Education Expenditure Responses to Crop Loss in Indonesia: A Gender Bias*

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Introduction

The recent financial crisis in Asia, coupled with the drought in Southeast Asia brought on by the El Niño weather pattern, have focused international attention on the impact of income shocks on households in developing countries. The welfare cost of highly variable income depends on the ability of households to smooth consumption by saving in good years and dissaving in bad years. If households are unable to smooth consumption and thus are forced to reduce consumption levels when faced with

Second, rather than studying total expenditure or savings, we study educational expenditure.[3] Although one would expect to observe decreases in a perfect measure of total expenditure if households reduced expenditure in response to crop loss, we argue that evidence of expenditure cuts may be more easily detected in less aggregated expenditure data. Total expenditure data are likely to suffer from serious reporting error due to the large number of different expenditures involved. For instance, in the IFLS, one category of nonfood expenditure is calculated as the sum of expenditure on clothing, household supplies and furniture, medical costs, ceremonies, gifts, taxes, and other such expenditures over the previous year. Obtaining an accurate measure requires acute recall from the respondents. Instead, we opted to examine the more "lumpy" and distinct category of educational expenditure. Also, when households cut back on expenditure, it is likely that they cut back on purchases of big items and then make up for it by consuming more of smaller items. The noise in the aggregate expenditure data may mask these smaller net cutbacks in total expenditure.

The third contribution of our article is that it examines gender differences in educational expenditure after crop loss. The finding that families with girls have a higher propensity to cut back on educational expenditure than do families with boys highlights a possible area for policy intervention. The finding that girls' education may be adversely affected by the shocks is of particular concern given the wide-ranging evidence supporting the importance of the role of women's education in the development process.[4]

Estimation Strategy

In order to test whether household expenditure responds to transitory income shocks, it is first necessary to separately identify the permanent and transitory components of income. We employ the estimation framework of C. Paxson, modifying it to utilize the aforementioned unique self-reporting of crop loss in the IFLS data.[5] First, we estimate an income equation and use the estimates to identify the permanent and transitory components of income. We then include these income measures as explanatory variables in expenditure equations and estimate the marginal propensities to consume (MPC) out of transitory and permanent income.

Estimates of permanent income, Y^P, and transitory income, Y^T, are obtained from the estimation of the following equation:

$$Y_i = \alpha_0 + \alpha_1 X_i^P + \alpha_2 X_i^T + \epsilon_i, \tag{1}$$

where X_i^P is a vector of variables that one would expect to permanently and predictably affect income, X_i^T is a vector of variables that are correlated with transitory income, α_0, α_1, and α_2 are parameters, and ϵ_i is a mean zero error term. The estimates of Y_i^T and Y_i^P are then obtained as follows:

$$Y_i^P = \hat{\alpha}_0 + \hat{\alpha}_1 X_i^P, \tag{2}$$

$$Y_i^T = \hat{\alpha}_2 X_i^T, \tag{3}$$

$$\hat{\epsilon}_i = \hat{\alpha}_0 - \hat{\alpha}_1 X_i^P - \hat{\alpha}_2 X_i^T, \tag{4}$$

where α_0, α_1, and α_2 are the estimates of the parameters of equation (1).

which year and month the crop loss occurred.[8] Table 1 presents the sample means and variances of the variables that are used in the estimation.

Estimation of Transitory Income

We estimate equation (1). The variables, X_i^P, used to identify permanent income, Y_i^P, are the number of adults in each of several education-gender categories, the occupation of the household head, whether the household head is self-employed or not, provincial dummy variables, and the value of land (if any) farmed by the family. To identify transitory income, Y_i^T, Paxson used deviations of rainfall from the mean and the variance of rainfall as the variables X_i^T. In our article, the vector X_i^T consists of three variables: Crop Loss$_i$, Crop Loss$_i$ × Land Value$_i$, and Labor Supply Response$_i$. The variable Crop Loss$_i$ is a dummy variable that equals one if the household reported a crop loss in 1993 and zero otherwise. To recognize that larger farms are likely to encounter larger transitory income, we interact the crop loss variable with the value of the farm land to create Crop Loss × Land Value. The labor supply variable (Labor Supply

Minimum	Maximum
0	1
0	1.007×10^8
0	1
0	2.000×10^7
−103,948	2.013×10^7
34,612	6.478×10^7
1,300	6.421×10^7
0	1.100×10^7
0	1.312×10^7
0	5
	4
	5
	12
	4
0	5
0	5
0	5
0	4
0	3
0	2

ucation expenditure, and durable expenditure.
income data, and lived in a rural area.

