# Household Vulnerability to Poverty in Vanuatu and the Solomon Islands[1]

**Lachlan McDonald**
PhD Candidate
RMIT University, Melbourne, Australia

***Abstract***

*Melanesian countries such as Vanuatu and the Solomon Islands are renowned for their vulnerability to economic and environmental shocks. Equally, analyses of household vulnerability are becoming a mainstay of the development economics literature. Yet little empirical work has been done that examines the extent to which Melanesia's exposure to risks at a national level affects the vulnerability of households to experiencing poverty. This paper addresses the gap by using cross-sectional data from a survey that was specifically designed to capture information on households' characteristics, their experience of shocks and their responses to shocks during an extremely cyclical phase in the global economy. Unlike conventional studies of household vulnerability, it calculates households' probability of experiencing a broad, non-monetary, characterisation of poverty: the multidimensional poverty index, given the inherent limitations on relying solely on monetary metrics of wellbeing in Melanesia. It shows that while poverty and vulnerability are linked, the incidence of vulnerability is typically more widespread than the observed rate of poverty. This confirms the results of vulnerability analyses in other developing country contexts that while poverty is an essential indicator of wellbeing, it provides limited foresight into future poverty. Moreover, around three quarters of the total estimated vulnerability in Vanuatu and the Solomon Islands stems from excess volatility in expected wellbeing, rather than inordinately low levels of wellbeing. Being wealthier (both in a conventional sense and in terms of traditional Melanesian artefacts of wealth), better educated and employed also reduces a household's vulnerability. This ability to distinguish between different types of vulnerability, as well as understanding the key aspects of households' resilience, makes such analyses critical for guiding policymakers interested in poverty prevention in Melanesia.*

[1] This paper is part of a broader research project investigating the vulnerability and resilience of Pacific Island households to the effects of macroeconomic shocks. It is sponsored by the Australian Agency for International Development (AusAID) through an Australian Development Research Award (ADRA)

## 1. Introduction

Analyses of household vulnerability are becoming increasingly prominent in the development economics literature. In large part, this has reflected the emerging understanding that, in order to reduce poverty, policymakers need information on both the current incidence of poverty and also the magnitude of the threat of poverty, measured *ex-ante* (Calvo and Dercon, 2005). Such a perspective implicitly recognises that poverty is a stochastic phenomenon. To that end, while the current incidence of poverty is a critical indicator of wellbeing it provides limited foresight into future poverty. Rather, whether a household is likely to fall into poverty in the future is also determined by its exposure to a variety of different shocks as well as its ability to effectively cope in the face of shocks.

Yet little empirical work has been done that examines the vulnerability of households in Melanesian countries, such as Vanuatu and the Solomon Islands to experiencing povetry. This is despite the fact that both countries are renowned for being acutely vulnerable to economic and environmental shocks at a national level.

Using unique cross-sectional data of household characteristics, households' experiences of shocks and their responses to shocks, this paper addresses this gap. It estimates the *ex-ante* risk that households in Vanuatu and the Solomon Islands will, if currently non-poor, experience poverty one period ahead, or if currently poor, remain in poverty. It follows an approach to estimating vulnerability originally devised by Chaudhuri, *et al.* (2002) that has been widely used in a number of developing country contexts when only cross-sectional data are available.

The paper makes a number of important contributions. By combining empirical survey data with sophisticated modelling techniques it provides a recent and detailed account of vulnerability in Melanesia. It also makes a contribution to the vulnerability literature more broadly by estimating households' vulnerability to a broader measure of poverty; specifically multidimensional poverty, drawing on Alkire and Foster's (2011a) approach for calculating a Multidimensional Poverty Index (MPI). It therefore builds on Jha and Dang (2010) who relied on aggregate household income and expenditure data for Papua New Guinea (PNG) from 1996. The use of the MPI as a proxy for wellbeing, rather than more conventional monetary metrics like consumption, reflects the inherent limitations on relying solely on monetary metrics of wellbeing in Melanesia.

Also, to the extent that it identifies those households that are likely to be poor in the future, the paper is of particular interest to policymakers interested in designing social protection policies in Melanesia.

The proceeding sections are organised as follows: Section 2 provides a review of the empirical literature measuring household vulnerability; Section 3 outlines the methodology, including the econometric specification for estimating vulnerability; while Section 4 details the results; and Section 5 concludes.

## 2. Literature Review

The World Bank articulated in its 2000/01 World Development Report that sustainable poverty reduction required a forward-looking approach to reducing vulnerability (World Bank, 2000). By concentrating on the different risks facing households and communities, as well as the formal and informal strategies for dealing with risks, the report was instrumental in helping to shift thinking on effective social protection. In particular, it noted that preventing future poverty, via reducing a household or community's vulnerability to risk was just as important as alleviating the current incidence of poverty (Moser, 2001). As a consequence, attempts to operationalise vulnerability are rapidly becoming a cornerstone of development economics, as evidenced by the rapid propagation of papers with vulnerability and poverty in the title (Guimarães, 2007). Unlike static measures of poverty, vulnerability assessments provide a framework for explaining susceptibility to harm, and for guiding actions to enhance wellbeing through the reduction of risk (Adger, 2006; Dercon, 2006).

Economic assessments of vulnerability include macro country-level assessments of vulnerability and micro-theoretic analyses that focus chiefly on households. One of the better-known macro indices is the Economic Vulnerability Index (EVI), which asserts that some states are economically vulnerable to the extent that the dual risks of natural hazards or trade- and exchange-related economic shocks will hamper economic development (Guillaumont, 2010). In this sense, the focus is on institutional capacity to deal with the effects of exogenous shocks at a national level, with vulnerable countries those that are unable to prevent deterioration in their national income or the human development of their citizens in the face of natural and economic shocks.

Two classifications have been created by the United Nations to reflect such national vulnerability; namely, Least Developed Countries (LDCs) and Small Islands Developing

States (SIDS).[2] These classifications explicitly recognize the unique development challenges facing the most vulnerable countries. They are used to attract special international support for development, including special and differential trade provisions at the World Trade Organisation (WTO) and concessional loan arrangements from the World Bank (WTO, 2013; World Bank, 2012).[3] Fulfilling all Overseas Development Assistance (ODA) commitments to LDCs is also one of the commitments of Millennium Development Goal 8: Global Partnerships for Development (United Nations, 2013). Both Vanuatu and the Solomon Islands, the focus countries for this analysis, are LDCs and SIDS – the latter also acknowledging that they share the peculiar vulnerabilities of small islands including limited size, remoteness and exposure to natural disasters. Indeed, it is well accepted that the island nations of the south-west Pacific, which include Vanuatu and the Solomon Islands, are particularly exposed to the effects of economic shocks and natural hazards (McGillivray, *et al*. 2008; Naudé, *et al*. 2009; Guillaumont, 2010). The vulnerability to these shocks, in turn, reflects the combination of each country's innate shock exposure as well as the institutional limitations that prevent these states from being able to effectively mitigate the risks (Santos-Paulino, 2011).

Yet how this broad view of vulnerability is transmitted to individual households in Melanesia is little known. To be sure, Melanesian households are exposed to the effects of an array of different shocks: including covariate international economic shocks (in particular terms-of-trade shocks associated with international commodity price inflation), environmental hazards and other idiosyncratic shocks that affect individual households. However, little primary research has been done to estimate the impact that these are likely to have on households' future wellbeing. Put simply, there are few estimates of households' vulnerability to poverty, and what work there has been done has had to rely on sparse and often unreliable macro–level data (Feeny, 2010). Jha and Dang (2010) found that a substantial proportion of PNG households are indeed vulnerable to poverty as a result of risk, with vulnerability varying across region, household size, gender and education. To some extent this provides a useful counterpoint to more stylised views regarding vulnerability in Melanesia; in particular, that

[2] LDCs are defined as "low-income countries suffering from the most severe structural impediments to sustainable development" (United Nations, 2011). There are three criteria for a country to be afforded LDC status: low income, human vulnerability and economic vulnerability. The third is based on the EVI.

[3] The International Development Association (IDA) is one of the two development institutions at World Bank; in addition to the International Bank for Reconstruction and Development (IBRD). The IDA is responsible for providing; *inter alia* long-term interest-free loans to developing countries. While the IDA does not explicitly take LDC status into account, all but two LDCs are eligible for such loans (World Bank, 2012).

the prominence of the "traditional economy" insulates households from macroeconomic events, such as the Global Economic Crisis (GEC) (Regenvanu, 2009).[4]

An in-depth analysis of households' vulnerability to poverty in Melanesia is therefore warranted. Accordingly, this paper draws on an approach initially devised by Chaudhuri, *et al.* (2002) to estimate households' vulnerability as the probability of experiencing MPI-poverty one period into the future. The selection of this approach, over a range of available options, reflects the general trend in the empirical economics literature, which appears to be settling on it as the preferred approach (Zhang and Wan, 2009, p278).[5] The analysis also draws from the literature on vulnerability as uninsured exposure to shocks (see: Amin, *et al*. 1998; Glewwe and Hall, 1998; Corbacho, *et al*. 2007) in that it concentrates on households' exposure to specific macroeconomic and other shocks – in particular the sharp increase in international food and fuel prices in the lead up to the Global Economic Crisis (GEC) and the GEC itself.

The broad popularity of estimating vulnerability as the probability of experiencing future poverty is likely to reflect three primary advantages. Firstly, it produces results that are analogous to more established poverty measures, including a headcount measure of vulnerability (Alwang, *et al.* 2001). Secondly, it sheds light on the relationship between vulnerable and poor households; by expressing vulnerability in terms of the probability of being poor it is intuitive to interpret, despite being demanding in terms of the data (Celidoni, 2013). Thirdly, and perhaps most importantly, is that the approach is applicable when only cross-sectional data are available. According to Hoddinott and Quisumbing (2003) the choice of appropriate approach to estimating vulnerability is, ultimately, a function of the availability of the data on hand. While such analyses would ideally draw from panel data of sufficient length and richness, panel data sets are rare in poor developing economies which often only have access to cross-sectional data (Chaudhuri, *et al.* 2002).

The approach has been adopted in a number of different contexts, in particular when only cross-sectional data are available. Chaudhuri (2003) used the methodology on cross-section data in Philippines and Indonesia while Surahadi and Sumarto (2003) used repeated cross

[4] According to Regenvanu (2009) the central tenets of the "traditional economy" include universal access to land on which to access food and make a living, customary dispute resolution practices, and strong familial ties characterized by norms of sharing and reciprocity. He suggests, therefore, that the "traditional economy" provides households with a social security system that is largely absent in a formal sense as well as a buffer from the transmission of externally-generated macroeconomic shocks.

