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 a negative transitory income shock, there may be a role for government assistance. By examining the impact of transitory income on educational expenditure, we investigate in this article whether households are able to smooth consumption. We have chosen to focus on educational expenditure because of its obvious social benefits.

Our aim is to make several contributions to the literature. First, in order to test whether households are able to smooth consumption, it is necessary to obtain estimates of permanent and transitory income. The data used in this article are from the 1993 Indonesian Family Life Survey (IFLS).[1] That survey is unique in that it contains self-reported incidences of crop loss. We have used these reports of crop loss to obtain estimates of transitory income. This is an improvement on earlier studies that have estimated permanent income from sets of instruments one would expect to have a permanent and systematic effect on income, such as education and work experience, and have treated the residual income as transitory income.[2] The IFLS also provides information on the measures taken in response to crop loss. We use these self-reported measures in our current analysis.

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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).

In order to assess the impact of the transitory income shock on expenditure, the following equation is estimated:

$$\text{EXP}_i = \eta_0 + \eta_1 \hat{Y}_i^P + \eta_2 \hat{Y}_i^T + \eta_3 \hat{\epsilon}_i + \eta_4 X_i + u_i, \tag{5}$$

where X_i is a vector of variables that may be expected to affect expenditure, for example, size and age structure of the household; η_0, η_1, η_2, η_3, and η_4 are parameters; and u_i is a mean zero error term. Perfect consumption smoothing as implied by the permanent income hypothesis requires that the marginal propensity to consume out of permanent income should be near one, and the MPC out of transitory income will be zero because all transitory income is saved (or dissaved).[6] Hence, a coefficient on Y^T of zero is evidence in favor of a family's ability to smooth consumption. If families are unable to smooth consumption, then the coefficient on Y^T should be significantly greater than zero. This reflects the fact that a negative (positive) shock to income has a negative (positive) effect on expenditure. Since the residual income term contains unobserved components of both permanent and transitory income, the coefficient on this variable is expected to lie between zero and one.

We first estimate the total expenditure equation, then estimate equations where the dependent variable is food expenditure and nonfood expenditure. Next, we estimate an expenditure equation where the dependent variable is education expenditure. Finally, in order to examine gender differences in the response of educational expenditure to crop loss, Y^T is interacted with dummy variables that reflect the gender composition of the school-age children in the household.

Data and Empirical Results

The data used are from the 1993 Indonesian Family Life Survey (IFLS). The IFLS covers a sample of 7,224 households across 13 provinces of Indonesia.[7] Together, these provinces account for approximately 83% of the Indonesian population. Only households that supplied a complete set of income data (6,251 households) and lived in a rural area (3,352 households) were included in the final data set. After cleaning the income data for outliers and dropping those households that reported missing values for some of the explanatory variables, the sample available for estimation was 3,073 households. As mentioned above, an unusual and attractive feature of the IFLS data is that respondents were asked whether the household had experienced a crop loss in the past 5 years and, if so, in

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$_i$ × Land Value$_i$. The labor supply variable (Labor Supply Response$_i$) is constructed using the self-reported responses to the crop loss that are available in the IFLS. The possible responses were acquiring debt, selling assets, using savings, receiving gifts, cutting down on household expenditure, and a householder taking an extra job. Table 2 shows that of the 149 households that experienced a crop loss in 1993, 33.56% reported having cut down on household expenditure. This is a point we will address below. Of relevance to the income equation, however, is the fact that 41.61% of households reported having taken an extra job in response to crop loss. The households that took an extra job offset their transitory income with the extra earnings. Hence, the extra labor supply needs to be incorporated in the estimation of transitory income. This is implemented by including the dummy variable Labor Supply Response$_i$ in the X_i^T vector.[9]

The results of the income regressions are reported in table 3. The coefficient on the Crop Loss dummy variable is negative and statistically significant at the 5% level. The interaction of the Crop Loss dummy with Land Value is also negative and has a P value of .07. The labor supply variable (Labor Supply Response) is positive and significant at the 5% level. The coefficients are then used to construct estimates of Y_i^T, Y_i^P, and ϵ_i, following equations (2), (3), and (4). For households that experienced a crop loss and did not have a labor supply response, the estimated drop in income due to the crop loss is equal to 24.2% of their permanent income.

The IFLS only provides information on economic hardships (or negative shocks). Ideally, we should also know which households experienced positive transitory income shocks in that period. Without this information, the mean of the positive shocks will be absorbed into the constant term and hence be incorporated in our estimates of Y_i^P. However,