TABLE 2

RESPONSES TO A CROP LOSS

Measure Taken	Number of Households	Percentage of Households
Extra job	62	41.61
Acquire debt	44	29.53
Sell assets	36	24.16
Use savings	9	6.04
Receive gifts	18	12.08
Cut down on household expenses	50	33.56

TABLE 3

INCOME EQUATION ESTIMATES

Variable	Coefficient Estimate	t-Ratio
Intercept	541,530	1.808
Transitory income variables:		
Crop loss	−199,881.5	−2.164
Cross loss × land value	−.0129	−1.793
Crop loss × labor supply response	448,115	1.976
Permanent income variables:		
Land value	.0234	3.800
Number of household members between ages:		
0 and 5	16,070	.547
6 and 11	92,550	2.548
12 and 17	105,285	2.890
18 and 64	357,815	1.817
Over 65	11,619	.161
Members over age 18 by education and gender:		
Males with primary school	−244,947	−1.198
Females with primary school	−302,621	−1.534
Males with secondary school	122,911	.617
Females with secondary school	148,792	.752
Males with postsecondary school	753,110	2.181
Females with postsecondary school	1,362,474	2.817
Adjusted R^2	.353	
N	3,073	

NOTE.—Each equation also contains controls for the employment type (e.g., self-employed) and the occupation of the household head, as well as provincial dummy variables. The variance-covariance matrix allows for heteroscedasticity of unknown form (see Halbert White, "A Heteroskedasticity Consistent Covariance Matrix Estimator and a Direct Test of Heteroskedasticity," *Econometrica* 48, no. 4 [1980]: 817–38). N = households that responded to the 1993 Indonesian Family Life Survey, supplied a complete set of income data, and lived in a rural area.

TABLE 4

AGGREGATE EXPENDITURE EQUATIONS

VARIABLES	DEPENDENT VARIABLE		
	Total Expenditure	Food Expenditure	Nonfood Expenditure
Y^P	.813	.322	.491

TABLE 5

AGGREGATE EXPENDITURE EQUATIONS WITH REPORTED RESPONSES

VARIABLES	DEPENDENT VARIABLE		
	Total Expenditure	Food Expenditure	Nonfood Expenditure
Y^P	.812	.321	.490
	(12.91)	(8.635)	(10.81)
$Y^T \times$ cutback	−.707	−.328	−.379
	(−.700)	(−.635)	(−.726)
$Y^T \times (1 -$ cutback)	.195	.245	−.050
	(.626)	(.825)	(−.229)
ϵ	.317	.116	.200
	(7.024)	(5.733)	(5.158)
Number of household members between ages:			
0 to 5	−38,372	35,918	−74,290
	(−.863)	(.978)	(−3.171)
6 to 11	160,630	119,280	41,353
	(4.117)	(4.029)	(1.711)
12 to 17	238,670	79,060	159,610
	(4.877)	(2.223)	(5.288)
18 to 64	183,450	126,880	56,574
	(5.241)	(4.871)	(2.615)
Over 64	158,800	42,630	116,170
	(2.693)	(1.121)	(2.632)
Adjusted R^2	.230	.084	.263
N	3,073	3,073	3,073

NOTE.—Each equation also contains provincial dummy variables. The t-ratios are in parentheses. The variance-covariance matrix allows for heteroscedasticity of unknown

by creating the variables $Y^T \times$ Cutback and $Y^T \times (1 -$ Cutback), where Cutback equals one if the household reported cutting back on expenditure in response to the crop loss and zero otherwise. In all three expenditure categories, the MPC out of transitory income is insignificantly different from zero regardless of the reported measures taken.

Educational Expenditure

We argued above that it is likely that households that cut back on expenditure cut back on purchases of big items and then make up for this lost consumption by consuming more smaller items. Because the noise in the expenditure data may mask these smaller net cutbacks in total expenditure, we also chose to investigate the more narrowly defined category of educational expenditure. We chose educational expenditure because of the obvious negative social externalities of cutbacks in this area. Also, although educational expenditure was implicitly included in responses to questions on durable and nondurable expenditure, a further section of the IFLS survey asked questions directly aimed at educational expenditure. The more focused nature of these questions and the specific character of the expenditure is likely to have elicited more accurate responses.