[5] A preponderance of different estimation methods have emerged in empirical economics literature, prompting Hoddinott and Quisumbing (2003, p1) to suggest that the work on vulnerability is still at the "let a hundred flowers bloom" stage. However, three broad empirical approaches have emerged to estimate vulnerability: vulnerability as expected poverty approach (VEP); vulnerability as uninsured exposure to risk (VER); and vulnerability as low expected utility (VEU).

section data in Indonesia from both before and after the Asian Financial Crisis. The approach has also been used to estimate vulnerability to poverty across a range of different developing-country contexts, including: Papua New Guinea (Jha and Dang, 2010); Vietnam (Imai, *et al.* 2011); rural China (Zhang and Wan, 2006); Guatemala (Tesiluc and Lindert, 2004); Nigeria (Chiwaula, *et al*. 2011); Madagascar (Gunther and Harttgren, 2009); and Bangladesh (Azam and Imai, 2012). It has yielded estimates that have proved credible in out-of-sample tests (Chaudhuri, *et al*. 2002; Surahadi and Sumarto, 2003). Indeed, in Melanesia, Jha and Dang (2010, p245) compared their estimates of vulnerable households with observed poverty data seven months after the initial survey; they found that their estimate "[did] a reasonably good job of predicting those who are not vulnerable and those who are vulnerable to poverty".

## 3. Methodology and Results

Fieldwork for this study was conducted during 2010—2011 and consisted of 955 household surveys. Careful consideration was given to the location of fieldwork. In an attempt to capture the diversity in experiences of vulnerability and resilience, six locations were targeted in each country. These were selected based on criteria that sought to reflect diversities: remoteness, economic activity, and environmental differences. The locations of the communities and their common characteristics are provided in Table 1 below (for more information (see Feeny, *et al.* forthcoming).

**Table 1: Research fieldwork locations and their characteristics**

| | Vanuatu | Solomon Islands | Characteristics |
|---|---|---|---|
| **Urban** | Port Vila (Efate)<br>(Ohlen and Blacksands) | Honiara (Guadalcanal)<br>(White River and Burns Creek) | Settlements in each country's capital city |
| | Luganville (Santo)<br>(Pepsi and Sarakata) | Auki (Malaita)<br>(Lilisiana and Ambu) | Settlements in each country's second largest town |
| **Rural** | Baravet (Pentecost) | Guadalcanal Plains Palm Oil Limited (GPPOL) Villages (Guadalcanal) | Rural communities heavily involved in commercial agriculture |
| | Hog Harbour (Santo) | Malu'u (Malaita) | Rural communities separated from the respective second city by a direct road |
| | Mangalilu/Lelepa (Efate) | Weather Coast/Marau Sound (Guadalcanal) | Communities on the same island as the respective capital city with known links to Oxfam Australia. |
| | Mota Lava (Banks Islands) | Vella Lavella (Western Province) | Remote communities a significant distance from the respective capital cities |

### 3.1 A Model of Household Wellbeing

In order to draw inferences about households' future wellbeing from cross-sectional data Chaudhuri, *et al.* (2002) make a number of simplifying assumptions in their model; in particular that cross-sectional variation in consumption is a good proxy for inter-temporal variance, and that the structure of the economy remains stable.

The level and variance of a household's wellbeing is considered to be a function of the stochastic nature of risk factors, and the extent to which households are exposed to them, as well as the capacity and desire of a household to protect its wellbeing in the face of shocks. Equation 1 provides a reduced-form equation for household wellbeing, $w_{it}$:

$$w_{it} = f(X_i, S_{it}, R_{it}, e_{it}) \qquad 1$$

Household wellbeing, in this instance, is the weighted deprivation score according to Alkire and Foster's (2011a) method for calculating the MPI. To that end, increases in $w_{it}$ represent increasing levels of destitution in one of three dimensions of wellbeing: health; education; and standard of living. This differs to most analyses of household vulnerability, which typically use per capita household expenditure consumption as the indicator of welfare. It also provides more a different perspective on Melanesian households than Jha and Dang (2010) which relied solely on aggregated household expenditure data in PNG. The decision to eschew monetary metrics of wellbeing reflects the inherent limitations of relying on these measures in Melanesia – where around 80 per cent of the population reside in rural areas and have only limited engagement in formal markets (Regenvanu, 2009). Hoddinott and Quisimbung (2003, p12) acknowledge there is no reason why vulnerability cannot be expressed outside the triad of material wealth-income-consumption that is usually used to calculate vulnerability. Indeed, a number of authors have noted that vulnerability can be expressed in terms of broader non-monetary dimensions of wellbeing, including Body Mass Indices (Dercon and Krishnan, 2000) or even access to basic services or social exclusion (Coudouel and Hentschel, 2000; Alwang, *et al*. 2001).

$X_i$ is a vector of time-invariant household characteristics including demographic characteristics, socioeconomic status (i.e. households' wealth score on a wealth index), livelihood sources and endowments of assets. The wealth index draws on Filmer and Pritchett (2001) by using a principal components approach to construct a score of socioeconomic status (the authors refer to this as "wealth") using indicators of durable assets and dwelling characteristics. In additional to this conventional index of wealth, a separate index was

calculated that reflects other important aspects of wealth in a traditional Melanesian setting. This draws heavily from the Malvatumauri National Council of Chiefs in Vanuatu (MNCC), who recently enumerated alternative measures of wellbeing in Melanesia (MNCC, 2012). Variables include ownership of various livestock, cultural status symbols, membership of church organisations, access to natural resources, such as land, gardens and the sea, and social capital (Tables A1 and A2 in Appendix provides a full list of the assets included and the coefficients of both the conventional and traditional wealth indices, respectively).

$S_{it}$ represents observed locally covariate and idiosyncratic shocks experienced by household $i$ between *t-1* and *t*. While $R_{it}$ includes household $i$'s observed responses to a negative shock between *t-1* and *t;* in effect, capturing households' revealed preferences for different coping strategies (and their capacity to enact them). The inclusion of observed shocks as well as responses to shocks stands in contrast to a number of other papers, which, due to data limitations, must infer households' endogenous capacity to smooth the effects of shocks on wellbeing (Kurosaki, 2010).

The error term, $e_{it}$, represents unobservable household and community characteristics, as well as unobserved idiosyncratic shocks and responses that contribute to differential welfare outcomes of otherwise observationally equivalent households.

The vulnerability of a household $i$ at time *t* ($V_{i,t}$) is calculated as the probability that the level of weighted MPI deprivations one period ahead, $w_{i,t+1}$, will exceed a critical threshold *z* (Equation 2).

$$V_{i,t} = Pr\left(w_{i,t+1} > z\right) \qquad 2$$

The stochastic process that generates the wellbeing of a household $i$ has the following specification:

$$w_i = \boldsymbol{X_i}\beta + e_i \qquad 3$$

Where $\boldsymbol{X_i}$ is represents a bundle of household characteristics, observed experiences of shocks and their responses. Shocks include price shocks as well as other shocks such as labour market and environmental shocks, while coping responses include households' attempts to augment income as well as reallocate consumption expenditures, in addition to asset sales and their attempts to utilise social and environmental capital endowments (see Table A3 in Appendix for descriptive statistics of variables used). $\beta$ is a vector of parameters to be

estimated using OLS and $e_i$ is the mean-zero disturbance term. The fitted value of Equation 3 is the expected level of wellbeing for household $i$.

Chaudhuri, *et al*. (2002) argue that, to the extent that households face different risks and have different risk-management strategies, then the variance of household wellbeing should be heterogeneous across households. Indeed, the variance of the disturbance term, $\widehat{\sigma^2}_{e,i}$, is interpreted by the authors in economic terms as the inter-temporal variance of wellbeing.[6] They therefore allow for heteroskedasticity in the model by regressing the variance of the disturbance term on the observable characteristics of the household $\boldsymbol{X_i}$ (Equation 4)**.** $\theta$ is a vector of parameters to be estimated via OLS.

$$\widehat{\sigma^2}_{e,i} = \boldsymbol{X_i}\theta + u_i \qquad 4$$

where

$$u_i = N\,(0, \sigma_i^2\,) \qquad 5$$

Christiaensen and Subbarao (2005, p527) consider the estimation of the *ex-ante* probability distribution of risk to be "the major empirical challenge in determining [a households'] vulnerability". The implication in this approach is that household wellbeing is stationary and that the future distribution of idiosyncratic shocks to wellbeing is assumed to be identically and independently distributed over time for each household – though critically not between households.[7] The resultant non-monotonicity of this approach is advantageous since it does not implicitly rule out the fact that households with low consumption may nevertheless face greater consumption volatility than households with higher average levels of consumption (Chaudhuri, 2003).[8]

Because the presence of hetreoskedastic errors, OLS yields inefficient estimates of coefficients. The estimation of $\beta$ and $\theta$ therefore follows a three-step feasible generalized least squares (FGLS) procedure suggested by Amemiya (1977). The intuition of the three-step method is to obtain consistent estimates of the error term and then to use these estimates

[6] Chaudhuri (2003, p14) interprets the errors of this equation in economic terms as the inter-temporal variance of consumption, rather than measurement error and incidental unobserved variation. Viewed from this perspective, he contends that the usual OLS assumption of constant variance across households is somewhat restrictive. However, this also presumes that the model is fully specified which, given that a households' experiences of shocks (and their responses to those shocks) are not excluded, which is a somewhat strong assumption.

[7] This approach therefore abstracts from large covariate shocks in the future, which the authors admit is an unavoidable shortcoming of using a single cross-sectional data to predict future wellbeing (Chaudhuri, *et al.* 2002, p7).

[8] Chaudhuri, *et al.* (2002, p25) note that the simple linear specification of Equations 3 and 4 risks producing estimates of expected wellbeing and its variance that are negative. To the extent that negative values are not economically meaningful (one cannot have a negative poverty score, after all) the authors suggest dropping those observations or choosing a different specification for the models, such as a tobit regression. A Tobit regression was therefore used to censor the sample for any predicted estimates of wellbeing that were negative (of which there were two in the sample of 917). The censored sample made an imperceptibly small difference to the size of the coefficients and did not alter the statistical significance of any coefficient.

to transform the original model such that the errors become homoscedastic. Chaudhuri, *et al.* (2002) note that a key advantage of the FGLS approach is that the mean and variance of household wellbeing are unbiased predictors of future wellbeing, even when wellbeing is measured with error (unless the measurement error varies systematically with some household characteristics).

