AUGUST 2007

IIDE
discussion paper:
200708-02

IIDE institute for international and development economics

DISCUSSION PAPER

VULNERABILITY AND POVERTY DYNAMICS IN THE MALDIVES

August 2007

IIDE discussion paper 200708-02

Hans de Kruijk
ERASMUS UNIVERSITY ROTTERDAM
dekruijk@few.eur.nl

Martine Rutten
ERASMUS UNIVERSITY ROTTERDAM &
NETHERLANDS MINISTRY OF FINANCE
mmrutten@gmail.com

JEL codes: C23, C25, I32

Key words: vulnerability, income poverty dynamics, Maldives, Logit regression, probability of escaping from or falling into poverty

Stichting IIDE, Institute for International & Development Economics
Email: i4ide@intereconomics.com Website: www.i4ide.org

VULNERABILITY AND POVERTY DYNAMICS IN THE MALDIVES

Hans de Kruijk[1] and Martine Rutten[2]

[1] *Erasmus University Rotterdam, Netherlands, and Team Leader of the Maldives Vulnerability and Poverty Assessments 1997/8 and 2004*
Email address for correspondence: dekruijk@few.eur.nl
Postal address: Erasmus University Rotterdam, P.O.Box 1738, 3000DR Rotterdam, Netherlands
Tel: +31 104082142, Fax: +31 104089161

[2] *Policy advisor of the Dutch Ministry of Finance and External Research Fellow at the School of Economics, Erasmus University Rotterdam, Netherlands*[1]

Abstract:

Despite rapid economic and social development of the Maldives, the vulnerability of the island population in terms of poverty remains high. Using household panel data for the period 1997/98 – 2004 we show that, although the majority of the poor manages to escape from poverty, a substantial part of the non-poor falls back into poverty at the same time. Using Logit regression analysis, the most influential determinants of escaping household poverty are shown to be: the level of education, participation in community activities, and the proportion of adults employed. Factors that have the largest impact on impeding a poverty escape are: the proportion of household members not working due to bad health, living in the North, and the proportion of female household members. The former two factors, in addition to household size, are also most influential on the odds of falling into poverty. Working in tourism, or the public sector, and taking out a loan to invest are important factors that prevent households from falling into poverty. Policy implications of these results are not only relevant at government level but also at household level. The government may consider paying more attention to the development of the two Northern regions, improve access to good quality education and health care, and further develop (private sector) tourism across the country. Household coping strategies involve investing in education, entering the labour market (especially in tourism and the public sector) and family planning.

JEL classification: C23, C25, I32

Keywords: vulnerability, income poverty dynamics, Maldives, Logit regression, probability of escaping from or falling into poverty

The authors wish to acknowledge the valuable comments and suggestions from Joseph Francois, Karen van der Wiel and Willem van den Andel. This paper presents the opinions of the authors, and is not meant to reflect the opinion or official position of any institution with which they are or have ever been affiliated with. The responsibility for any remaining errors or infelicities remains with the authors.

1. Introduction

The Maldives witnessed rapid economic growth over the recent period, averaging eight percent per year over the last decade. The country has also achieved many of the Millennium Development Goals (MDGs). However, despite high economic growth and social progress the Maldives continues to face major developmental challenges. These include the vulnerability of the island population and the wide disparities in income and access to social services and infrastructure, particularly between the capital Male' and the outer atolls.

This paper analyses the vulnerability of the island population of the Maldives over the period 1997 to 2004. It draws upon the Vulnerability and Poverty Assessment surveys that have been carried out for the Maldives in 1997 and 2004 (from hereon referred to as VPA I and VPA II, respectively)[2]. A previous paper examined the extent of poverty in the Maldives for the years 1997 and 2004 by constructing a composite poverty index based on people's priorities.[3] Since VPA II was carried out approximately half a year before the Tsunami of December 26 2004 hit the Maldives, its effects on development are not taken into account in the present paper. A forthcoming paper will cover this issue. Nonetheless, this paper provides invaluable information on the vulnerability and poverty situation of the island population just before the Tsunami, which is needed to assess the impact of the Tsunami. More importantly, the analyses of the development patterns of different types of households presented in this paper will also be helpful for designing optimal recovery strategies and the best way for households to make the fullest use of relief and other support.

Vulnerability is defined here as the probability that a household will experience an episode of poverty over time. It is measured in terms of changes in income poverty of households, with some households remaining poor (non-poor) and some households that were previously poor (non-poor) escaping from (falling into) poverty. We subsequently use Logit regression analysis to determine the factors behind these observed changes. It enables us to identify not only possible household coping strategies, but also appropriate and targeted government policies that may help households to escape from or remain out of poverty.