Table 6 shows the results of estimating educational expenditure equations. Educational expenditure includes tuition costs, uniforms, books, transport and boarding costs, and any other education-related expenditures. Educational expenditure is regressed on permanent income, transitory income, variables that reflect the number of household members in each age category, and regional dummy variables. The age of household members is likely to affect the demand for education, and regional dummy variables are included to capture differences in the supply of educational facilities and attitudes to education across regions.

As in the previous expenditure equations, the MPC out of transitory income is insignificantly different from zero in the education expenditure equation that does not use the self-reported responses to crop loss. However, this result changes once the MPC out of transitory income is allowed to be identified separately for households that reported a cutback on household expenditure. Column 2 of table 6 reports these results. The estimated marginal propensity to consume education for those households who reported cutting back on expenditure is positive (0.197) and statistically significantly different from zero (P value = .03).

The danger of interacting the self-reported measure with transitory income in order to detect violations of smoothing for the group of house-

TABLE 6

EDUCATIONAL EXPENDITURE EQUATIONS

Variables	(1)	(2)	(3)
Y^P	.159	.159	.158
	(5.681)	(5.681)	(5.698)
Y^T	.102		
	(1.171)		
$Y^T \times$ cutback		.197	.098
		(2.112)	(.774)
$Y^T \times (1 -$ cutback)		.043	.044
		(.368)	(.377)
$Y^T \times$ cutback $\times$ (females ages 12 to 17)			.822
			(2.590)
$Y^T \times$ cutback $\times$ (males ages 12 to 17)			.071
			(.312)
ϵ	.066	.066	.066
	(2.462)	(2.463)	(2.464)
Number of household members between ages:			
0 to 5	−57,459	−57,471	−57,525
	(−5.182)	(5.183)	(−5.176)
6 to 11	16,501	16,433	16,779
	(1.108)	(1.103)	(1.143)
12 to 17	109,080	109,060	113,960
	(6.412)	(6.413)	(4.067)
Females between ages 12 to 17			−8,672.1
			(−.233)
18 to 64	−9,042.4	−9,101.3	−8,795.4
	(−.858)	(−.863)	(−.839)
Over 64	26,920	26,927	27,164
	(.988)	(.989)	(.999)
Adjusted R^2	.122	.122	.123
N	3,073	3,073	3,073

NOTE.—Each equation also contains provincial dummy variables. The t-ratios are in parentheses. The variance-covariance matrix allows for heteroscedasticity of unknown form (see Halbert White, "A Heteroskedasticity Consistent Covariance Matrix Estimator and a Direct Test of Heteroskedasticity," *Econometrica* 48, no. 4 [1980]: 817–38). N = households that responded to the 1993 Indonesian Family Life Survey, supplied a com-

heterogeneity. However, the issue of unobserved heterogeneity can be

the payoff would be higher educational attainment and consequently higher living standards for later generations, as well as faster economic development. This research suggests that providing subsidies for girls' education may be a suitable way of targeting these policies.

Notes

1. The survey was a collaborative effort of Lembaga Demografi of the University of Indonesia and the RAND Corporation. It received financial support from the National Institute of Child Health and Human Development, USAID, the Ford Foundation, and the World Health Organization.

2. See, e.g., P. Musgrove, "Permanent Income and Consumption in Urban South America," *American Economic Review* 69 (June 1979): 355–68; S. S. Bhalla, "Measurement Errors and the Permanent Income Hypothesis: Evidence from Rural India," *American Economic Review* 63 (1979): 295–307; K. I. Wolpin, "A New Test of the Permanent Income Hypothesis: The Impact of Weather on the Income and Consumption of Farm Households in India," *International Economic Review* 23 (1982): 583–94. Christina Paxson obtained region-wide estimates of transitory income from regional weather shocks. See Christina H. Paxson, "Using Weather Variability to Estimate the Response of Savings to Transitory Income in Thailand," *American Economic Review* 82, no. 1 (1992): 15–33.

3. See, e.g., Paxson for evidence of expenditure cuts.

4. Cross-country studies using national aggregate data have shown that the level of women's education has a strong negative effect on child mortality. See

ined in detail in a companion paper, where the labor supply response was endogenized. See Lisa A. Cameron and Christopher Worswick, "Labour Supply Re-