The three-step method proceeds as follows:

The first step is to estimate Equation 3 via OLS. Then the estimated residuals from this equation are squared and incorporated as the dependent variable in Equation 4, which is estimated using OLS.

The second step is to transform Equation 3 to produce the asymptotically efficient FGLS estimate of the variance of future wellbeing ($\boldsymbol{X_i}\hat{\theta}_{FGLS}$). In order to do this, Equation 3 is transformed using the predicted values from Equation 4, $\boldsymbol{X_i}\hat{\theta}_{OLS}$ (Equation 6).

$$\frac{\widehat{\sigma^2}_{OLS,e,i}}{\boldsymbol{X_i}\hat{\theta}_{OLS}} = \left(\frac{\boldsymbol{X_i}}{\boldsymbol{X_i}\hat{\theta}_{OLS}}\right)\theta + \frac{u_i}{\boldsymbol{X_i}\hat{\theta}_{OLS}} \qquad 6$$

As part of this step the variance of wellbeing $\left(\boldsymbol{X_i}\hat{\theta}_{FGLS}\right)$ is converted into a measure of the predicted standard deviation of wellbeing (Equation 7)

$$\sigma_{i,t+1} = \sqrt{\boldsymbol{X_i}\hat{\theta}_{FGLS}} \qquad 7$$

The third, and final, step is to use the predicted standard deviations from Equation 7 to transform Equation 3 in order to yield the asymptotically efficient estimate of $\hat{\beta}_{FGLS}$ (Equation 8).

$$\frac{w_i}{\sigma_i} = \left(\frac{\boldsymbol{X_i}}{\sigma_i}\right)\beta + \frac{e_i}{\sigma_i} \qquad 8$$

In order to overcome issues of systematic measurement error, a number of authors stratify the sample of households in developing countries according to metropolitan and rural regions given the differences in employment sources and domestic food production (Chaudhuri, *et al.* 2002; Tesliuc and Lindert, 2004). This paper adopts similar approach by separately

estimating vulnerability-to-poverty for the capital cities, Honiara and Port Vila, as well as the remaining non-capital city locations.[9]

A household's vulnerability to poverty one period ahead is therefore estimated by Equation 9:

$$V_{i,t} = Pr\left(w_{i,t+1} > z \mid \boldsymbol{X_i}, \sigma_{i,t+1}\right) = \Phi\left(\frac{\boldsymbol{X_i}\hat{\beta}_{FGLS} - z}{\sigma_{i,t+1}}\right) \qquad 9$$

Where $V_i$ represents the probability that a household with characteristics $\boldsymbol{X_i}$ will experience weighted deprivation counts in excess of $z$, the conventional threshold for multidimensional poverty applied in MPI estimates (i.e. where weighted sum of a household's deprivations sum to 30 per cent; UNDP, 2010, p8). The probability density function of future wellbeing is denoted by $\Phi$, which is the cumulative density function of the standard normal.[10] This follows a standard approach in the literature, (Chaudhuri, *et al* 2002, Zhang and Wan, 2006; 2009; Jha and Dang, 2010; Azam and Imai, 2009).

## 4. Results

### 4.1 Model Diagnostics

Table 2 presents the estimated coefficients on the determinants of *ex-ante* mean and variance of household wellbeing (Equations 6 and 8, respectively) that are used to estimate household vulnerability. The model was estimated using the aggregate sample as well as separately estimating for capital city and non-capital city locations. The results presented here detail the disaggregated model, for which there are 917 unique data points.[11]

[9] Because of the essentially rural character of both Luganville and Auki it is assumed that any systematic measurement error would likely be most pronounced between capital and non-capital regions. However, as a check of the robustness of this assumption the sample was also dichotomised into urban (i.e. capital cities plus Luganville and Auki) and rural. The results were broadly unchanged.

[10] The lower bound of zero for a household's weighted deprivation scores gives rise to a positive skew in the distribution and results in rejection according to the Shapiro-Wilk and Jarque–Bera tests for normality. However, graphical indicators suggest the distribution is approximately normal, and thus justifies its inclusion in the model.

[11] In calculating the expected mean and variance of wellbeing 38 observations were dropped from the total sample of 955 households due to missing data.

## Table 2: Model of the Estimation of Vulnerability to MPI Poverty

| | | Total Sample | | Capital City | | Non-Capital city | |
|---|---|---|---|---|---|---|---|
| Dependent Variable | | MPI score | Variance | MPI score | Variance | MPI score | Variance |
| Observed Household Characteristics | Conventional Wealth | -0.032*** | 0.000 | -0.052*** | -0.002 | -0.034*** | -0.000 |
| | | (-8.952) | (0.010) | (-3.893) | (-1.276) | (-9.002) | (-0.378) |
| | Traditional Wealth | -0.005 | -0.003*** | -0.004 | -0.003* | -0.003 | -0.003*** |
| | | (-1.108) | (-3.700) | (-0.382) | (-1.682) | (-0.587) | (-2.968) |
| | Size | 0.005 | 0.001 | 0.046*** | 0.005** | 0.006 | 0.000 |
| | | (1.499) | (1.112) | (3.082) | (2.469) | (0.941) | (0.063) |
| | Size Squared | -0.000 | -0.000 | -0.003*** | -0.000** | -0.000 | 0.000 |
| | | (-0.448) | (-0.983) | (-2.704) | (-2.271) | (-0.157) | (0.405) |
| | Dependency Ratio | 0.005 | 0.000 | -0.009 | -0.004** | 0.003 | 0.000 |
| | | (0.975) | (0.458) | (-0.608) | (-2.031) | (0.615) | (0.361) |
| | Gender Head | 0.008 | 0.002 | 0.030 | 0.002 | 0.011 | 0.004* |
| | | (0.673) | (1.015) | (0.995) | (0.401) | (0.827) | (1.811) |
| | Adult Education | -0.082*** | -0.009*** | -0.127*** | -0.013*** | -0.071*** | -0.009*** |
| | | (-7.903) | (-5.043) | (-4.014) | (-2.680) | (-6.633) | (-4.929) |
| | Food Peddler | 0.017** | 0.003** | 0.019 | 0.005 | 0.004 | 0.002 |
| | | (2.233) | (2.295) | (0.912) | (1.603) | (0.422) | (1.258) |
| | Other Peddler | 0.008 | -0.001 | -0.050** | 0.000 | 0.008 | -0.000 |
| | | (1.076) | (-0.523) | (-2.416) | (0.137) | (1.039) | (-0.342) |
| | Employed | -0.042*** | -0.003** | -0.033 | -0.000 | -0.042*** | -0.005*** |
| | | (-5.021) | (-2.3250) | (-1.187) | (-0.072) | (-4.830) | (-3.056) |
| | Cash Crop Seller | 0.010 | 0.003** | 0.011 | -0.002 | 0.017** | 0.001 |
| | | (1.219) | (1.979) | (0.408) | (-0.479) | (2.065) | (0.816) |
| | Urban | 0.044*** | 0.006*** | | | 0.045*** | 0.003 |
| | | (4.917) | (3.389) | | | (4.004) | (1.517) |
| | Vanuatu | -0.027*** | 0.002 | -0.037 | -0.005 | -0.036*** | 0.001 |
| | | (-3.404) | (1.573) | (-1.453) | (-1.388) | (-4.198) | (0.936) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Observed Shock Experience | Real inflation shock | 0.004 | 0.003** | 0.040 | 0.002 | 0.000 | 0.002 |
| | | (0.450) | (2.365) | (1.654) | (0.575) | (0.049) | (1.190) |
| | Environmental Shock | 0.019*** | 0.003** | 0.028 | 0.008** | 0.011 | 0.001 |
| | | (2.588) | (2.251) | (1.264) | (2.454) | (1.424) | (0.574) |
| | Theft Shock | -0.015** | -0.002* | -0.015 | 0.003 | -0.008 | -0.001 |
| | | (-2.139) | (-1.788) | (-0.582) | (0.852) | (-1.030) | (-0.440) |
| | Lifestyle Shock | -0.008 | -0.001 | 0.003 | 0.001 | 0.008 | 0.000 |
| | | (-1.095) | (-0.976) | (0.155) | (0.472) | (1.112) | (0.109) |
| | Other Economic Shock | -0.006 | -0.003** | 0.039* | 0.002 | -0.012 | -0.003** |
| | | (-0.778) | (-2.283) | (1.844) | (0.571) | (-1.512) | (-2.270) |
| | Labour Market Shock | -0.014 | 0.000 | 0.021 | -0.005 | -0.013 | 0.001 |
| | | (-1.320) | (0.074) | (0.929) | (-1.413) | (-1.020) | (0.461) |
| | Increase income | -0.010 | -0.001 | 0.001 | 0.003 | -0.010 | -0.001 |
| | | (-0.965) | (-0.684) | (0.036) | (0.621) | (-0.828) | (-0.449) |
| Observed Coping Behaviour | Reduce non-discretionary spending (education) | -0.008 | -0.002* | 0.017 | -0.005* | -0.014* | -0.002 |
| | | (-1.077) | (-1.678) | (0.835) | (-1.728) | (-1.766) | (-1.072) |
| | Reduce discretionary spending (demerit goods) | 0.002 | -0.000 | 0.021 | 0.000 | -0.010 | -0.001 |
| | | (0.282) | (-0.068) | (0.959) | (0.108) | (-1.285) | (-0.767) |
| | Use Environment | 0.019* | 0.000 | 0.075*** | -0.002 | 0.002 | -0.002 |
| | | (1.748) | (0.003) | (2.998) | (-0.626) | (0.161) | (-0.864) |
| | Use Traditional Economy | 0.021*** | 0.002 | 0.006 | 0.007** | 0.022*** | 0.001 |
| | | (2.845) | (1.227) | (0.259) | (2.004) | (2.789) | (0.454) |
| | Sell Assets | -0.032*** | -0.002 | -0.068** | 0.001 | -0.021** | -0.001 |
| | | (-3.502) | (-1.412) | (-2.613) | (0.343) | (-2.091) | (-0.383) |
| | Use Financial resources | 0.015 | 0.006*** | -0.057* | 0.003 | 0.026* | 0.007*** |
| | | (1.257) | (3.208) | (-1.735) | (0.909) | (1.914) | (2.901) |
| | Constant | 0.193*** | 0.008** | 0.052 | -0.008 | 0.213*** | 0.015*** |
| | | (9.219) | (2.139) | (0.808) | (-0.821) | (9.212) | (3.597) |
| | Observations | 917 | 917 | 159 | 159 | 758 | 758 |
| | R-squared | 0.348 | 0.142 | 0.484 | 0.258 | 0.399 | 0.156 |
| | Adj. R-squared | 0.329 | 0.117 | 0.387 | 0.121 | 0.377 | 0.125 |

