dependent variable in the second stage and only a predicted capability index, not an interaction with the province dummy, is used as an explanatory variable together with other control variables. Case B (the second column) is same as Case A except that an interaction of the capability index and the province dummy is used in the second stage. The interaction is included to see if there is any difference of the effects of capability index on Z score in different provinces. Case C is same as Case A except that Z score of weight for age is a dependent variable in the second stage. In Case D, the interaction is added to Case C.

In the first stage, 'average schooling years of group leaders' is chosen as an instrument for the dependent variable on whether a household has a woman belonging to Mothers' Groups. This is a valid instrument as it is significant (and negative) in the first stage and it has little association with Z scores. This is because the more needs will arise to form an autonomous Mothers' Group among the community without educated leaders and the existence of educated leaders itself does not necessarily lead to children's better nutritional indicators.

Table 3 Heckman Sample Selection Model for Z Scores of Child Nutritional Conditions

	Case A		Case B		Case C		Case D	
Dep. Variable in the Second Stage:	**Height for Age**		**Height for Age**		**Weight for Age**		**Weight for Age**	
Interaction of Capability Index and Province Dummy:	**No**		**Yes**		**No**		**Yes**	
1st Stage: Dep. Variable: Whether a household has a woman belonging to Mother's Group								
E_i: Average Schooling Years of Group Leaders	-0.0854	(-3.49) **	-0.0852	(-3.45) **	-0.0465	(-2.77) **	-0.0577	(-3.06) **
H_{2i}:The perceived trend of diarrhoea.	-0.7201	(-6.09) **	-0.7203	(-6.10) **	-0.5242	(-4.85) **	-0.5527	(-4.99) **
D_i: Province Dummy (1= East Sepik and 0 = Simbu)	1.4799	(7.62) **	1.4807	(7.64) **	1.0517	(5.92) **	1.1275	(6.33) **
Constant	-0.2089	(-1.12)	-0.2105	(-1.13)	-0.3816	(-2.45) *	-0.3281	(-2.05)
2nd Stage: Dep. Variable:	**Z Score (Height for Age)**		**Z Score (Height for Age)**		**Z Score (Weight for Age)**		**Z Score (Weight for Age)**	
Predicted Capability Index	**-0.8166**	**(-0.94)**	**-1.5315**	**(-0.96)**	**0.5154**	**(1.64) +**	**1.3836**	**(2.24) ***
Predicted Capability Index*Di: Province Dummy	-	-	**1.0211**	**(0.53)**	-	-	**-1.2970**	**(-1.99) ***
Y_i: Child's Age (months)	0.0309	(2.01) *	0.0300	(1.90) +	-0.0142	(-1.79) +	-0.0091	(-1.36)
H_{2i}:The perceived trend of diarrhoea.	-0.2449	(-0.41)	-0.1470	(-0.25)	-0.7908	(-2.02) *	-0.8082	(-2.28) *
D_i: Province Dummy (1= East Sepik and 0 = Simbu)	-1.9532	(-1.63)	-4.5951	(-0.95)	1.3060	(1.52)	4.2943	(2.66) **
Constant	1.9563	(0.70)	3.8233	(0.91)	-4.7251	(-5.99) **	-6.6486	(-4.72)
β_λ **Sample Selection Effect of Mother's Group**	**0.1029**	**(0.11)**	**0.0238**	**(0.03)**	**2.9179**	**(5.49) ** **	**2.7655**	**(5.61) ** **
Number of Observations =	389		389		389		389	
Number of Censored Cbs. =	225		225		225		225	
Number of Uncensored Cbs. =	164		164		164		164	
Wald Chi ^{2} (5) (or (4))=	5.5600		6.1900		13.24*		14.67*	

Note: 1.** =Significant at 1% level, * = Significant at 5% level, + = significant at 10% level.

A main finding is that Z score of weight for age of Mothers' Groups is significantly higher than that of the rest (with external supports) after controlling for sample selection bias as suggested by the significantly positive coefficient of β_λ in Case C and Case D. However, β_λ is not significant in Case A and Case B where Z score of height for age is a dependent variable. The interaction of the capability index and the province dummy is negative and significant only in Case D. This implies that while Z scores of weight for age of children in East Sepik are generally higher than those in Simbu as implied by the positive and significant coefficient of the province dummy in Case D, higher capability index does not much increase Z score of weight for age of children in East Sepik. This result further suggests that the positive effect of capability index on Z scores of weight for age in Case C is mainly associated with the sample in Simbu.