TABLE 1

SUMMARY STATISTICS OF KEY VARIABLES

Variable	Mean	SD (N = 3,073)	Minimum	Maximum
Crop loss	.0485	.2150	0	1
Cross loss × land valued (rupiah)	268,180.4	3,267,348	0	1.007×10^8
Labor supply response	.0202	.1406	0	1
Land value	2,923,342	1.07×10^7	0	2.000×10^7
Income	1,108,956	1,620,035	−103,948	2.013×10^7
Total expenditure	1,991,200	2,241,000	34,612	6.478×10^7
Food expenditure	1,140,700	1,700,700	1,300	6.421×10^7
Nonfood and nondurable expenditure	273,410	516,455	0	1.100×10^7
Education expenditure	197,090	642,490	0	1.312×10^7
Number of household members between ages:				
0 and 5	.6476	.8023	0	5
6 and 11	.7013	.8462		4
12 and 17	.6196	.8170		5
18 and 64	2.2994	1.0720		12
Over 65	.2099	.4840		4
Members over age 18 by education and gender:				
Males with primary school	.7878	.6740	0	5
Females with primary school	.9925	.5997	0	5
Males with secondary school	.2929	.5775	0	5
Females with secondary school	.1894	.4463	0	4
Males with postsecondary school	.0254	.1693	0	3
Females with postsecondary school	.0124	.1134	0	2

NOTE.—Total expenditure is the sum of food expenditure, nonfood and nondurables expenditure, education expenditure, and durable expenditure. 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 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
	(12.93)	(8.652)	(10.82)
Y^T	−.151	.026	−.176
	(−.305)	(.083)	(−.679)
ϵ	.317	.116	.200
	(7.027)	(5.735)	(5.160)
Number of household members between ages:			
0 to 5	−38,443	35,872	−74,316
	(−.865)	(.977)	(−3.171)
6 to 11	160,240	119,030	41,208
	(4.107)	(4.020)	(1.705)
12 to 17	238,850	79,005	159,570
	(4.878)	(2.222)	(5.287)
18 to 64	183,110	126,660	56,449
	(5.230)	(4.860)	(2.611)
Over 64	158,840	42,657	116,180
	(2.693)	(1.121)	(2.632)
Adjusted R^2	.229	.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 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.

if the incidence of positive shocks is symmetrical to that of negative shocks, less than 5% of households will have experienced a positive shock, and so this effect will be relatively small. Hence, we believe that the omission of information on positive shocks has not caused our estimates of permanent income to be seriously overstated. Any variability in the positive shocks across households will fall into the error term. Using this fact, we explored the sensitivity of the expenditure equation results to the lack of information on positive shocks but did not find it to be problematic.[10]

Cutting Back on Expenditure

Next we use the estimates of Y^T and Y^P as explanatory variables in expenditure equations, according to equation (5). The vector of explanatory variables, X_i, includes the number of household members in each age category and provincial dummy variables. The results from the estimation of expenditure equations for aggregate expenditure, food expenditure, and nonfood expenditure are presented in table 4. The coefficient on Y^P

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 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.

is positive and significant in all three equations, with the estimate near one in the total expenditure case and the coefficients from the other two equations summing almost exactly to the coefficient from the aggregate expenditure equation. This reflects the fact that permanent income is spent on these different groups of goods in different proportions.

The estimate of the MPC out of transitory income in the aggregate expenditure equation is not significantly different from zero. This indicates that household aggregate expenditure is unaffected by the loss of income due to the crop loss, and this is also the case when we analyze the food and nonfood-nondurables components.[11] Hence, even though 34% of households that experienced a crop loss report that they responded by cutting back on household expenditure as shown in table 2, we cannot detect evidence of this in the aggregate expenditure data. Table 5 reports results that allow the MPC out of transitory income to differ for households that reported that they cut back on household expenditure

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 households that reported cutting back on expenditure is that we may just be picking up unobserved heterogeneity across the groups that reported cutting back on expenditure and those that did not. That is, unobserved characteristics that are correlated with the likelihood of the household reporting cutbacks (as opposed to actually cutting back expenditure) are

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 complete set of income data, and lived in a rural area.

also correlated with the household's level of educational expenditure. This could be the case, for example, if less well-educated households (which are likely to spend less on their children's education) are more likely to report cutting back on expenditure than better-educated households. Educational attainment of adult household members, however, does not differ according to whether expenditure cutbacks were reported. Also, variables that are likely to affect a household's demand for education per se have been included as explanatory variables in the regressions, for example, Y_i^P and the age structure of the household. Thus, in our view it is unlikely that the results are being driven by unobserved

heterogeneity. However, the issue of unobserved heterogeneity can be more fully addressed only by having access to panel data.

Gender Bias

The third column of table 6 allows the coefficient on $Y^T \times$ Cutback to vary depending on whether there are girls of school age in the household, boys of school age in the household, or no children of school age in the household.[12] A variable reflecting the number of females in the 12–17 age category is also included to ensure that we are identifying the effect of transitory income for households that have girls in that age category, not merely the presence of girls. The estimate of the marginal propensity to spend on education out of transitory income is 0.822 and strongly significant (P value = .01) for households that reported cutting back on expenditure and having girls of school age. It is insignificantly different from zero for all other households.[13] This corresponds to a decrease in mean educational expenditure of 45% for such households. This is in contrast to the MPC out of Y^T for all other households, which is insignificantly different from zero.

