Propensity to Consume Farm Family Disposable Income from Separate Sources

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Farm family disposable income is generated from farm operations, off-farm sources, and government payments. If these three income components are fungible (a dollar from one source is a perfect substitute for a dollar from another source), then the propensities to consume each should be the same. This study examines the farm family propensity to consume from separate income sources. Results indicate that the propensity to consume off-farm income and government payments is higher than the propensity to consume farm income.

Key words: farm family disposable income, income fungibility, marginal propensity to consume.

Traditional consumption hypotheses imply that the marginal propensity to consume (MPC) income from one source is the same as that for income from any other source. In other words, income from one source is a perfect substitute for income from another source (income is fungible). A recent survey of the literature (Thaler) casts doubt on the fungibility of incomes from separate sources. If incomes from separate sources are not perfect substitutes, an increase in income from one source may not produce the same change in consumption as does an increase in income from another source.

Incomes from separate sources are often consumed at different marginal rates (Thaler). Fully anticipated income, such as off-farm wages, may be consumed at a higher rate than is less certain income, such as farm income (Ishikawa and Ueda). Friedman (p. 62) argues that MPCs are related to income variability; individuals with volatile incomes have lower MPCs than those with stable incomes. Consumers with more stable incomes have less need to offset income fluctuations with savings. Thaler suggests that income uncertainty and variability may lead consumers to maintain a system of mental accounts and hence be able to consume incomes from separate sources differently. This suggests a farm household, having incomes with varied risks, may have different MPCs by income source.

Farm household disposable income is derived from farming operations, government payments, and off-farm income. If incomes are not fungible, a reduction in government payments will not have the same impact on farm consumption expenditures as does a reduction in income from the farming operation. For example, if the MPC of income from government payments is higher than the MPC of income from farming, then a decrease in government payments, offset by an equal increase in farm income, will adversely affect farm household consumption expenditures.

The purpose of this study is to examine the marginal propensities to consume farm income, government payments, and off-farm income. Primary data from a sample of Kansas farms over 1977–90 are used to estimate a consumption function in which MPCs of incomes from separate sources are allowed to differ.

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Consumption Behavior and Fungible Income

Numerous works have examined the propensity of farm families to consume total disposable income (Friedman; Girão, Tomek, and Mount; Langemeier and Patrick). However, little attention has been given to the propensities of farm families to consume incomes from separate sources. Hymans and Shapiro, and Yen, Chern, and Lee examine impacts on the propensity to consume food of incomes from different sources. Hymans and Shapiro find that the marginal propensities to consume food out of transfer payments and income subsidies are higher than are marginal propensities to consume food out of incomes from wages and other sources. Yen, Chern, and Lee conclude that the propensities to consume food, food at home, and food away from home differ by income source.

Holbrook and Stafford use three years of primary data to investigate whether propensities to consume permanent income differ by income source.[1] The propensity to consume permanent income from transfer payments is substantially lower than that from wage income, "mixed" income, and capital income. They conclude that an individual's MPC of total income is a weighted average of the MPCs of incomes from different sources, with the weights being the fraction of total income accounted for by each income type (Holbrook and Stafford).

Model Development

Several specifications of the relationship between disposable income and consumption are available. The permanent income (Friedman), life-cycle (Ando and Modigliani), relative income, and partial adjustment hypotheses are widely recognized. The life-cycle hypothesis is used here.[2]

In its basic form, the life-cycle hypothesis may be specified as

$$(1) \qquad C_t = \beta_0 + \beta_1 Y_t + \beta_2 C_{t-1} + \beta_3 W_t$$

where t refers to time, C is consumption expenditures, Y is disposable income, W is wealth, and β_0, β_1, β_2, and β_3 are parameters. Parameter β_0 is the measure of autonomous consumption. The short-run MPC (SMPC) is β_1 and the long-run MPC (LMPC) is

$$(2) \qquad \text{LMPC} = \frac{\beta_1 + \beta_3 \dfrac{\partial W_t}{\partial Y_t}}{1 - \dfrac{\beta_2}{(1+g)}} \approx 1 - \frac{\beta_1 + \beta_3 \bar{\omega}}{1 - \dfrac{\beta_2}{(1+g)}}$$

where g is average annual consumption growth rate and $\bar{\omega}$ is average ratio of wealth to income.[3] If incomes from separate sources are fungible, (1) is equivalent to

$$(3) \qquad C_t = \beta_0 + \beta_1(Y_{1t} + Y_{2t} + \ldots + Y_{zt}) + \beta_2 C_{t-1} + \beta_3 W_t$$

$$= \beta_0 + \beta_1 \sum_{s=1}^{z} Y_{st} + \beta_2 C_{t-1} + \beta_3 W_t$$

where Y_{st} is income from any of z different sources in year t. If incomes from different sources are not fungible, (3) is not appropriate. Instead, a system of consumption functions is needed allowing for allocation of planned consumption among the different incomes. A life-cycle consumption system meeting such a requirement may be specified as

$$\begin{array}{lllllll}
(4a) & \lambda_1 C_t & = \beta_{01} & + \beta_{11} Y_{1t} & + \beta_{21}\lambda_1 C_{t-1} & + \beta_{31} W_t \\
(4b) & \lambda_2 C_t & = \beta_{02} & + \beta_{12} Y_{2t} & + \beta_{22}\lambda_2 C_{t-1} & + \beta_{32} W_t \\
 & \vdots & \vdots & \vdots & \vdots & \vdots \\
(4c) & \lambda_z C_t & = \beta_{0z} & + \beta_{1z} Y_{zt} & + \beta_{2z}\lambda_z C_{t-1} & + \beta_{3z} W_t
\end{array}$$

[1] Holbrook and Stafford excluded self-employed groups, including farmers, from their sample.