This result is consistent with the qualitative survey which confirmed the CBO's better awareness of children's growth and nutrition in Simbu as shown in Table 4. In Simbu, more CBOs have child growth and nutrition as an objective than in East Sepik, in more groups such an objective is decided by members themselves, more groups provide information on child growth and nutrition to their members, more groups have organised child growth monitoring at some stage. However, all groups that had organised such monitoring were found to have discontinued this practice. On the contrary, the coefficient of the province dummy is negative and significant in Case A where height for age is a dependent variable, which implies that on average children in Simbu have higher Z score of height. This result is broadly consistent with studies that have found child growth in PNG shows strong regional differences, with highlands children being generally shorter but stockier than those from lowland areas (Mueller, 2001).

Table 4 CBOs' Awareness of Children's Nutrition and Growth

	Simbu (%)	East-Sepik (%)
Groups having child growth and nutrition as an objective	58	32
Groups where such objective is decided by members themselves	42	26
Groups providing information on child growth and nutrition to their members	33	6
Groups that have organised child growth monitoring at some stage	17	4
Groups that continued monitoring child growth	0	0

Source: IFAD (2000).

Regarding the results on other explanatory variables, the perceived trend of diarrhoea is negative and significant in all cases in the first stage and only in Case C and Case D (for weight for age) in the second stage. That implies women feel necessary to form the autonomous Mothers' Group if they perceive diarrhoea to be more prevalent. Increasing trend of diarrhoea worsens the score of weight for age, which is the temporary measure of mal-nutrition, but not that of height for age, the more permanent measure.

To see which component in the capability index is associated with the significant coefficient of predicted capability index for Z score in weight for age, we have repeated the estimation based on the same specifications (Equations (1)-(3)) for each component of the index. Important components to improve Z score of weight for age includes (a) need index (positive and insignificant, z score for significance of the coefficient =1.53), (b) resource mobilisation (positive and insignificant, z score=1.43), (c) sanction (positive and significant at 5 % level, z score =2.00), and (d) Training (positive and significant at 1 % level, z score=2.72).[20] It is noted that a few Mothers' Groups get some limited training.

[20] Coefficients and Z scores for the other variables in each case are broadly similar to those of Case D in Table 3.

Table 5 presents the results based on propensity score matching. These results are consistent with the results based on Heckman Sample Selection Model. Average Z scores of weight for wage of children in Mothers' Groups is significantly higher than those in the rest regardless whether nearest neighbour matching or Kernel matching is used. However, this result is not observed for Z score of height for wage. 'Hypothesis A' that mothers belonging to Autonomous Mothers' Groups has a positive and significant effect has been strongly corroborated by two different methodologies.

Table 5: Effects of belonging to Autonomous Mother's Group (Estimation using Bootstrapped Standard Errors)					
Z Score for Height for Age					
	Mother's Group	Others	**Average Effect**	S.E.	t value
Nearest Neighbour Matching					
	179	174	**-0.0033**	0.804	-0.041
Kernel Matching					
	179	216	**-0.302**	0.597	-0.604
Z Score for Weight for Age					
	Mother's Group	Others	**Average Effect**	S.E.	t value
Nearest Neighbour Matching					
	179	174	**0.498**	0.272	1.828 +
Kernel Matching					
	179	216	**0.397**	0.24	1.657 +
Note: 1.** =Significant at 1% level, * = Significant at 5% level, + = significant at 10% level.					
2. The Balancing Hypothesis is satisfied in all cases.					

VI. Concluding Observations

Drawing upon survey data collected in 2000, the present study analysed capabilities of women community-based organisations in rural Papua New Guinea comparing autonomous organisations with those that receive external support. We focus on the extent to which the behaviour of these organisations contributes to reducing prevalence of child malnutrition in member households.

The results of Heckman Sample Selection Model show that (1) autonomous Mothers' Groups are more efficient in improving nutritional status in weight for age

measure than those externally supported and (2) higher capabilities of these same groups are associated with lower underweight. The former result is also confirmed by the Propensity Score Matching Model. However, these results are mainly associated with households in Simbu, but not in East Sepik Province reflecting higher awareness of need for better nutrition and growth of children at community level in the former. In East Sepik, on the other hand, there were relatively few literate group leaders, child nutrition did not figure prominently as a group priority for members, and they received negligible information on child nutrition, with very little child growth monitoring.[21]

We have also investigated differential performance attributes associated with the ownership dimension, comparing autonomous Mothers' Groups with those receiving external support. Mothers' Groups tend to use resources more efficiently than the latter as suggested by the result of *t* test for difference of sub-component of capability index. This is generally consistent with the positive (though insignificant) effect of the autonomous way of resource use on the measure of weight for age. Our paper is one of the few to suggest the need to focus on the role of autonomous voluntary women's organisations in reducing the prevalence of child malnutrition in developing countries. What we did not explicitly was analyse the exact *mechanism* whereby those organisations operate to improve the nutritional status of children. Future work will need to shed both theoretical and empirical light on this issue.