The paper fits well within the general class of literature on the measurement and analysis of vulnerability.[4] While an overview of the different methods used to measure and analyse

[2] See Appendix 1 for detailed information on VPA I and VPA II.
[3] Kruijk and Rutten (2007).
[4] See for example Alayande and Alayande (2004) for a study on vulnerability in Nigeria, Chaudhuri et al. (2002), Pritchett et al. (2000) and Suryahadi and Sumarto (2003) on vulnerability in Indonesia, Dercon and Krishnan (2000) for an analysis of vulnerability in Ethiopia, Gaiha and Imai (2006) on vulnerability in rural India, Glewwe and Hall's (1998) study on vulnerability in Peru, Kamanou and Morduch (2004) for

vulnerability[5] is beyond the scope of this paper, our paper is similar to that of Jalan and Ravallion's (1998, 2000) study on rural China, McCulloch and Baulch's (1999, 2002) analysis for rural Pakistan and Lawson et al.'s (2006) study on Uganda in that it applies regression analysis to a model of a discrete dependent variable measuring the dynamic poverty status on a set of independent variables in order to explain the probabilities of entering and exiting poverty observed over a certain time period.

The remainder of the paper is organised as follows. Section 2 shortly describes the geographic and socio-economic context in the Maldives that sets the scene for the remainder of the paper. Section 3 examines the vulnerability of the island population over the period 1997 to 2004 in terms of changes in household income poverty. Section 4 identifies the factors that are likely to have caused the observed changes in income poverty. The final section concludes.

2. The Maldives context

The island universe in Maldives is particularly varied and diverse. The 1,190 islands that make up the Republic are grouped into 26 natural atolls that together form a chain 820 km in length and 130 km at its widest point, set in an area of more than 90,000 square km of the Indian Ocean. Nearly 200 islands are inhabited. All are very small. Only 33 inhabited islands have a land area of more than 1 square km and no fewer than 75 islands – more than one-third of the total – have less than 500 inhabitants, while 100 islands – 50 percent of the total – have less than 1,000 inhabitants. This gives the Maldives a geography that is extreme, even by the exceptional standards of small archipelagic states.

The small size of the inhabited islands, in terms of both land area and population, and the large distances between them, especially when measured in travel times by the common means of transport, the *dhoni*, implies severe diseconomies of scale. These are felt hardest when delivering health and education services (even at basic levels) and providing their infrastructure: nearly all materials need to be imported so construction costs are many times higher than in continental developing countries. Development potential is further constrained by the lack of mineral resources, the lack of rivers and streams, poor soils that are ill-suited for agriculture, and the dependence on rainfall for agriculture and for affordable potable

---

an analysis of Cote d'Ivoire, Kurosaki (2006a,b,c) for a study on vulnerability in Pakistan, Ligon and Schechter (2002, 2003) on vulnerability in Bulgaria and Sen's (2003) analysis of vulnerability in rural Bangladesh.

[5] Baulch and Hoddinott (2000), Cafiero and Vakis (2006), Calvo and Dercon (2005), Coudouel et al. (2002), Dercon (2001), Hoddinott and Quisumbing (2003), Kamanou and Morduch (2004), Kurosaki (2006c) and Ligon and Schechter (2002, 2004), together provide a good overview of the literature.

water. Many people also find it difficult or expensive to reach social services, since even when these are available on nearby islands, people do not have the options common in continental countries of using a bicycle or simply walking.

Despite these constraints, the Maldives has made significant progress and has recently graduated from least developed country status – a feat no other country has ever managed. Economic growth has been impressive, with an annual growth rate of growth of about ten percent during the 1980s and early 1990s – and about seven percent per annum between 1997/98 and the middle of 2004, the two measuring points of the VPA surveys. Population growth has also declined – from three percent per year in the late 1970s to below two percent currently. As a result, growth in GDP per capita has also been high – at around 5% per year. In 1995 prices, per capita GDP increased from around $400 in 1977 to nearly $1,700 in 1997 – and to more than $2,400 in 2004.

Rapid economic growth has largely been due to the success of the tourist industry. Between 1997 and 2004 the number of resorts increased from 73 to 86 and the number of annual tourist arrivals from 366,000 to more than 600,000. The other activity of importance outside tourism, especially in terms of employment and income on the islands, is fisheries and its related processing - between 1977 and 2004, exports of marine products increased from 18,000 to 75,000 tons. Including all supporting activities in tourism such as parts of manufacturing, construction, trade, transport and other services, tourism represents well over half of the economy and the share of fisheries including fish processing accounts for about twelve percent.

The Maldives is on track to achieve most of the Millennium Development Goals (MDGs) by 2015. Many characteristics of poverty found in other parts of South Asia and in Africa are not present in the Maldives. There is no starvation, although there are serious nutritional problems but there is no link between income and nutrition status. Primary education is already practically universal implying no gender disparities in enrolments and literacy rates are close to 100 percent for the age-group 15-24 years. Child mortality rates and maternal mortality rates are declining rapidly both in Male' and in the atolls. The incidence of HIV/AIDS is very low and malaria has been eradicated. There is no urban begging, even though incomes of many people are low. And while many houses in the capital Male' are getting more and more overcrowded due to continuous and increasing rural-urban migration, there are no slum dwellers.