Z-statistics in parentheses; standard errors; *** p<0.01, ** p<0.05, * p<0.10

Overall the models perform relatively well. For the level of expected deprivations the adjusted R-squared of the model is around 0.38 for both capital city and non-capital city regions models. The predicted mean level of deprivations is also close to the actual level of deprivations (Table 3). For the expected variance, the model fits somewhat less well, with the adjusted R-squared around 0.16 for capital cities and 0.11 for non-capital city regions and the differences between each of the actual and predicted variances statistically significant. The relatively more modest fit of the variance equation is consistent with other FGLS models of household wellbeing (Del Ninnio, *et al.* 2006, p10) and reflects the fact that predicted volatility is systematically lower than actual volatility.[12]

**Table 3: Goodness of fit: Predicted versus Actual MPI deprivations**

| | Actual | Predicted |
|---|---|---|
| **Total** | | |
| *Mean* | 0.206 | 0.208 |
| *Standard Deviation* | 0.140 | 0.119*** |
| **Capital Cities** | | |
| *Mean* | 0.208 | 0.215 |
| *Standard Deviation* | 0.157 | 0.123*** |
| **Non-capital Cities** | | |
| *Mean* | 0.206 | 0.207 |
| *Standard Deviation* | 0.136 | 0.114*** |

*** Statistically significant at the 1 per cent level

### 4.2 Aggregate Vulnerability and Poverty

By construction, vulnerability has two sources: low expected level of wellbeing and excess volatility in expected wellbeing. On this basis Chaudhuri, *et al.* (2002, p18) suggest two separate thresholds for determining vulnerable households: 50 per cent and the prevailing rate of headcount poverty. They then divide the aggregate population into three distinct groups: the highly-vulnerable (i.e. with a better-than-even chance of being poor); the relatively vulnerable (i.e. households whose probability of being poor in the future is greater than the average rate of poverty in the population but less than 50 per cent); and the non-vulnerable (Table 4). Tesliuc and Lindert (2004, p65) note that this characterisation of vulnerability is loosely correlated with the more familiar taxonomy of non-poor, transient poor and chronic poor, though the two are not exact substitutes.

[12] A number of tests were also run to check the specification of the model. Importantly, there was no correlation between the error from the wellbeing equation and the explanatory variables. And the adjusted R-squared was higher when shocks and response variables were included in the model, confirming the choice to include them.

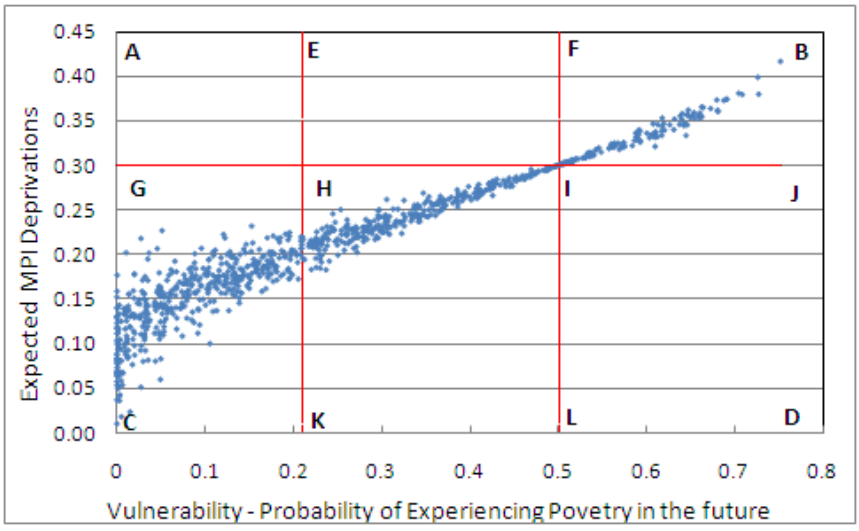
**Table 4: Vulnerability and Poverty Groupings**

| Group | Estimated vulnerability (i.e. predicted probability of being poor one period ahead) | Source of Vulnerability | Poverty Equivalent |
|---|---|---|---|
| High Vulnerability | In excess of 50 per cent | Low-mean (LM) vulnerable. Households vulnerable due to chronically low wellbeing | Chronic poor |
| Relative Vulnerability | Greater than the prevailing rate of headcount poverty but lower than 50 per cent | High volatility (HV) vulnerable. Households vulnerable due to excess volatility in their expected wellbeing | Transient poor |
| Non-Vulnerable | Below the existing rate of headcount poverty | | Non-poor |

Author: based on and Chaudhuri, *et al.* (2002)

Figure 1 plots the expected weighted sum of MPI deprivations for each household (Equation 8) and the calculated expected probability of experiencing poverty (Equation 9). The line *KE* represents the prevailing rate of poverty (20.8 per cent): the "relative vulnerability threshold" while *FL* is set at 0.50, the "high vulnerability threshold". *GJ* represents Alkire and Foster's (2011) threshold for MPI poverty (0.30 weighted deprivations). Accordingly, the non-vulnerable group is represented as AECK*;* the HV vulnerable is represented by *EFKL;* with the LM vulnerable cohort as *FBLD.*

**Figure 1: Vulnerability and expected weighted sum of deprivations in Melanesia***




* Higher deprivation score represents lower household wellbeing
Source: Author

Another way of presenting these results is to compare the different types of vulnerability with observed poverty. Table 5 organises households according to poverty and vulnerability status. In general, there is a positive correlation between the observed weighted sum of MPI deprivations and the expected probability of experiencing future poverty (correlation coefficient of 0.53). Around 48 per cent of the sample is considered to vulnerable, with

vulnerability stemming from both chronic and transitory factors – though the latter tends to dominate. Indeed around 35 per cent of all households surveyed (representing three quarters of the total vulnerable cohort) are vulnerable owing to excess volatility in their wellbeing. The importance of transitory factors is evident in the fact that only 7 per cent of the sample (i.e. around one quarter of observed poor households) are chronically poor, while the vulnerability of around half of the observed poor is due to transitory factors; with the remaining quarter of currently poor households not expected to be poor in the future. Importantly, 31.6 per cent of the total sample (around four-tenths of all non-poor households) are non-poor but considered vulnerable, with the vast majority of this cohort vulnerable due to excess volatility in their wellbeing. 47.5 per cent of all households surveyed are neither poor, nor vulnerable.

**Table 5: Vulnerability and Observed Poverty***

| | | Observed poverty | | |
|---|---|---|---|---|
| | | Poor<br>20.8% | Non-Poor<br>79.2% | |
| Estimated vulnerability | Total vulnerability<br>48.2% | Chronic poor<br>(LM vulnerable)<br>6.9% | Vulnerability to chronic poverty<br>(LM vulnerable)<br>6.4% | High vulnerability<br>12.9% |
| | | Frequently poor<br>(HV vulnerable)<br>9.7% | Vulnerability to frequent poverty<br>(HV vulnerable)<br>25.2% | Relative vulnerability<br>35.3% |
| | Not vulnerable<br>51.8% | *AEGH*: Infrequently poor<br>(poor but not vulnerable)<br>4.3% | Not vulnerable and not poor<br>47.5% | |

* Shaded area is vulnerable; N = 917
Source: Author, adapted from Chaudhuri, *et al*. (2002) and Tesliuc and Lindert (2004)

### 4.3 Vulnerability to Poverty by Location

The incidence of poverty and vulnerability in each of the twelve survey locations is presented in Table 6. In line with the aggregate results, vulnerability is more widespread than poverty, with headcount vulnerability rates higher than headcount poverty rates in each location. Moreover, much of the vulnerability stems from HV vulnerability, rather than LM vulnerability. Capital cities have a higher incidence of poverty and vulnerability than non-capital cities, while aggregate rates of headcount poverty and vulnerability are higher in the Solomon Islands than in Vanuatu.

At the individual community level there is substantial variation in both the rates of poverty and vulnerability. Generally speaking, however, communities with the highest rates of MPI poverty also tend to have the highest rates of vulnerability. As with poverty, the highest rates of vulnerability are observed in urban settler communities and geographically distant

communities, with the lowest rates in communities that are essentially rural in character, with good access to land and opportunities to earn income from agriculture and tourism but with effective transport links for market centres (such as Luganville, GPPOL villages and Hog Harbour).[13] The Weather Coast stands out as having clearly the highest rate of both observed poverty (42.7 per cent) and estimated vulnerability (90.7 per cent) of any of the locations. Urban regions, such as Auki, Honiara and Vila also have relatively high rates of both poverty and vulnerability. These relativities between communities are also reflected in the mean level of vulnerability – i.e. the mean probability of experiencing poverty in each region. On this score, the Weather Coast has a mean vulnerability score of 0.47, compared with only around 0.14 in the lowest-poverty areas.

[13] It should be noted that Auki and Luganville are the second largest towns in the Solomon Islands Vanuatu, respectively, the rate of observed poverty in Auki tends to more closely resemble the characteristics of geographically isolated and capital cities while in Luganville is more akin to the well-connected rural communities of GPPOL and Hog Harbour. In part, this may reflect the divergent economic fortunes of the two cities: in particular the steady stream of tourism to the east coast of Espirto Santo that funnels through Luganville and is largely absent from Malaita. Indeed, it is likely to be no coincidence that Hog Harbour, which is connected to Luganville via the East Santo road, also performs relatively well on poverty and vulnerability metrics. It provides a cautionary tale of the importance of not over-generalising the results from twelve unique communities.