A priori, though, we know that informal voluntary women associations, based on intra group trust, typically assist their members with consumption and income smoothening from savings and credit activity. Members to address especially the

[21] Save the Children (NZ), measured underweight in its intervention area, but data collected in year 2000 were not analysed at central level (Wewak) for organisational learning with feed back to mothers and communities.

widespread rural protein-energy malnutrition (PEM) in PNG need to access nutrition education with growth monitoring with which to diagnose location specific causes and solutions to underweight and stunting prevalence with capacity development for their leaders. Support for existing autonomous women organisations is a particularly relevant intervention in PNG, where governance with limited trust in formal institutions, and modest outreach of services, remain issues for large segments of the rural population. Designing external support to voluntary associations to avoid compromising the participation that is a precondition for sustainability remains an intriguing further issue to pursue.

Appendix 1: A matrix of capability index to assess institutional changes in food security and nutrition interventions

Indicator	None/Zero	Low	Mean/Fair	Good	Superior
1. Need Assessment	None: activities determined externally and imposed	Outsiders assess; no CBO involvement	Outsiders assess; interests of CBOs are considered	Community assesses; outsiders help in analysis and action choice	Community assesses and analyses action and sets priorities
2. Organisation	Management structure imposed and created externally	Imposed but some activities internalised by the community	Imposed but the community became active in management	The community uses already established community organisations	The community is involved and control management
3. Leadership	Leadership by external organisation and/or local elite; no election by members	Organisational support is independent of community structure (leaders elected but influenced by local élites)	Organisational support operating under leadership of independent agents	Community taking initiatives together with external agents (leaders elected by democratic voting)	Organisational support fully represents variety of community interests and controls external agents
4. Training	Community organisation with workers & receive no training	Training of community organisation workers determined externally and imposed	Community organisation proposes but support decided externally	Short local preservice training plus regular in-service training provided by outsiders	Short local preservice training plus regular in-service training provided by supportive local supervisors/trainers
5. Resource Mobilisation	No resource contribution by community. No fees for services. Externally financed.	Village agents externally paid. Fees for services; but community has no control over money collected	Community undertakes fund raising and self-help activity; **fees** paid, but no community control over expenditure. Agents are voluntary.	Occasional community fund-raising; fees; community controls allocations of money. Agents voluntary.	Community mobilises funds from internal and external sources. Controls allocation of money, pays village agents.
6. Management	Induced by external support (ex. WDS). No clear objectives	Group manages but is advised externally. Process-oriented objectives, no targeting (curative, not preventive)	Group responsible and monitors. No targeting. More curative than preventive.	Impact oriented. Group responsible and monitors. Interventions targeted to at-risk groups. More curative than preventive.	Impact oriented. Group is responsible and monitors. Interventions targeted to at-risk groups

Table A.1 (continued)

Indicator	None/Zero	Low	Mean/Fair	Good	Superior
7. Sanctions & Regulations	No bylaws. No sanction system.	Externally imposed bylaws/sanction system.	Group set its own bylaws/sanction system.	Group set its own bylaws & sanction system recognised by decentralised local bodies. Sanctions/penalties meted out to those that do not respect rules (free riders)	A group set its own bylaws & sanctions within existing formal/legal regulatory systems and is recognised by decentralised local bodies. Sanctions/penalties meted out to those that do not respect rules (free riders)
8. Assessment: evaluation/monitoring: Orientation of actions	No information system used locally. Nobody aware of problem dimension or program progress	Information sent to outsiders, who are aware of problem dimension and program progress, but no feedback to community	Village agent uses information for daily activities; and is aware of problem dimension & program progress	Community receives information necessary for decision-making from village agent. Community sub-committee aware of problems, program progress & benefits.	**Community sub-committee disseminates information so that entire community is aware of problems, plans, & program progress & benefits.**