However, despite rapid economic growth and social progress the Maldives continues to face major developmental challenges. These include the vulnerability of the island population and the wide disparities in income and access to social services and infrastructure, particularly between the capital Male' and the outer atolls.

The coming sections aim to identify not only who is poor and at what times, but also the underlying factors causing households either to fall into or escape from poverty. Such analysis will be indicative of appropriate government policies for sustainable development, as well as household coping strategies.

3. Vulnerability in the Maldives: income poverty dynamics

Unit of measurement and analysis

The VPA surveys include twelve living standard indicators, all of which impinge upon vulnerability, i.e. the risk of experiencing an episode of poverty.[6] The most relevant indicator, however, is income since individuals or households with sufficient income can – to some extent – 'buy themselves' out of poverty along the other living standard dimensions and so become less vulnerable overall. We therefore use income as the indicator with which to track changes in the poverty situation.[7]

The unit of analysis is the household. Moving from the household to the individual level simply means dividing the household income by the number of household members. This approach neglects economies of scale within the household and intra-household income inequality, proper diagnosing of which was beyond the scope of the VPA surveys.

Household income itself is a complex concept and difficult to measure in a developing country where a large part of the labour force is either self-employed or of the own-account worker type. Like most poverty studies we therefore use per capita household expenditures as a proxy for per capita household income. Per capita household expenditures are calculated as the sum of per capita household cash expenditures on consumer goods, the value of own-produced consumption (based on local market prices), the value of salaries in kind, and actual housing rent paid. They exclude gifts received (since donors will report these items in their own consumption expenditures) and the imputed rent of owner-occupied housing (since there is no housing market on the islands).

[6] See Kruijk and Rutten (2007) for more detail.

[7] We are well aware of the fact that changes in income do not fully capture all aspects of vulnerability, but in fact no single indicator will. For example, a household may be part of a broader network, which is able to provide resources in case a negative event occurs. See for example World Bank (2001) Chapter 1, Box 1.3 and Coudouel et al. (2002) for more on the measurement of vulnerability.

Panel data

We use a panel of 1,169 households, almost half of the households of the VPA II survey sample which also had been interviewed for VPA I to analyse vulnerability in the Maldives. The panel is limited to the island population , i.e. the capital Male' is excluded, since people on the islands move less frequently compared to Male' and even if they do so it is generally known where they went to. The geographical dispersion of the panel households is wide, ensuring that the results apply to all atolls and regions. Table 1 summarises the characteristics of the surveys and the panel used to assess the vulnerability of the island population.

Table 1: Summary information on the sample and panel dataset

Sample\Panel	**Atoll sample VPA-1**	**Panel sample VPA-1**	**Atoll sample VPA-2**	**Panel sample VPA-2**
Number of households in the sample	2,286	1,169	2,421	1,169
Total number of persons in the sample	14,203	7,616	14,603	7,180
Average household size (persons)	6.2	6.5	6.0	6.1
Percentage of women in the household	52	52	53	53
Average age of the sample population	21	21	25	25
Average level of education* of the adult population	1.47	1.47	1.62	1.63
Average expenditures per person per day	19	19	26	25

*1=low, 2=middle, 3=high
Source: VPA II

The full dataset and the panel subset for both periods are alike, indicating that the panel offers a good representation of the entire population. There were, however, changes between 1997 and 2004. The average household size decreased, and both per capita expenditures and average levels of education increased.

Income poverty dynamics

The panel data provide valuable insights into the dynamics of poverty. They not only show to what extent poverty has changed from 1997 to 2004, but also reveal more about those who are currently poor, showing what proportion were also poor previously and what proportion has fallen into poverty from higher levels of income. Tables 2 and 3 present the panel households by income class in absolute numbers and percentage distribution, respectively. These so-called transition tables distinguish five income classes based on three poverty lines of 7.5, 10 and 15 rufiyaa per person per day, plus the international poverty line used for the Millennium Development Goals (MDGs), Rf. 4.34, which is the rufiyaa equivalent of one dollar per person per day in terms of purchasing power parity.