Conclusions and Implications for Public Policy

The self-reported measures that the respondents took to overcome crop loss suggest that not all farm households are capable of smoothing consumption in the face of income shocks. Of the households that reported a crop loss in 1993, 34% reported that they cut expenditure. Our study finds that this self-reported behavior cannot be confirmed by examining the aggregate expenditure data. We show that the use of noisy aggregate data camouflages the cutbacks. Once we narrow the range of focus to the socially valuable category of educational expenditure and specifically examine the households that reported a cutback on expenditure, we find that those households are not able to perfectly smooth consumption. In this article, we have made no attempt to explain what determines a household's choice to cut back expenditure. This is an area for future research, but it is likely that households that have chosen to cut back have little access to credit markets or labor markets. Given that households choose to cut back on expenditures, it is those with girls of school age (rather than boys of school age) that reduce educational expenditure.

These results paint a picture of expenditure on female education as a luxury good that is reduced or eliminated when hardship hits. Cutbacks in educational expenditure in response to crop loss perpetuate the effect of an otherwise transitory shock. The fact that it seems to be women's education that is sacrificed is a further cause for concern, because the benefits of women's education in terms of fertility, child mortality, health outcomes, and general economic development are well established.

The inability of rural households to smooth consumption reveals a role for government support in times of crop loss. If properly targeted,

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 R. Singh, "Fertility-Mortality Variations across LDC's: Women's Education, Labor Force Participation and Contraceptive Use," *Kyklos* 47, no. 2 (1994): 209–29. Duncan Thomas found that there is a positive association between a mother's education and the height of daughters but not that of sons. See Duncan Thomas, "Like Father, like Son: Like Mother, like Daughter: Parental Resources and Child Height," *Journal of Human Resources* 29, no. 4 (1994): 950–88. Also, since better-educated women (more so than better-educated men) have a higher likelihood of having better-educated children, and especially better-educated girls, the benefits of educating women today are carried on to the future in a perpetuating cycle. For evidence, see E. M. King, J. R. Peterson, S. M. Adioetomo, L. J. Domingo, and S. H. Syed, *Change in the Status of Women across Generations in Asia* (Santa Monica, Calif.: RAND, 1986); and L. A. Lillard and R. J. Willis, "Intergenerational Educational Mobility," *Journal of Human Resources* 29, no. 4 (1994): 1126–66.

5. See Paxson.

6. See Milton Friedman, *A Theory of the Consumption Function,* National Bureau of Economic Research, General Series, no. 63 (Princeton, N.J.: Princeton University Press, 1957).

7. The provinces covered in the survey are in Java, Sumatra, Bali, West Nusa Tenggara, Kalimantan, and Sulawesi.

8. Respondents were also asked about economic shocks due to death or sickness of a household member, unemployment, price falls, and natural disasters. Transitory income shocks must by definition be deviations from expectations and of a temporary nature. This article concentrates on crop loss because it is an unpredictable and short-lived shock and also because we wished to enhance comparability with earlier studies that have focused on shocks to farming households.

9. The importance of controlling for the labor supply response was exam-

ined in detail in a companion paper, where the labor supply response was endogenized. See Lisa A. Cameron and Christopher Worswick, "Labour Supply Responses to Crop Loss in Indonesia" (University of Melbourne, Department of Economics, Melbourne, 1998). Endogenizing the labor supply response results in larger estimates of transitory income, but the results reported below are robust to whether labor supply is endogenized or not. In the interest of a clear exposition, we have chosen to present this simpler specification. Traditionally, labor supply responses are not controlled for when estimating transitory income because information on them is not available. Not controlling for labor supply income results in smaller estimates of transitory income than those presented in the text, but it does not qualitatively affect the conclusions drawn here. The underestimation of transitory income merely leads to inflated coefficients on the transitory income variables.

10. One would expect the positive residuals to be made up of a larger proportion of transitory income than the negative residuals, because the positive shocks fall into the residual income. If positive income shocks are an important component of income in the survey year, one would expect the coefficients on the positive residuals to be closer to zero in the expenditure equations. We reestimated the expenditure equations, replacing the variable ϵ_i with two variables: ϵ_i^+, which contains the positive residuals (and zeroes if the residual was negative), and ϵ_i^-, which contains the negative residuals (and zeroes otherwise). The coefficient on ϵ_i^+ was insignificantly different from the coefficient on ϵ_i^- in every specification estimated.

11. We do not analyze durables expenditure because purchases of durables are infrequent. We also do not include educational expenditures in the nonfood-nondurables component, since it is analyzed separately below.

12. The age category used is 12–17. This is the age category that has a significant positive impact on educational expenditure; it is also the age range in which it is most likely for children to be removed from school. The results are robust to the use of the age group 5–17.

13. We also performed a test of whether the coefficient on $Y^T \times$ Cutback $\times$ Females Age 12–17 equals the coefficient on $Y^T \times$ Cutback $\times$ Males Age 12–17. This restriction was rejected (P value = .03). Finally, we reestimated the equation excluding the insignificant variables $Y^T \times$ Cutback and $Y^T \times$ Cutback $\times$ Males Age 12–17. This had only a minor impact on the estimated coefficient on $Y^T \times$ Cutback $\times$ Females Age 12–17.