Appendix 2: Tables on Capability Indices of CBOs

Nearest Neighbour Matching

Nearest Neighbour Matching is the method to take each treated unit and search for the control unit with the closest propensity score. Let T be the set of treated units (i.e. households belonging to Mother's Groups) and C be the set of control units (i.e. others), and Z_i^T and Z_j^C be the observed outcomes (i.e. Z score) of treated and control units. $C(i)$ denotes the set of control units matched to the treated units i with an estimated value of the propensity score of p_i. In *Nearest Neighbour Matching,*

$$C(i) = \min_j \left\| p_i - p_j \right\|$$

Denoting the number of controls matched with observation $i \in T$ by N_i^C and define the weights $\omega_{ij} = \frac{1}{N_i^C}$ if $j \in C(i)$ and $\omega_{ij} = 0$ otherwise. The number of units in the treated group is N^T. Then the formula for a matching estimator is:

$$\tau = \frac{1}{N^T} \sum_{i \in T} \left[Z_i^T - \sum_{j \in C(i)} \omega_{ij} Z_j^C \right]$$

$$= \frac{1}{N^T} \left[\sum_{i \in T} Z_i^T - \sum_{i \in T} \sum_{j \in C(i)} \omega_{ij} Z_j^C \right]$$

$$= \frac{1}{N^T} \sum_{i \in T} Z_i^T - \frac{1}{N^T} \sum_{j \in C} \omega_j Z_j^C$$

where $\omega_j = \sum_i \omega_{ij}$.

Kernel Matching

With *Kernel Matching* all treated are matched with a weighted average of *all* controls with weights that are inversely proportional to the distance between the propensity scores of treated and controls (Becker and Ichino, 2002). Then the formula for a matching estimator is:

$$\tau = \frac{1}{N^T} \sum_{i \in T} \left\{ Z_i^T - \frac{\sum_{j \in C} Z_j^C G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in C} G\left(\frac{p_k - p_i}{h_n}\right)} \right\}$$

where $G(\ .)$ is a kernel function and h_n is a bandwidth parameter. We use a Kernel Matching Estimator because the results are not subject to a specific radius or a number of stratification.

Appendix 3: Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Capability Index of CBOs	323	2.63	0.88	1.00	4.75
Age of the Group Leader	397	38.25	7.65	22.00	60.00
The distance (in walking time minutes) to nearest healthpost or clinic.	383	77.91	80.51	0.00	360.00
Whether the CBO is legally registered	412	0.28	0.45	0.00	1.00
Province Dummy (1= East Sepik and 0 = Simbu)	423	0.57	0.50	0.00	1.00
Z Score of Height for age	423	−0.52	3.83	−9.98	9.99
Z Score of Weight for age	423	−0.33	2.87	−3.83	9.99
Ai: Child's Age (months)	416	27.07	17.14	0.16	65.68
H2i:The perceived trend of diarrhoea.	404	0.29	0.71	−1.00	1.00
Ei: Average Schooling Years of Group Leaders	412	7.16	4.54	0.00	17.00
H2i:The perceived trend of diarrhoea.	404	0.29	0.71	−1.00	1.00

References

Agarwal, Bina. 2002. "The Hidden Side of Group Behaviour", in Judith Heyer, Frances Stewart and Rosemary Thorp, *Group Behaviour and Development, Is the Market Destroying Cooperation?,* UNU/Wider Studies in Development Economics, Oxford: Oxford University Press.

Alderman, Harold, John Hoddinott, and Bill Kinsey 2002. "Long Term Consequences of Early Childhood Malnutrition", Mimeo, Department of Economics, Dalhousie University, Halifax, Canada.

Alkire, Sabina, and Severine Deneulin. 2002. "Individual Motivation and Consequences for Within-group Behaviour" in Judith Heyer, Frances Stewart and Rosemary Thorp, *Group*

Behaviour and Development, Is the Market Destroying Cooperation?, UNU/Wider Studies in Development Economics, Oxford: Oxford University Press.

Anderson, Siwan, and Jean-Marie Baland. 2001. "The Economics of Roscas and Intra-household Resource Allocation", W.P. University of Namur, Aug. 2001.

Becker, Sascha O., and Andrea Ichino. 2002. "Estimation of average treatment effects based on propensity scores", *The Stata Journal* 2(4): 358-377.

Bianchi, Tito. 2002. "Leaders and Intermediaries as Development Agents", in Judith Heyer, Frances Stewart and Rosemary Thorp, *Group Behaviour and Development, Is the Market Destroying Cooperation?,* UNU/Wider Studies in Development Economics, Oxford: Oxford University Press.