Table 2: Number of panel households by income class, 1997 and 2004

2004 / 1997	<4.3	4.3-7.5	7.5-10	10-15	>15	
<4.3	0	3	8	16	22	49
4.3-7.5	4	6	13	26	78	127
7.5-10	0	6	9	34	85	134
10-15	4	12	16	47	186	265
>15	10	17	21	66	480	594
	18	44	67	189	851	1169

Source: VPA II

Table 3: Percentage distribution of households by income class, 1997 and 2004

2004 / 1997	<4.3	4.3-7.5	7.5-10	10-15	>15	
<4.3	0%	0%	1%	1%	2%	4%
4.3-7.5	0%	1%	1%	2%	7%	11%
7.5-10	0%	1%	1%	3%	7%	11%
10-15	0%	1%	1%	4%	16%	23%
>15	1%	1%	2%	6%	41%	51%
	2%	4%	6%	16%	73%	100%

Source: VPA II

The transition tables confirm that between 1997 and 2004 income poverty fell considerably for all poverty lines. For instance, between 1997 and 2004, the proportion of households with less than Rf.15 per person per day fell from approximately 49% to 27%. The diagonal elements show which households were in the same income class both in 1997 and in 2004. Only 47% of the households remained in the same income class, showing just how dynamic the poverty situation in the Maldives is. Of the 53% of households that changed income class, around 40% graduated to a higher class (above diagonal elements) and around 13% fell into a lower class (below diagonal elements).

The final row of Table 3 shows that in 2004, 73% of households had incomes greater than Rf. 15 per person per day; the remaining 27% can be considered poor. Of this figure 17% can be classified as chronic poor since their income was also below Rf.15 in 1997; the other 10% had been non-poor seven years earlier but had fallen into poverty. These can be classified as vulnerable. The final column of Table 3 shows that in 1997 51% of the population had incomes greater than Rf. 15 per day. The remaining 49% were poor but of these households 32% managed to escape poverty during the period and were non-poor by 2004. This flow in and out of poverty is depicted graphically in Figure 1.

Figure 1 shows that, during the seven-year period, three out of five of those poor households in 1997 managed to escape from income poverty. On the other hand, one in five of the non-poor households fell into poverty. In order to determine whether these findings are robust and insensitive to the choice of the poverty line, the poverty dynamics analysis has been repeated using a poverty line of Rf.10 per person per day. The results are displayed in Figure 2.

Figure 1: Income poverty dynamics for the island population of the Maldives, Rf.15 poverty line

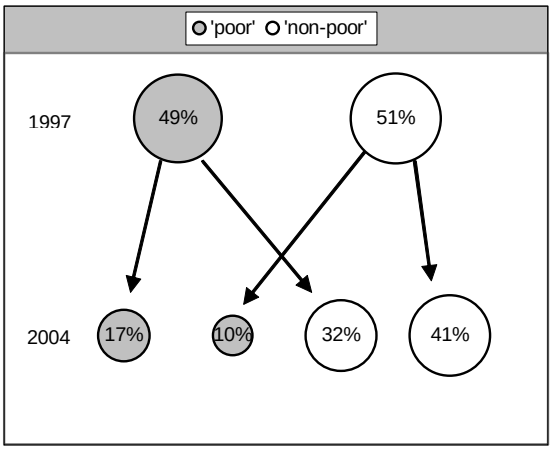
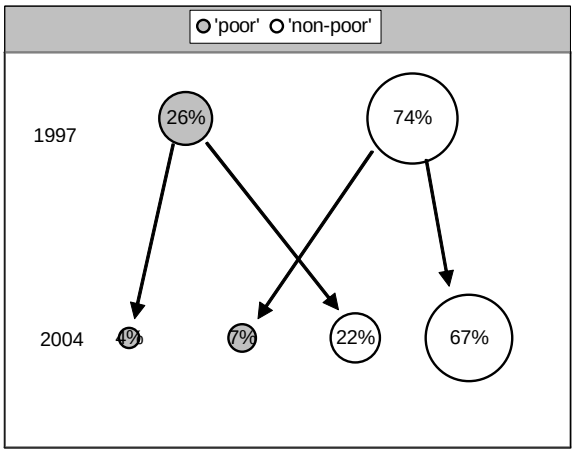


Figure 2: Income poverty dynamics for the island population of the Maldives, Rf.10 poverty line



The figures indeed confirm that the pattern of movement in and out of income poverty for the two poverty lines is similar. In both cases, the majority of those who were income poor in 1997 had escaped from poverty. Those who were income poor in 2004 belonged to one of two groups: those who had also been poor in 1997 and, in this case a larger group, those who had been non-poor in 1997 but had subsequently fallen into poverty.

These large movements between income groups clearly indicate that the income poverty situation is quite dynamic. It implies that anti-poverty programmes should be designed not just to lift the poor out of poverty, but also to prevent the non-poor from falling into poverty.

4. Factors influencing entry into and exit out of poverty in the Maldives: econometric analysis

In order to understand the factors associated with the observed poverty transitions, we apply a multivariate econometric analysis which models a discrete dependent variable measuring dynamic poverty status.