**Table 6: Vulnerability and Poverty; By Location**

| Location | N | % Households* | | Mean vulnerability | % Vulnerable | | Vulnerability to Poverty Ratio | LM Vulnerability to Poverty Ratio |
|---|---|---|---|---|---|---|---|---|
| | | Poor | Vulnerable | | Relative Vulnerability (HV Vulnerable) | High Vulnerability (LM Vulnerable) | | |
| Total | 917 | 20.8 | 48.2 | 0.24 | 73.3 | 26.7 | 2.3 | 0.62 |
| Urban | 318 | 24.2 | 50.6 | 0.25 | 70.2 | 29.8 | 2.1 | 0.62 |
| Rural | 599 | 19.0 | 46.9 | 0.23 | 75.1 | 24.9 | 2.5 | 0.61 |
| Capital Cities | 159 | 26.4 | 52.8 | 0.27 | 61.9 | 38.1 | 2.0 | 0.76 |
| Non-capital city | 758 | 19.7 | 47.2 | 0.23 | 76.0 | 24.0 | 2.4 | 0.58 |
| Solomon Islands | 473 | 25.4 | 56.9 | 0.28 | 66.2 | 33.8 | 2.2 | 0.76 |
| Honiara | 80 | 23.8 | 52.5 | 0.25 | 71.4 | 28.6 | 2.2 | 0.63 |
| Auki | 78 | 34.6 | 71.8 | 0.32 | 71.4 | 28.6 | 2.1 | 0.59 |
| GPPOL | 85 | 10.6 | 25.9 | 0.14 | 86.4 | 13.6 | 2.4 | 0.33 |
| Weather Coast | 75 | 42.7 | 90.7 | 0.47 | 30.9 | 69.1 | 2.1 | 1.47 |
| Malu'u | 80 | 26.3 | 42.5 | 0.19 | 79.4 | 20.6 | 1.6 | 0.33 |
| Vella | 75 | 16.0 | 62.7 | 0.25 | 87.2 | 12.8 | 3.9 | 0.50 |
| Vanuatu | 444 | 16.0 | 39.0 | 0.19 | 84.4 | 15.6 | 2.4 | 0.38 |
| Vila | 79 | 29.1 | 53.2 | 0.27 | 52.4 | 47.6 | 1.8 | 0.87 |
| Luganville | 81 | 9.9 | 25.9 | 0.14 | 100.0 | 0.0 | 2.6 | 0.00 |
| Hog Harbour | 72 | 11.1 | 29.2 | 0.14 | 100.0 | 0.0 | 2.6 | 0.00 |
| Mangalilu | 72 | 13.9 | 34.7 | 0.15 | 92.0 | 8.0 | 2.5 | 0.20 |
| Baravet | 66 | 16.7 | 57.6 | 0.23 | 89.5 | 10.5 | 3.5 | 0.36 |
| Banks | 74 | 14.9 | 35.1 | 0.18 | 96.2 | 3.8 | 2.4 | 0.09 |

Note: the fraction poor is the headcount poverty rate, while the fraction vulnerable is the headcount vulnerability rate for those who are relatively" vulnerable. Mean vulnerability is the mean probability of experiencing poverty in the future in the cohort

*Poverty and vulnerability are not mutually exclusive (see Table 5)

There are also important differences in the mixture of vulnerability in across communities. Communities that have particularly high rates of poverty, such as Weather Coast, Auki, Port Vila (and to a somewhat lesser extent Honiara and Malu'u), also tend to have a greater proportion of LM vulnerability than the rest of the sample. On the face of it this suggests that in areas where poverty and vulnerability to poverty are relatively high, chronic factors as well as exposure to risk have important role to play. In the other communities, it is transitory factors, such as exposure to shocks, which appear to be the main driver of future wellbeing. In fact, at the extreme end of the spectrum, in low-poverty low-vulnerability communities such as Luganville and Hog Harbour, what poverty that does exist appears to be entirely the result of transitory factors. The geographically remote communities of Baravet and Vella Lavella present interesting cases, with relatively low levels of poverty, yet with high rates of vulnerability more akin to some of the high-vulnerability locations. Again, in each case, the result appears to be inordinate exposure to shocks.

Chaudhuri, *et al.* (2002, pp11-17) claim that juxtaposing poverty and vulnerability, as well as decomposing vulnerability into its two main components (HV and LM vulnerability), provides important insights for the design of social protection policies. Vulnerability-to-poverty ratios can be useful for identifying communities in need of poverty-prevention programs that may not be evident from poverty statistics alone. For instance, the geographically distant community of Vella Lavella in the Western Province of the Solomon Islands has a lower-than-average rate of poverty compared with the rest of the communities visited in the Solomon Islands, yet a higher-than-average rate of vulnerability. Moreover, vulnerability-to-poverty ratios can potentially be useful in prioritising policy action between communities with ostensibly similar circumstances. An example can be seen when comparing the communities of Baravet and Banks Islands in Vanuatu; each has a relatively similar rate of headcount poverty (between 15 and 17 per cent), yet the expectation of future poverty is markedly different, with the vulnerability to poverty considerably higher in Baravet (57.6 per cent) than in the Banks (35.1 per cent).

The mix of vulnerability, too, is likely to have important social protection policy implications. To the extent that vulnerability in some communities appears to derive from chronic factors, social protection policies designed to mitigate risk, such as insurance, may not be as effective in improving wellbeing as policies designed to target the root causes of chronic poverty. The converse is also likely to be true in communities where vulnerability is largely the result of transitory factors and exposure to risk.

### 4.4 A Profile of Household Vulnerability in Melanesia

In general, a household's wealth (both conventional and traditional forms) and level of education are strong predictors of reduced vulnerability to experiencing poverty one period ahead. In non-capital cities having access to formal employment reduced vulnerability while in capital cities larger households with more adults were more vulnerable.

Holding all else constant, households with a greater conventional wealth index score tend to be less vulnerable owing to their lower rates of expected poverty (a negative sign implies a reduction in deprivations and thus an improvement in wellbeing). In fact, a one per cent increase in a households' conventional wealth index (based on household characteristics and ownership of durable assets) decreases its weighted deprivation score by 0.03 in non-capital regions and by almost 0.05 in the capitals. Additionally, households that are relatively well-endowed with traditional wealth (based upon livestock holdings, environmental assets and social capital) also tend to be less vulnerable. However, in contrast to conventional wealth, traditional wealth reduces vulnerability by acting as a shock absorber; lowering expected volatility (i.e. the variance) of future wellbeing.

Better educated households have both lower average levels and volatility of expected MPI deprivations. Increasing the share of adults that have passed at least one year of secondary school decreases a households' weighted deprivation score by between 0.07 and 0.13 – a considerable amount seeing that the threshold score for poverty is 0.30. This result is generally consistent with most studies that examine the link between education and vulnerability. Glewwe and Hall (1998) attribute this to Schultz's (1975) hypothesis that more educated households adapt more quickly as economic circumstances change (in addition to the increasing returns to scale of education). It is also consistent with the results for PNG that households with more educated heads are less vulnerable to poverty (Jha and Dang 2010).

Having access to formal employment does not affect households' vulnerability in capital cities, where employment is relatively widespread, though it decreases vulnerability in non-capitals by reducing both households' expected level of MPI deprivations and the volatility of their wellbeing. This possibly illustrates the importance of relatively stable forms of income from formal employment in rural areas, as distinct from more ephemeral agriculturally based income sources. Indeed, both cash crop sellers and food peddlers are more vulnerable in non-

capital city regions. This also further underscores the importance of connecting rural areas to formal markets.

Household size tends to increase vulnerability in capital cities, owing to a higher level and volatility of expected MPI deprivations.[14] The additional vulnerability of larger households in capital cities is generally consistent with other studies that linked household size and vulnerability to macroeconomic shocks. Using data from Argentina, Corbacho, e*t al*. (2007) suggests that larger households tended to be poorer in urban in regions than in rural regions; and also suggest that urban households with more adults were concomitantly more exposed to adverse labour market shocks. This may well be the case in Melanesia too, with the number of adults in a household a statistically significant predictor of its experience of a labour market shock in the capital cities (see Appendix A4).

Female-headed households are slightly more vulnerable than male-headed households. This is limited to non-capital city regions and is due to excess volatility in expected wellbeing. The modest impact on household vulnerability is consistent with much of the literature which generally failed to find a strong relationship between the head's gender and a households' vulnerability, once other correlates of wellbeing are accounted for.

The experience of global economic shocks, such as terms-of-trade shocks associated with international commodity price inflation, did little to influence households' vulnerability. Presumably this was because the experience of food and fuel price inflation was almost universally experienced by households. In terms of households observed experiences of other shocks, and their observed responses to shocks, there were some clear distinctions between capital and non-capital city regions. Households in urban squatter settlements in capital cities that reported experiencing an environmental shock (such as a natural disaster or crop failure) had higher expected volatility in their wellbeing, and thus are, on average, more vulnerable to poverty. In contrast, the coefficients on environmental shocks in non-capital city regions, where the environment is much more prominent in households' livelihoods, are not statistically significant. Interestingly, households in the capitals that resorted to using the natural environment in order to cope with a negative shock are also more vulnerable to poverty – with almost 0.08 percentage points higher expected level of weighted deprivations than those households that did not resort to the environment in the capitals. That capital city residents with connections to the environment are relatively more vulnerable could be

[14] With the coefficient on the square of household size negative and significant, the maximum vulnerability occurs in capital cities with around eleven household members.

evidence of the inadequacy of environmental resources in providing a minimum standard of living in those areas. Indeed, the headcount MPI poverty rate of households in the capital cities that indicated that the garden was their primary source of food was 34.7 per cent – statistically higher than both the headcount poverty rate of the rest of the capital city population and the non-capital city population, 18.2 per cent and 19.5 per cent, respectively.

Households that used financial services to cope with the effects of shocks, such as drawing down household savings, claiming an insurance policy or seeking a formal line of credit, have lower average vulnerability in capital cities; on account of lower expected levels of deprivations. This is unsurprising, and is consistent with ordinary consumption smoothing behaviour to avoid poverty, in the face of income shocks, seen elsewhere. However, the fact that this behaviour also appears to reduce the prospect of experiencing non-monetary MPI poverty is an interesting finding. In contrast, using financial services in non-capital city regions, where financial services are much less available, is linked with increased vulnerability by increasing the average level and volatility of expected MPI deprivations. On the face of it this result is surprising, given the fact that improving access to services in rural areas is a key policy focus in Melanesia (GOV, 2006, p8).[15] Without more comprehensive information on the divers of this effect it is difficult to make clear assertions. It is an issue that therefore clearly warrants further investigation.