Binswanger, Hans, and Swaminathan S. Aiyar. 2003. "Scaling Up Community-Driven Development, Theoretical Underpinnings and Program Design Implications." World Bank Policy Research Working Paper. Washington D.C.. World Bank.

Chaudhuri, Shubhan. 2006. "Poverty, Risk and Vulnerability", presented at the conference "Frontiers in Practice: Reducing poverty through better diagnostics", March 2006. Washington D.C.: World Bank (www.worldbank.org).

Christiaensen, Luc, and Harold Alderman. 2001. "Child Malnutrition in Ethiopia, Can Maternal Knowledge Augment the Role of Income", World Bank Africa Region Technical Paper No. 22, October 2001, Washington D.C.: World Bank.

Dercon, Stefan, 2006, "Risk, Growth and Poverty", presented at the conference "Frontiers in Practice: Reducing poverty through better diagnostics", March 2006, Washington D.C.: World Bank (www.worldbank.org).

Eklund, Per, Katsushi Imai, and Fabrizio Felloni. 2006. "Women's Organisations, Maternal Knowledge, and Social Capital to Reduce Prevalence of Stunted Children - Evidence from Rural Nepal", forthcoming in *Journal of Development Studies*.

Fafchamps, Marcel. 2005. "Social Capital and Development", forthcoming in *Journal of Development Studies.*

Foster, E. Michael, 2003, "Propensity Score Matching: An illustrative Analysis of Dose Response", *Medical Care,* 41(10), 1183-1192.

Grootaert, Christiaan, and Thierry van Bastelaer. 2002. *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners*, Washington D.C.: World Bank.

Harell-Bond, Barbara. 1986. *Imposing Aid, Emergency Assistance to Refugees.* New York. Oxford University Press.

Hayami, Yujiro. 2001. *Development Economics–From the Poverty to the Wealth of Nations*, Second Edition, New York: Oxford University Press, 2001.

Heyer, Judith, Frances Stewart and Rosemary Thorp eds. 2002. *Group Behaviour and Development, Is the Market Destroying Cooperation?,* UNU/Wider Studies in Development Economics, Oxford: Oxford University Press.

IFAD. 2000. "Country Programme Evaluation", Rome, the IFAD, Office of Evaluation & Studies, IFAD, Rome.

IFPRI. 2006. "Africa: Improving Health Through Agriculture", http://www.ifpri.org/media/20060502Nairobi.asp accessed on 18th May 2006.

Kameda, T., Stasson, M.F., Parks, C.D., Zimmerman, S.K., & Davis, J.H.. 1992. "Social dilemmas, subgroups, and loss of motivation in task-oriented groups" *Social Psychology Quarterly*, 55: 57-65.

Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi. 2005. "Governance Matters IV: Governance Indicators for 1996-2004", World Bank, Washington D.C. 2005.

Kikuchi, Masao and Yujiro Hayami. 1980. Inducements to Institutional Innovations in and Agrarian Community, *Economic Development and Cultural Change.* 29-1: 21-36.

Mahmud, Simeen. 2001. "Women's Groups in Rural Bangladesh." Judith Heyer, Frances Stewart and Rosemary Thorp, *Group Behaviour and Development, Is the Market Destroying Cooperation?,* UNU/Wider Studies in Development Economics, Oxford: Oxford University Press.

Mueller, Ivo. 2001 "The Spatial Pattern of Child growth in PNG" in R.M. Bourke, M.G. Allen, J.G. Sainsbury (eds.), "Food Security for Papua New Guinea" Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, PNG University of Technology, Lae 26-30 June 2000. Canberra*: Australian Centre for International Agricultural Research (ACIAR) Proceedings* 99. 2001: 414-431.

Rosenbaum, Paul R., and Donald B. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects", *Biometrica* 70(1): 41-55.

Shrimpton, Roger. 1995. 'Community Participation in Food and Nutrition Programme: An Analysis of Recent Governmental Experiences', Chapter 13 in *Child Growth and Nutrition in Developing Countries,* Per Pinstrup-Andersen, et al. New York: Cornell University.

Smith, Lisa C, Usha Ramakrishnan, Aida Ndiaye, Lawrence Haddad, and Reynaldo Martorell. 2003. "The Importance of Women's Status for Child Nutrition in Developing Countries." Research Report 131. Washington D.C.: IFPRI.

World Bank, 2006, Directions in Development, Repositioning Nutrition as Central to Development, A Strategy for Large Scale Action, Washington D.C. www.worldbank.org.