We consider two important sub-groups within the panel: those who escaped from poverty between 1997 and 2004 and those who fell into poverty over the same period. For the former we carry out a so-called ‘escape’ regression, which is applied to all households that were poor in 1997. For the latter we carry out a so-called ‘fall’ regression, which is applied to all households that were non-poor in 1997. The escape and fall regressions have been estimated

using the binomial Logit estimation method, where the dependent variable takes a value of 1 if the poverty situation of a household in 2004 is different from that of 1997 and a value of 0 if no change in the poverty situation has occurred.[8]

We distinguish the poor from the non-poor using a poverty line of Rf. 15 per person per day. This is of such a level - the highest of all poverty lines considered in section three - that transitions across this poverty line are substantive and meaningful. This is to counteract some of the criticism of Ravallion (1996) on the discrete dependent variable approach to modelling poverty transitions, mainly with respect to its loss of information compared to an approach of modelling directly the underlying variable measuring the standard of living.

The explanatory variables included in the regressions have been chosen using an iterative procedure. A broad impression of poverty dynamics was obtained starting from a theoretical model, which was subsequently fine-tuned as data were accumulated by means of OLS regression analyses of the dependent variable on various combinations of the explanatory variables.[9]

Table 4 displays the results in terms of the marginal effects of each variable, together with the z-value and significance of the coefficient associated with each of the explanatory variables.

[8] The binomial Logit estimation method was preferred over a binomial Probit estimation since it obtained a better fit with the data.
[9] See Appendix 2 for more detail.

Table 4: Binomial Logit of escape and fall regressions

	Escape		Fall	
Number of Observations	560		563	
Observed probability	0.64		0.2	
Independent variables (X)	**Marginal effect**	**z-statistic**	**Marginal Effect**	**z-statistic**
Fixed Term	-0.1159	-0.85	-0.4156	-4.9***
Determinants at household				
Human capital				
Initial number of household members	-0.0112	-1.9*	0.0157	2.5**
Change in number of household members	-0.0208	-3.5***	0.0265	4.5***
Initial number of young household members	0.1242	1.3	0.1303	1.4
Change in number of young household members	-0.1039	-1.2	0.0729	0.9
Initial proportion of adults employed	0.1334	2.1**		
Change in proportion of adults employed	0.1592	3.2***		
Proportion employed in trade and transport VPA-2	0.1006	1.2	-0.1298	-1.8*
Proportion employed in (semi) government VPA-2	-0.0376	-0.6	-0.2904	-3.7***
Proportion employed in the tourism sector VPA-2	0.0945	1	-0.3352	-2**
Proportion employed in the agriculture sector VPA-2	-0.1467	-1.8*	-0.0204	-0.3
Proportion employed in the fishing sector VPA-2	-0.0188	-0.3	-0.0180	-0.3
Proportion employed in manufacturing sector VPA-2	0.0072	0.1	-0.0205	-0.4
Initial proportion employed working as employee			0.1016	1.6
Change in proportion of working as employee			0.0785	1.5
Initial proportion of working as own account worker	-0.0608	-1.1		
Change in proportion of own account workers	-0.0728	-1.6		
Dummy for receiving remittances	0.0988	3.1***	-0.0547	-1.5
Initial average level of education	0.1983	3.1***		
Change in average level of education	0.0956	2**		
Other capital				
Dummy for taking a loan to invest VPA-2	0.0936	1.7*	-0.1346	-1.9*
Dummy for investing without taking a loan VPA-2	0.0569	0.8		
Initial proportion of members voluntary participating in community activities	0.1894	2**	-0.0901	-1
Change in proportion of members voluntary participating in community activities	0.0892	1.3	-0.1070	-1.5
External determinants				
Household-specific				
Proportion of household members female VPA-2	-0.1531	-2**		
Dummy for female-headed household VPA-2	-0.0179	-0.6		
Proportion of members not working because of bad health VPA-2	-0.2941	-2.9***	0.1740	1.8*
Regions				
Dummy for Northern region	-0.1598	-3.4***	0.2649	5***
Dummy for Northern Central region	-0.1756	-3.7***	0.2040	3.6***
Dummy for Central region	-0.0772	-1.3	0.1567	2.6***
Dummy for Southern Central region	-0.0472	-1	0.0704	1.1
Pseudo R-squared (McFadden)	**0.18**		**0.19**	
Proportion of correct predictions	**0.71**		**0.83**	
Predicted probability at mean of X	**0.68**		**0.14**	

* Significant at 10% level ** Significan at 5% level *** Significant at 1% level
Empty cells indicate that the variables are not included in the regression.

Using the poverty escape regression, 71% of the cases are predicted correctly using this model. Together with a Pseudo R-squared of 18% this indicates a moderate to weak fit of the model. Similarly, for the falling into poverty regression, 83% of the cases were predicted correctly and the Pseudo R-squared equals 19%. The remainder of the results are discussed below, focussing on the results that are significant at the 10% level at least.