Households that sold assets tended to be less vulnerable than households that did not; possibly suggesting that households that sold assets were better able to smooth the effects of shocks. This is consistent with studies in other developing-country contexts; for instance, Rosenzweig and Wolpin (1993) found evidence that livestock sales and purchases are used as part of farm households' consumption-smoothing strategies in India. However, asset sales have also been found to be suboptimal as a coping mechanism in some contexts; particularly when shocks are covariant as widespread sales depress prices (Fafchamps and Gavian, 1997). To the extent that assets may therefore be sold during times of stress for less consideration than they might be worth otherwise, such sales may, ultimately, weaken households' resilience to future shocks. However, with only cross-sectional data available, identifying this effect is beyond the scope of this paper. Few inferences can be made regarding the effect of land sales on vulnerability since it was not captured in the survey.

[15]In the survey, a much higher proportion of households in capital cities indicated that they had access to a bank account than in non-capital cities (62.4 per cent compared with 50.6 per cent) however, this rate fell substantially the more geographically distant communities were (15.6 per cent in Weather Coast; 27.3 per cent in Baravet).

Actively drawing on the traditional economy during shocks, i.e. drawing on informal insurance networks such as family and "*wantoks*", tended to increase household's vulnerability modestly; in non-capital city regions where it reflected a higher average rate of deprivations and in capital cities where is increased volatility of expected wellbeing. At first glance, this appears to be at odds with the shock-absorbing role played by traditional wealth. However, even when traditional wealth was excluded from the model the coefficient on using the traditional economy remained significant; suggesting that the result is robust to the model's specification.[16] This may, therefore, be providing some evidence to support Connell's view that secular shifts in the Pacific, including rapid urbanisation, are causing traditional safety nets to break down, with households in urban squatter communities even resorting to abandoning their cultural obligations, simply to get by (Connell, 2010; 2011). Accordingly, an additional variable, that of jettisoning cultural obligations (such as giving less at church, fundraising events or to "*wantok*") was also included in the model (though separately from using the traditional economy since there was a degree of collinearity when both were included). In capital cities jettisoning such obligations resulted in a statistically significant, though modest, increase in the expected volatility of wellbeing, while in non-capital city areas the coefficient was statistically insignificant.

Notwithstanding the fact that more than four-fifths of households looked to augment their income in times of stress, once other household characteristics were accounted for, it has no discernible influence on households' vulnerability. Linked to this, somewhat, is the fact that households almost universally suggested that they did not withdraw their children from school in order to increase the stock of available household labour during times of stress. In fact, qualitative information collected in key informant interviews and focus group discussions with men and women indicated that households prioritised the payment of school fees and went to great lengths to ensure that there was sufficient money to continue their children's education. However, this general reluctance to specifically link children's school attendance with shocks may be most relevant for primary school, with the reality in Vanuatu and the Solomon Islands being that only a relatively small share of children are able to complete their secondary education because households are unable to pay the ongoing fees (AusAID, 2012).

[16]In order to check for potential issues of multicollinearity between traditional wealth and use of the traditional economy during shocks, the model was re-run excluding traditional wealth. While the coefficient became on expected volatility of wellbeing capital cities because insignificant, the coefficient on expected level of wellbeing in non-capital cities remained significant.

The reduced spending on education that was nominated in response to a shock (and which used as a proxy measure of broader changes in non-discretionary spending) mainly took the form of cutting expenditure on schooling such as textbooks, uniforms and transport.[17] Cutting these outlays was significant in reducing households' vulnerability in non-capital regions. However, to the extent that reducing education expenditure jeopardises the formation of human capital, then households that appear to be using education as a mechanism to smooth variation in wellbeing may ultimately be increasing their vulnerability to future shocks. This is particularly the case given the centrality of education attainment to households' resilience, as explained above.

## 5. Discussion

This paper estimates the vulnerability of households in Vanuatu and the Solomon Islands to experiencing multidimensional poverty. It combines unique empirical survey data with an approach to estimating vulnerability to poverty that is widely used in the development economics literature. It sharpens the analytical focus on household wellbeing in Melanesia, beyond current observed poverty, by identifying those households that are likely to experience poverty in the future and the reasons why they are likely to be poor. By examining household's exposure to shocks during an extremely cyclical phase in the world economy, it examines the contribution that macroeconomic and other shocks, as well as household's responses to shocks, have on their level of vulnerability.

In general, headcount vulnerability rates tend to be higher in areas where headcount poverty rates are also high. This confirms a link between poverty and vulnerability. However, in each location surveyed the incidence of vulnerability was more widespread than the observed rate of poverty. This further underscores the fact that headcount poverty is a necessary, but insufficient, indicator of households' future wellbeing. Policymakers interested in social protection would therefore be well served by dedicating resources to forward-looking anti-poverty policy interventions as well as focusing on alleviating the current incidence of poverty.

[17] A number of variables were considered to capture information on household budgetary reallocations during shocks. These included changes in non-discretionary items (food, education, health and other essentials) and changes in household spending on discretionary items (non-essentials and demerit goods). However, most spending variables were highly correlated, suggesting that if non-discretionary (or discretionary) spending was curtailed households tended not to discriminate. Two measures of spending were therefore selected as proxy measures; one non-discretionary spending (education) and discretionary spending (demerit goods). These also had the advantage of being the consumption response variables available that were least correlated with other response variable, thus mitigating issues of multicollinearity in the wellbeing model.

Generally speaking, being wealthier, better educated and employed reduces a household's vulnerability in Vanuatu and the Solomon Islands. This is consistent with other vulnerability analyses in developing countries and highlights the importance of education policies and the removal of barriers that prevent households from engaging in the formal economy. Indicators of traditional Melanesian wealth were also important in reducing the volatility of households' expected wellbeing. In effect, this suggests that traditional livelihood assets (such as land, gardens, livestock, and strong social capital) act like a shock absorber for Melanesian households, mitigating the adverse effects of risk. This confirms Regenvanu (2009) thesis that traditional livelihoods provide households with a safety net from the acute macro vulnerability that small island states of Melanesia have to the effects of economic and environmental shocks. However, contradicting this somewhat, is the fact that drawing on the traditional support structures in times of need increases household vulnerability in non-capital city regions with a similar effect observed for households in capital cities that drew upon environmental resources. Similarly, drawing on financial services increased vulnerability in non-capital city regions (where financial services are scarce), though reduces vulnerability in capital cities, where they are relatively plentiful. More work is clearly needed to better understand the efficacy of the various coping mechanisms available to households in Vanuatu and the Solomon Islands in times of stress.

The results also indicate that around three quarters of the total estimated vulnerability in Vanuatu and the Solomon Islands stems from excess volatility in expected wellbeing. This is an interesting finding, given the MPI measure itself is based upon at least one static indicator and a number of slow-moving flow variables.[18] This may be an indication of the important role that Melanesia's inordinate exposure to risks, at a national level, has in determining households' wellbeing prospects. It also confirms that poverty in Melanesia, like elsewhere, is a stochastic phenomenon. It may also provide some evidence to suggest that the traditional livelihoods are not able to comprehensively insure households from the effects of external shocks.

However, in a number of areas where the observed rate of poverty was already relatively high, chronic factors were also important in driving vulnerability. This was particularly the case in urban communities of Port Vila, Honiara and Auki as well as in the geographically isolated community on the Weather Coast.

[18] Of the ten indicators used to calculate the MPI, one is static (whether a household experienced infant mortality); while the remaining indicators are flow variables and subject to change.

The ability to distinguish between different types of vulnerability highlights an important contribution of vulnerability analyses. By understanding whether poverty in Vanuatu and the Solomon Islands is caused by transitory of chronic factors, policymakers can formulate their social protection policies to target the causes of poverty. For instance risk mitigation policies are unlikely to be as effective in the capital cities of Vila and Honiara, where vulnerability stems from the low endowments, as a transfer program that targets the cause of vulnerability. Analysing vulnerability separately from vulnerability might also facilitate the prioritisation of social protection policies between communities that, on the face of it, have similar rates of poverty yet different risk profiles.

However, it is important to be mindful of some of the key limitations in this analysis. In particular, by relying on cross-sectional data to estimate developments over time the analysis is necessarily assumption driven. Moreover, there are a number of recognised shortcomings to multidimensional poverty indices, while issues of endogeneity mean causal relationships should be treated with some caution. Ravallion (2010) criticises the indices that collapse multiple dimensions into a single score, such as the MPI, for lacking a transparency as well as an explicit linkage to conceptual analysis. He suggests that such measures can even potentially distort poverty assessments. Alkire and Santos (2010, p61) also acknowledge that to ensure the international comparability of the MPI, only generic data are included – thus necessarily abstracting form important local determinants of wellbeing. However, Alkire and Foster (2011b) contend that the MPI is conceptually anchored in Sen's capability approach, as well as emphasising the transparency around its construction and demonstrating the MPI's robustness to a range of weights.

The very nature of the risk-response-outcome nexus that characterises vulnerability also means that endogeneity of explanatory variables in the model is a pervasive issue. Very few variables are likely to be truly exogenous, a point noted by Glewwe and Hall (1998, p196) in their analysis of vulnerability that "basically, only those characteristics of household heads that are determined by the age of adulthood are assumed to be exogenous". While Glewwe and Hall were referring to the fact that most household characteristics are the by-product of previous decisions in response to changing economic conditions, this is also the case with households' exposure to shocks and coping mechanisms. Shock experience is endogenous with wellbeing, with poor (and vulnerable) households more likely to experience natural disasters and less likely to experience formal labour market shocks owing to their relatively closer links to the land. While households' coping behaviour in the face of shocks is

obviously endogenous to the shock it is also endogenous to the environment, households' own ability to mobilise resources and even the success (or failure) of previous coping behaviour to past shocks. To that end, one should be careful when concluding that a certain coping mechanism (such as drawing on the traditional economy) is linked with heightened vulnerability because it is something that households did because they were vulnerable, or whether it was not a successful strategy and thus was a characteristic of those households that were unable to smooth shocks.

Notwithstanding its potential shortcomings, this paper has addressed an important gap in analyses of wellbeing in Melanesia: the dearth of estimates of households' vulnerability to poverty. Importantly it also demonstrates the utility of examining vulnerability using broader, non-monetary, measures of wellbeing, such as the MPI.