Determinants at household level – Human capital

In line with prior expectations, the estimation results suggest that a high initial level of and positive change in the number of household members keeps households in poverty and pushes households below the poverty line. Moreover, escape seems to be hampered less than fall is being promoted by a large initial household or an increase in household size.

The base level and change in proportion of adults employed have a strong positive effect on the odds of escaping poverty, but do not significantly affect the probability of falling into poverty. Industry of employment matters as well. Being employed in the agricultural sector negatively affects the probability of escaping poverty whilst having no noticeable effect on the probability of falling into poverty. In contrast, being employed in the trade and transport, government and tourism sectors makes it less likely for individuals to fall into poverty. Of these variables, the proportion of household members employed in the government sector has an ambiguous influence; it both (insignificantly) hampers escape from poverty and it significantly and strongly prohibits fall into poverty, as being employed in the government sector is relatively secure and salaries are more or less fixed. The proportion of household members employed in tourism has the strongest effect on preventing from falling into poverty of all variables included in the poverty fall regression.

Receiving remittances from household members employed elsewhere has the expected, positive effect on the odds of escaping poverty and the expected negative effect on the odds to fall into poverty. The initial average level of and change in the average level of education of a household are also positively related to escape. Although no apparent relationship exists with the poverty fall dummy, the coefficient for the level of education present in a family is the largest in the poverty escape regression.

Determinants at household level – Other capital

When a household takes on a loan to invest, it increases the chance that the household will escape poverty or it decreases the chance that the household will fall into poverty. The results show that the impact of taking out a loan to invest is largest on the odds of falling into poverty.

A clear positive relation exists between the initial proportion of household members voluntarily active in community activities and the probability that a household escapes poverty. More community involvement also prevents households from falling into poverty (although this result is not significant).

External household-specific determinants

The proportion of women in a household significantly impedes escaping from poverty, but does not influence falling into poverty. Having a female household head also slightly diminish the chances of escaping poverty (though this result is not significant). The proportion of family members unable to work due to bad health decreases the chances of escaping poverty and has the largest negative coefficient of all variables in the poverty escape regression. It also significantly increases the likelihood that a family will wind up in poverty.

Regional determinants

The results on the influence of the region in which households live on the odds of escaping or falling into poverty provide some interesting patterns. All dummies included in the regressions decreased the odds of escaping poverty and increased the probability of falling into poverty with significant results for the more Northern regions. This means that living in the omitted region, the Southern region in this case, was best for households. In contrast, households living in the North Central and Northern region are more likely to remain in poverty or to fall into poverty, with the latter having the biggest positive impact on the odds of falling into poverty of all variables included in the poverty fall regression.

5. Conclusions

Despite rapid economic development of the Maldives and being on track on achieving most of the MDGs, the vulnerability of the island population in terms of poverty dynamics seems to be quit high. We have used Logit regression analysis to determine the factors behind these observed changes during the period 1997/98 – 2004 with panel data. This allows us to identify not only possible household coping strategies, but also appropriate and targeted government policies that may help households to escape from or remain out of poverty.

It appears that the most influential determinants helping households to escape from poverty are: (i) the initial level of education, (ii) the proportion of members voluntarily participating in community activities and (iii) the change in (and level of) the proportion of adults employed. The three factors that have the largest impact on impeding an escape from poverty are: (i) the proportion of household members not working due to bad health, (ii) living in the two Northern regions and (iii) the proportion of female household members.

The factors most important with respect to falling into poverty are: (i) living in the Northern regions, (ii) the proportion of household members not working due to bad health and (iii) the number of young household members, whereas (i) working in the tourism sector, (ii) in the government sector or (iii) taking out a loan to invest are the most important helpful determinants that prevent households from falling into poverty.

Policy implications of these results are not only relevant at government level but also at household level. The government may consider, as important elements of their poverty reduction strategy, to pay more attention to the development of the Northern regions, further stimulate access to good quality education and health care for the island population, and further stimulate the development of (private sector) tourism across the country. With regard to poverty reduction strategies of the households themselves, they involve: (i) education, (ii) increasing the household labour force participation rate (especially in tourism and the government sector) and (iii) family planning.

References

Alayande O. and B. Alayande (2004), "A Quantitative and Qualitative Assessment of Vulnerability to Poverty in Nigeria", *Paper submitted for presentation at the CSAE Conference on Poverty Reduction, Growth and Human Development in Africa*, March 2004.

Baulch, B. and J. Hoddinott (2000), "Economic Mobility and Poverty Dynamics in Developing Countries", *Journal of Development Studies*, Vol. 36, No. 6, pp. 1-24.

Baulch, B. and N. McCulloch (2002), "Being Poor and Becoming Poor: Poverty Status and Poverty Transitions in Rural Pakistan", *Journal of Asian and African Economies*, Vol. 37 , No. 2, pp. 168-185.