It also highlights the importance of different lenses of wellbeing and suggests that examining vulnerability to non-monetary measures has merit. One of the key advantages of using unique survey data is that it was able to provide a perspective on wellbeing that is elusive in broader, aggregated, survey sets that are available in Melanesia, such as the HIES. Future work on vulnerability in Melanesia should therefore concentrate on combining the sampling breadth of the HIES with deeper perspectives on household wellbeing, beyond simply income and consumption. Such an approach would provide policymakers with a powerful evidence base with which to guide social protection policies.

**References:**


Adger, W. Neil

2006 Vulnerability. *Global Environmental Change* 16 (3), pp.268–281.

Alkire, Sabina, and James Foster

2011a Counting and Multidimensional Poverty Measurement. *Journal of Public Economics* 95, pp.476-487.

2011b Understandings and misunderstandings of multidimensional poverty measurement. *Journal of Economic Inequality* 9, pp.289-314.

Alkire, Sabina, and Maria Santos

2010 Acute Multidimensional Poverty: A New Index for Developing Countries. *Oxford Poverty and Human Development Initiative Working Paper*, No. 38.

Alwang, Jeffrey, Paul B. Siegel, and Steen Jorgensen

2001 Vulnerability: A View From Different Disciplines. *Social Protection*, Washington: World Bank.

Amemiya, T.

1977 "The maximum likelihood estimator and the non-linear three stage least squares estimator in the general nonlinear simultaneous equation model," *Econometrica*, 45, pp.955-968.

Amin, S., A. Rai, and G. Topa

2000 Does microcredit reach the poor and vulnerable? Evidence from northern Bangladesh. *Unpublished Manuscript*.

AusAID

2012 Poverty, vulnerability and social protection in the Pacific: The role of social transfers. Australian Agency for International Development, Canberra. Available at: http://www.ausaid.gov.au/aidissues/foodsecurity/Documents/social-transfer.pdf

Azam, M. and K. Imai

2012 "Households' Vulnerability to Idiosyncratic and Covariate Shocks - the case of Bangladesh", *Discussion Paper Serries DP2012-02*, Kobe University Research Institute for Economics and Business Administration, Kobe Japan.

Calvo, C. and S. Dercon

2005 "Measuring Individual Vulnerability" *Discussion Paper Series Number 229*, Oxford University Department of Economics.

Celedoni M

2013 “Vulnerability to poverty: an empirical comparison of alternative measures” *Applied Economics* 45 (12), pp.1493-1506.

Chaudhuri, Shubham

2003 “Assessing Vulnerability to Poverty: Concepts Empirical methods and Illustrative Examples”. *mimeo.* New York: Columbia University, Department of Economics.

Chaudhuri, Shubham, Jyotsna Jalan, and Asep Suryahadi

2002 “Assessing Household Vulnerability to Poverty from Cross Sectional Data: A Methodology and Estimates from Indonesia”. *Discussion Paper no. 01022-52*. New York: Columbia University.

Christiaensen, L.

2004 Measuring Household Vulnerability: Conceptual Issues and Illustrative Examples, PADI Conference on Measuring, Understanding and Alleviating Household Vulnerability, Dar es Salaam, 2-3 February, 2004. Accessed 29 December 2012, Available at: http://www.worldbank.org/afr/padi/Measuring%20Vulnerability.pdf

Christiaensen, Luc, and K. Subbarao

2005 Towards an Understanding of Household Vulnerability in Rural Kenya. *Journal of African Economies* 14 (4), pp.520–558.

Chiwaula, Levison S., R. Witt, and H. Waibel

2011 An Asset-based Approach to Vulnerability: The Case of Small-scale Fishing Areas in Cameroon and Nigeria. *The Journal of Development Studies* 47 (2), pp.338–353.

Connell, John

2011 “Elephants in the Pacific? Pacific Urbanisation and its Discontents”. *Asia Pacific Viewpoint*, 52 (2), pp.121-135.

2010 “Pacific islands in the global economy: Paradoxes of migration and culture”, *Singapore Journal of Tropical Geography*, 31, pp.115–129

Corbacho, Ana, Mercedes Garcia-Escribano, and Gabriela lnchaustel

2007 Argentina: Macroeconomic Crisis and Household Vulnerability. *Review of Development Economics* 11 (1), pp.92-06.

Coudouel, A. and J. Hentschel

2000 “Poverty Data and Measurement – Preliminary Draft for A Sourcebook on Poverty Reduction Strategies”. The World Bank: Washington, D.C. April.

Dercon, Stefan

2001 *Assessing Vulnerability to Poverty*. mimeo, Oxford: University of Oxford, Department of Economics.

2006 Vulnerability: A Micro Perspective. *QEH Working Paper Series – QEHWPS149*, Oxford: University of Oxford, Department of International Development.

Dercon, S. and P. Krishnan

2000."Vulnerability, seasonality and poverty in Ethiopia". *Journal of Development Studies* 36 (6), pp.25-53.

del Ninno C., G Vecchi and N Hussain

2006, "Poverty, Risk and Vulnerability in Pakistan", Centre for Research in Poverty and Income Distribution (CRPRID). Planning Commission, Government of Pakistan.

Fafchamps, M and S. Gavian

1997 "The Determinants of Livestock Prices in Niger," *Journal of African Economies, Centre for the Study of African Economies (CSAE)*, 6(2), pp. 255-95.

Feeny, S.

2010 *The Impact of the Global Economic Crisis on the Pacific Region*. Melbourne: Oxfam Australia, February, 2010.

Feeny, S, L. McDonald, A. Posso and J. Donahue

forthcoming "Household Vulnerability and Resilience to Shocks: Findings from the Solomon Islands and Vanuatu", *State Society and Governance in Melanesia*

Filmer, D., & Pritchett, L. H.

2001 "Estimating wealth effects without expenditure data – or tears: An application to educational enrolments in states of India". *Demography*, 38 (1), pp.115–132.

Foster J, J Greer and E Thorbecke

1984 "A Class of Decomposable Poverty Measures", *Econometrica*, 52, pp.761-766.

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 Economics*, 56 (1), pp.181-206.

Guimarães, R J R

2007 "Searching for the Vulnerable: A Review of the Concepts and Assessments of Vulnerability Related to Poverty", *The European Journal of Development Research* 19, pp.234–250.

Günther, Isabel, and Kenneth Harttgen

2009 "Estimating Households Vulnerability to Idiosyncratic and Covariate Shocks: A Novel Method Applied in Madagascar". *World Development* 37, pp.1222–1234.

Goldstein, H.

1999. *Multilevel statistical models*. London: Arnold.

Government of the Republic of Vanuatu (GOV)

2006 "Priorities and Action Agenda 2006 – 2015", *Department of Economic and Sector Planning Ministry of Finance and Economic Management*, Port Vila Vanuatu, Accessed 21/1/13, Available at: http://www.ausaid.gov.au/countries/pacific/vanuatu/Documents/government-of-vanuatu-priorities-action-agenda-2006-15.pdf

Guillaumont, Patrick

2010 Assessing the Economic Vulnerability of Small Island Developing States and the Least Developed Countries. Journal of Development Studies 46 (5), pp.828–854.

Hoddinott, J. and A. Quisumbing

2003 Methods for microeconometric risk and vulnerability assessments: A review with empirical examples. *Unpublished Manuscript.*

Imai, K., R. Gaiha and W. Kang

2011 Vulnerability and Poverty Dynamics in Vietnam, *Applied Economics*, 43, pp.3603-3618.

Jha, R. and T. Dang

2010 "Vulnerability to Poverty in Papua New Guinea in 1996." *Asian Economic Journal* 24 (3), pp. 235-251.

Kamanou, Gisele, and Jonathan Morduch

2004 Measuring Vulnerability to Poverty. In *Insurance Against Poverty*, edited by Stefan Dercon, United Nations University, Helsinki: Oxford University Press and World Institute for Development Economics.

Kurosaki T

2010 "Targeting the Vulnerable and the Choice of Vulnerability Measures: Review and Application in Pakistan" *The Pakistan Development Review*, 49 (2), pp. 87-103.

Malvatumauri National Council of Chiefs

2012 *Alternative Indicators of Well-being for Melanesia*: Vanuatu Pilot Study report, Port Vila, Vanuatu.

McGillivray, M., Naudé, W. and Santos-Paulino, A.

2008 'Small island states development challenges: introduction', *Journal of International Development*, 20 (4), pp. 481–485.

Moser, C

2001 "Insecurity and social protection – has the World Bank got it right?" *Journal of International Development*, 13, pp.361-368.

Naude, Wim, Amelia Santos-Paulino, and Mark McGillivray

2009 "Measuring Vulnerability: An Overview and Introduction". *Oxford Development Studies* 37 (3), pp.183–191.

Pritchett, Lant, Asep Suryahadi, and Sudarno Sumarto

2000 Quantifying Vulnerability to Poverty: A Proposed Measure with Applications to Indonesia. *SMERU Working Paper*, Social Monitoring and Early Response Unit, Washington: World Bank.

Ravallion, Martin

2010 "Mashup Indices of Development". *Policy Research Working Paper No. 5432*, World Bank, Washington.

Regenvanu, Ralph

2009 "The traditional economy as the source of resilience in Melanesia*"*. *Mimeo*. Port Vila: Vanuatu Cultural Centre.

Rosenzweig, M. and K. Wolpin.

1993 "Credit Market Constraints, Consumption Smoothing and the Accumulation of Durable Production Assets in Low-Income Countries: Investments in Bullocks in India." *Journal of Political Economy*, Vol. 101 (2), pp.223-244.

Santos-Paulino A

2011 "Fragility and Vulnerability in Small Island Developing States: Issues and Challenges" *First meeting of the Caribbean Development Round Table, ECLAC,* Port of Spain, 13 September 2011.

Schultz, T.W.,

1975 "Human Capital and Disequilibrium. *Journal of Economic Literature,* 13. pp.827–846.

Suryahadi, Asep, and Sudarno Sumarto

2003 Poverty and Vulnerability in Indonesia Before and After the Economic Crisis. *Asian Economic Journal,* 17 (1), pp. 45–64.

Tesliuc, Emil, and Kathy Lindert

2004 Risk and Vulnerability in Guatemala: A Quantitative and Qualitative Assessment. *Social Protection Discussion Paper 0404*. Washington: World Bank.