Cafiero, C. and R. Vakis (2006), "Risk and Vulnerability Considerations in Poverty Analysis: Recent Advances and Future Directions", *Social Protection Discussion Paper Series*, No. 0610, October 2006, World Bank, Washington D.C

Calvo, C. and S. Dercon (2005), "Measuring Individual Vulnerability", *Department of Economics Discussion Paper Series*, No. 229, March 2005, University of Oxford.

Chaudhuri, S., J. Jalan and A. Suryahadi (2002), "Assessing Households Vulnerability to Poverty from Cross-sectional Data: A Methodology and Estimates from Indonesia", *Department of Economics Discussion Paper Series*, No. 0102-52, Columbia University, New York.

Coudouel, Aline, Jesko S. Hentschel, and Quentin T. Wodon (2002), "Poverty Measurement and Analysis", Chapter 1 in *the PRSP Sourcebook*, World Bank, Washington D.C.

Dercon, S. (2001), "Assessing Vulnerability to Poverty", *Paper prepared for the Department for International Development (DfID)*, London. Available at: http://www.economics.ox.ac.uk/members/stefan.dercon/.

Dercon, S. and P. Krishnan (2000), "Vulnerability, Seasonality and Poverty in Ethiopia", *Journal of Development Studies*, Vol. 36, No. 6, pp. 25-53.

Gaiha, R. and K. Imai (2006), "Vulnerability and Poverty in Rural India – Estimates for Rural South India", *School of Economics Discussion Paper*, No. 0602, University of Manchester.

Glewwe, P. and G. Hall. (1998), "Are Some Groups More Vulnerable to Macroeconomic Shocks than Others? Hypothesis Tests based on Panel Data from Peru", *Journal of Development Studies*, Vol. 56, No. 1, pp. 181-206.

Hoddinott, J. and A. Quisumbing (2003), "Methods for Microecnomitric Risk and Vulnerability Assessments", *Social Protection Discussion Paper Series*, No. 0324, December 2003, World Bank, Washington D.C

Jalan, J. and M. Ravallion (1998), "Determinants of Transient and Chronic Poverty: Evidence from Rural China", *Policy Research Working Paper*, No. 1936, World Bank, Washington D.C.

Jalan, J. and M. Ravallion (2000), "Is Transient Poverty Different? Evidence for Rural China", *Journal of Development Studies*, Vol. 36, No. 6, pp. 82-99.

Kamanou, G. and J. Morduch (2004), "Measuring Vulnerability to Poverty", chapter in Dercon, S. (ed.) *Insurance against Poverty*, Oxford University Press.

Kruijk, de and Rutten (2007), "Weighting Dimensions of Poverty based on People's Priorities: Constructing a Composite Poverty Index for the Maldives", *Q2 Working Paper*, No. 35. Available at: http://www.q-squared.ca/papers35.html.

Kurosaki, T. (2006a), "Consumption Vulnerability to Risk in Rural Pakistan", *Journal of Development Studies*, Vol. 42, No. 1, pp. 70-89.

Kurosaki, T. (2006b), "The Measurement of Transient Poverty: Theory and Application to Pakistan", *Journal of Economic Inequality*, Vol. 4, No. 3, pp. 325-345.

Kurosaki, T. (2006c), "Vulnerability and Poverty: Concept, Measurement, and Implications to Poverty Reduction Policies in Asia". Available at: http://www.ier.hit-u.ac.jp/~kurosaki/vuln0601.pdf.

Lawson, D., A. McKay and J. Okidi (2006), "Poverty Persistence and Transitions in Uganda: A Combined Qualitative and Quantitative Analysis", *Journal of Development Studies*, Vol. 42, No. 7, pp. 1225-1251.

Ligon, E. and L. Schechter (2002), " Measuring Vulnerability: The Director's Cut", *UNU-WIDER Discussion Paper*, No. 2002/86.

Ligon, E. and L. Schechter (2003), "Measuring Vulnerability", *The Economic Journal*, Vol. 113, No. 486, pp. C95-C102.

Ligon, E. and L. Schechter (2004), "Evaluating Different Approaches to Estimating Vulnerability", *Social Protection Discussion Paper Series*, No. 0410, June 2004, World Bank, Washington D.C.

McCulloch, N. and B. Baulch (1999), "Distinguishing the Chronically from the Transitorily Poor: Evidence from Rural Pakistan", *IDS Working Paper*, No. 97, Institute for Development Studies, United Kingdom.

Pritchett, L. A. Suryahadi, S. Sumarto (2000), "Quantifying Vulnerability to Poverty", *Policy Research Working Paper*, No. 2437, World Bank, Washington D.C.

Ravallion, Martin (1996), "Issues in measuring and modelling poverty", *The Economic Journal*, Vol. 106, No. 438, pp. 1328-1343.

Republic of Maldives in co-operation with the United Nations Development Programme (1999), *Vulnerability and Poverty Assessment I, 1998*, Male', Maldives.

Republic of Maldives in co-operation with the United Nations Development Programme and the World Bank (2005), *Vulnerability and Poverty Assessment II, 2004*, Male', Maldives.

Sen, B. (2003), "Drivers of Escape and Descent: Changing Household Fortunes in Rural Bangladesh", *World Development*, Vol. 31, No. 3, pp. 513-534.

Suryahadi, A. and S. Sumarto (2003), "Poverty and Vulnerability in Indonesia Before and After the Economic Crisis", *Asean Economic Journal*, Vol. 17, No. 1, pp. 45-64.

World Bank (2001), *World Development Report 2000/01: attacking poverty*, World Bank, Washington D.C.

Appendix 1: Vulnerability and Poverty Assessment I (1997/8) and II (2004), Maldives

Survey methodology

Both VPA surveys covered all 200 inhabited islands in the atolls, as well as the capital, Male' – gathering information from all households and then selecting a number of others randomly for in-depth interviews. In the atolls, the survey for VPA-II selected as its sample half the households that had been enumerated in 1997/98 – forming the 'panel' – and the other half from the remaining households.

To supplement the household information, questionnaires were also administered at the community level – concerning physical infrastructure and the availability of social services and economic resources. Most of this information was obtained from the office of the island chief. In addition, members of the Island Development Committees and the Women's Development Committees also provided information on the main problems experienced in the intervening seven years and what they saw to be the priorities for further development.

While the second survey questionnaire largely repeated that of VPA-I, often with identical phrasing, it also included a few changes to correct for weaknesses in the earlier questionnaire and to account for structural changes that had made some questions redundant and required some additions to ensure proper coverage in a changed environment.

At the start of the survey, the staff of the island offices prepared a listing of all households. In the atolls, the household listing was split into two parts: the first consisted of those households that had been enumerated in the survey for VPA-I. The second part consisted of all other households on the island. From both parts, five households were selected at random, along with five others to be used as replacements in cases where the original households could not be found or would not co-operate. On islands with larger populations, the sample was increased to include ten additional households for every 1,500 persons. This method of determining the sample size was identical to that used in the first survey. The sample size is about 2,400 households in the atolls and 300 households in the capital Male'.

Data entry, editing and processing

During data entry a large number of items were checked for consistency and plausibility. If this process suggested errors, the data entry operators were prompted to cross-check the information they had entered with that on the forms – reducing the number of data transcription errors to an acceptable level while allowing obvious errors to be corrected at an early stage. Once all the data had been entered, more checks for consistency and errors were

carried out until an acceptable level of accuracy was obtained and only limited data gaps remained. This was an iterative process demanding frequent crosschecks with the original forms.

Reliability

Island-specific data like the physical infrastructure or education facilities are representative for the situation on the island, but household-specific data like household incomes are not representative at island level due to the small number of observations. Although on a small island where 50 households are living, 10 households may be a large proportion of all households, they constitute a sample so small that the variance, or standard deviation at island level, is generally beyond acceptable levels. However, when islands are grouped into atolls or regions the number of observations is large enough for reliable estimates.

Appendix 2: Methodology of the Logit regression analysis

The analysis was an iterative procedure. First, a broad impression of poverty dynamics was obtained and as knowledge of the topic was being accumulated the results were fine-tuned. At the start, a model was formulated using theoretical determinants. This model was then translated into an empirical one for testing. At the same time, the survey data from the panel households were converted into variables suitable for the model and then further adapted to satisfy multicollinearity conditions. Some theoretical determinants could not be inserted due to lack of information.

The prepared data were then imported into the statistical analysis programme E-views to do an initial assessment of the relationships between the dependent variable and the theoretical determinants. Then a systematic procedure was used to select the indicators that from the model results appeared to have a significant relation to the dependent variables. Logit regressions were run with as dependent variables the four possible poverty status of the households in the two surveys: *always poor, escaped, fallen back and never-poor*.

Determinants without significant regression coefficients were omitted from the regression one by one to see how coefficients of the other explanatory variables and their z-values reacted. In this way, the most significant and stable regression specifications were chosen. It should be noted however that for comparison reasons some insignificant variables have been retained in the models. The presence of such redundant variables is not harmful as long as there are sufficient observations in the dataset. This step also included general statistical tests on the validity of the model. Corrections were consequently made to satisfy heteroskedasticity conditions.

The knowledge obtained through the initial assessment on which variables are correlated and how was subsequently used to adapt the underlying model for poverty dynamics. These modified assumptions then made it necessary to change some variables as well as the way they were included. The regressions were then run again and various statistical tests applied to validate the results. This iterative process was repeated until there were no further improvements in the determination coefficients of the regressions.