United Nations

2011 LDC information: The criteria for identifying least developed countries Overview. Updated September 2011. Available at: http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_criteria.shtmlAccessed 21/1/13

2013 UN Target for ODA to LDCs (IPoA). Accessed 27/1/13, Available at: http://iif.un.org/content/un-target-oda-ldcs-ipoa accessed 21/1/13

UNDP

2010 *Human Development Report 2010*, United Nations Development Programme, New York, Palgrave Macmillan.

World Bank

2000 *World Development report 2000/01: Attacking Poverty*. New York: Oxford University Press.

2012 *Survey on International Support Measures specific to the Least Developed Countries (LDCs) related to Multilateral Official Development Assistance (ODA): Summary Results prepared by the United Nations Department of Economic and Social Affairs (DESA) and the Committee for Development Policy (CDP) Secretariat*. Accessed 21/1/13, Available at: http://esango.un.org/ldcportal/documents/10179/38203/sum_results_multi_worldbank.pdf

WTO

2013 *Work on special and differential provisions*, World Trade Organization, Geneva, Accessed 21/1/13, Available at http://www.wto.org/english/tratop_e/devel_e/dev_special_differential_provisions_e.htm

Zhang, Yuan, and Guanghua Wan

2006 An Empirical Analysis of Household Vulnerability in Rural China. *Journal of the Asia Pacific Economy*, 11 (2), pp.196–212.

2009 How Precisely Can We Estimate Vulnerability to Poverty? *Oxford Development Studies*, 37 (3), pp.277–287.

**Table A1: Wealth Index**

| Asset | Coefficient | Asset | Coefficient |
|---|---|---|---|
| Clock: Yes | 0.20264 | Unimproved Drinking Water: Yes* | -0.205437 |
| Clock: No | -0.185564 | Unimproved Drinking Water: No | 0.029644 |
| Bicycle: Yes | 0.262909 | Flush Toilet: Yes | 0.211278 |
| Bicycle: No | -0.055086 | Flush Toilet: No | -0.206033 |
| Radio: Yes | 0.153883 | Electricity: Yes | 0.226813 |
| Radio: No | -0.146336 | Electricity: No | -0.241529 |
| TV: Yes | 0.387999 | High Quality Building Materials: Yes | 0.185082 |
| TV: No | -0.163775 | High Quality Building Materials: No | -0.325069 |
| Computer: Yes | 0.640765 | High Quality Roofing Materials: Yes | 0.231306 |
| Computer: No | -0.059719 | High Quality Roofing Materials: No | -0.221814 |
| Sewing Machine: Yes | 0.183846 | Cook with Biomass: Yes | -0.067015 |
| Sewing Machine: No | -0.144014 | Cook with Biomass: No | 0.46443 |
| Mobile Phone: Yes | 0.094744 | Inside Kitchen: Yes | 0.337201 |
| Mobile Phone: No | -0.506727 | Inside Kitchen: No | -0.081799 |

*According to WHO/UNICEF definitions [19]
The first Eigenvalue 5.49 the second is 1.59

**Table A2: Traditional Wealth Index**

| Asset | Coefficient | Asset | Coefficient |
|---|---|---|---|
| Pig: Yes | 0.390221 | Saltwater Access: Yes | 0.109720 |
| Pig: No | -0.215211 | Saltwater Access: No | -0.434774 |
| Chicken: Yes | 0.413282 | Garden: Yes | 0.100600 |
| Chicken: No | -0.215666 | Garden: No | -0.717568 |
| Canoe: Yes | 0.292852 | Can access garden in <30 mins: Yes | 0.077477 |
| Canoe: No | -0.347879 | Can access garden in <30 mins: No | -0.094398 |
| Rent Land: Yes | -0.855383 | Decision Maker in Household Regarding Expenditure: Male | -0.140385 |
| Rent Land: No | 0.062899 | Decision Maker in Household Regarding Expenditure: Female | 0.023346 |
| Member of Church group: Yes | 0.047408 | Decision Maker in Household Regarding Expenditure: Both | 0.175577 |
| Member of Church group: No | -0.257614 | | |

The first Eigenvalue 2.74 the second is 1.39

[19] http://www.wssinfo.org/definitions-methods/watsan-categories/, accessed 21 1 2011 , accessed 19th September 2012

**Table A3: Descriptive Statistics of Observed Household Characteristics, Shock experiences and Responses to Shocks**

| | | | Capital City N = 174 | | Non-Capital City N = 781 | |
|---|---|---|---|---|---|---|
| **Variable Name** | **Variable Description** | **Obs.** | **Mean** | **St dev** | **Mean** | **St dev** |
| **Dependent Variable** | | | | | | |
| Weighted MPI deprivations | Weighted score of ten deprivations across three dimensions of wellbeing: health; education; and living standards. | 955 | 0.2083 | 0.1574 | 0.2061 | 0.1367 |
| **Household Characteristics** | | | | | | |
| Wealth | Conventional Wealth Index | 955 | 0.3222 | 0.8484 | -0.074 | 1.135 |
| Traditional Wealth | Traditional Wealth Index | 945 | -0.5930 | 1.0950 | 0.1196 | .8487 |
| Gender Head | Gender of household head: male= 0 female = 1 | 955 | 0.1264 | 0.3333 | 0.1241 | 0.3333 |
| Size | Number of people living in the household | 955 | 6.178 | 3.1563 | 5.2129 | 2.333 |
| Size Squared | Number of people living in the households (squared) | 955 | 48.074 | 64.788 | 32.610 | 29.701 |
| Dependency Ratio | Ratio of dependent household members (>65 and <18) to working aged household members | 945 | 0.7854 | 0.6635 | 0.9216 | 0.7852 |
| Adult Education | Percentage of adults in the household who completed at least one year of secondary school | 955 | 0.4619 | 0.3624 | 0.4091 | 0.3535 |
| Income Source - Employed | Household has access to formal employment | 507 | 0.7126 | 0.4538 | 0.4907 | 0.5002 |
| Income Source - Food Peddler | Household peddles food | 711 | 0.7011 | 0.4590 | 0.7542 | 0.4309 |
| Income Source - Other Peddler | Household peddles non-food items (betelnut, cigarettes, mats, etc) | 424 | 0.5459 | 0.4993 | 0.4213 | 0.4940 |
| Income Source - Cash Crop | Household sells cash crops (coconut, kava, copra) | 420 | 0.1839 | 0.3885 | 0.4967 | 0.5003 |
| Urban | Urban location of household: rural = 0; urban = 1 | 337 | | | | |
| Vanuatu | Country location of household: Solomon Islands = 0; Vanuatu = 1 | 469 | | | | |
| **Shock Experiences** | | | | | | |
| Real inflation shock | A household experienced an increase in real food prices or real fuel prices | 784 | 0.7873 | 0.4103 | 0.8284 | 0.3772 |
| Labour Market Shock | A household experienced reduced employment (job loss or reduced hours) | 149 | 0.2988 | 0.4590 | 0.1241 | 0.3300 |
| Natural Shock | A household experienced either a natural disaster or a crop loss shock | 647 | 0.6264 | 0.4851 | 0.6888 | 0.4632 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Theft Shock | A household experienced crime | 349 | 0.4023 | 0.4917 | 0.3572 | 0.4795 |
| Lifestyle Shock | A household experienced death\illness or a custom shock that made life hard | 359 | 0.3850 | 0.4880 | 0.3739 | 0.4841 |
| Other Economic Shock | A household experienced reduced demand for goods sold reduced supply of goods sold, reduced remittances, or an increase in household size that made life hard. | 258 | 0.3218 | 0.4685 | 0.2586 | 0.4381 |
| **Shock Responses** | | | | | | |
| Increase Income | Household looked for more ways to earn income following a shock | 788 | 0.7988 | 0.4020 | .83098 | 0.3750 |
| Reduce non-discretionary spending (education) | Household reduced spending on children's education following a shock | 307 | 0.2873 | 0.4538 | 0.3291 | 0.4701 |
| Reduce discretionary spending (demerit) | Household reduced spending on kava / cigarettes / betelnut / alcohol following a shock | 367 | 0.5287 | 0.5006 | 0.3521 | .47793 |
| Use Environment | Household ate more food from garden / reef following a shock | 776 | 0.7069 | 0.4564 | 0.8361 | 0.3704 |
| Use Traditional Economy | Household sought help from family / friend / neighbor following a shock | 566 | 0.6149 | 0.4880 | 0.5877 | 0.4925 |
| Jettison Traditional Economy | Household reduced their contributions to traditional fundraising events following a shock | 290 | 0.3046 | 0.4615 | 0.3035 | 0.4600 |
| Sell Assets | Household sold assets following a shock | 167 | 0.1839 | 0.3885 | 0.1729 | 0.3783 |
| Use Financial | Household used bank account, insurance policy, provident fund account following a shock | 121 | 0.1149 | 0.3199 | 0.1293 | 0.3358 |

Income sources are not mutually exclusive. As households were asked to nominate their top five income sources a given households may have access to more than one income source identified in the model. However having a job (either private or public ) and not having a job are mutually exclusive

**Table A4: Probit Regression Output**

| Dependent Variable | **Labour-Market Shock =1** | |
|---|---|---|
| | Model | dF/dx |
| Wealth | 0.149<br>(1.22) | 0.044 |
| Traditional Wealth | -0.442***<br>(-3.28) | -0.131 |
| Gender Head | 0.414<br>(1.25) | 0.136 |
| Number of Adults | 0.178**<br>(2.41) | 0.053 |
| Dependency Ratio | 0.040<br>(0.20) | 0.011 |
| Adult Education | -0.675*<br>(-1.66) | -0.200 |
| Employed | 1.299***<br>(3.36) | 0.300 |
| Food Peddler | -0.137<br>(-0.50) | -0.041 |
| Other Peddler | 0.179<br>(0.71) | 0.053 |
| Cash Crop Seller | 0.507<br>(1.25) | 0.166 |
| Goodness of fit tests | | |
| Hosmer Lemeshow Statistic<br>(p value) | 7.48<br>(0.49) | |
| Area under ROC Curve | 0.82 | |
| % correctly predicted | 83.32 | |

Robust z-statistics in parentheses; standard errors clustered on the basis of survey location; *** p<0.01, ** p<0.05, * p<0.10;
Dependent variable takes the value one if a household reported experiencing a labour market shock, and zero otherwise.
Hosmer Lemeshow Statistic is a lack-of-fit test: significant p values indicate a rejection of a goodness-of-fit test