[2] Langemeier and Patrick find the life-cycle hypothesis explains farm family consumption behavior better than do the other three hypotheses. We also rejected income fungibility using the partial adjustment hypothesis.

[3] Evans (pp. 34–36) shows that in the long-run $\partial W_t/\partial Y_t \approx \bar{W}/\bar{Y} = \bar{\omega}$.

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where the λ_s's (which sum to 1) represent the unknown proportions of planned consumption from the corresponding income sources. Since the λ_s's are not known, (4a) through (4c) cannot be estimated directly. However, summing (4a) through (4c) over the z income sources yields the estimatable function

$$(5)\quad C_t = \sum_{s=1}^{z} \lambda_s C_t$$

$$= \sum_{s=1}^{z} (\beta_{0s} + \beta_{1s} Y_s + \beta_{2s}\lambda_s C_{t-1} + \beta_{3s} W_t)$$

$$= \beta_0^* + \sum_{s=1}^{z} \beta_{1s} Y_{st} + \beta_2^* C_{t-1} + \beta_3^* W_t$$

in which

$$\beta_0^* = \sum_{s=1}^{z} \beta_{0s},\ \beta_2^* = \sum_{s=1}^{z} \beta_{2s}\lambda_s, \text{ and } \beta_3^* = \sum_{s=1}^{z} \beta_{3s}.$$

In (5), the short-run marginal propensity to consume income from source s ($SMPC_s$) is β_{1s} and the long-run marginal propensity to consume income from source s ($LMPC_s$) is[4]

$$(6)\quad LMPC_s = \frac{\beta_{1s} + \beta_3^* \dfrac{\partial W_t}{\partial Y_{st}}}{1 - \dfrac{\beta_2^*}{(1+g)}} \approx \frac{\beta_{1s} + \beta_3^* \bar{\omega}_s}{1 - \dfrac{\beta_2^*}{(1+g)}},$$

where $\bar{\omega}_s$ is average ratio of wealth to income from source s.

The consumption function specification in (5) is particularly useful because a priori assumptions about the propensity to consume may be incorporated or tested directly. For example, if equal MPCs are assumed, then $z = 1$. Equal propensities to consume incomes from different sources can also be tested by setting $z > 1$.

Data

Primary annual farm household data on consumption expenditures, income, net worth, and family size were obtained from the Kansas Farm Management Association from 1976–90. Continuous time-series data are not available from all farms during the period because farms leave and reenter the Association or farmers choose not to report household expenditures in a particular year. Farms with fewer than five years of usable data were omitted. The resulting unbalanced, pooled cross-section time-series sample consists of between 5 and 14 time-series observations of 165 farms (1,191 total data points).

Farm family size ranged from 3 to 9 household members, with an average of 4.5 members. All farms were organized as individual proprietorships. The primary enterprise was dryland cropping on 58 farms, cropping and cattle operations on 56 farms, irrigated cropping on 21 farms, general farming[5] on 14 farms, cropping and swine operations on 8 farms, cropping and dairy operations on 7 farms, and cropping and sheep operations on one farm.

Annual per-family-member consumption expenditures, adjusted net farm income (accrual-basis net farm income plus depreciation), government payments, off-farm income, and beginning net worth are reported in table 1. Nominal dollars were converted to real dollars using the Consumer Price Index (1990 = 100). Mean consumption expenditures[6] were moderately variable between farms and fairly stable over the period, ranging from an average $5,212 per family member in 1985 to $6,159 per family member in 1980.

The component parts of disposable income (table 1) varied widely between farms and over the period. Mean adjusted net farm income was the most variable of the three components, ranging from a low in 1981 of $536 per family member to a high of $22,024 in 1979. All farms received government payments and most earned off-farm income during the period. Mean government payments ranged from $745 per family member in 1980 to $10,366 per family member in 1987. Mean off-farm income ranged from a low of $2,911 per family member in 1984 to a high of $7,634 per family member in 1978. The average farm family's coefficient of variation of adjusted net farm income, of government payments, and of off-farm income are 134.5%, 62.4%, and 64.3%, respectively. Mean disposable income (the sum of adjusted net farm income, government payments, and off-farm income, all after taxes) also varied widely over the period, ranging from $7,221 per family

[4] See the appendix for derivation of $LMPC_s$.

[5] General farming is defined as a farming operation with no more than 35% of total labor utilized in any single enterprise.

[6] Consumption expenditures are defined as the sum of all expenditures for food, clothing, medical, household utilities, household operations and supplies, household upkeep and repairs, furniture and household equipment, automobile maintenance, education, recreation, and gifts and charitable contributions.

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Table 1. Mean Annual Per-Family-Member Consumption, Income, and Net Worth, 165 Kansas Farms, 1977–90

Year	# of farms	Consumption expenditures	Adjusted net farm income[a]	Government payments	Off-farm income	Beginning net worth
		1990 Dollars				
1977	62	5,314	10,293	3,022	6,086	116,607
1978	71	5,817	15,741	4,125	7,634	146,633
1979	65	6,132	22,024	1,605	4,532	135,139
1980	72	6,159	11,380	745	3,986	163,371
1981	87	5,390	536	2,051	4,634	131,561
1982	76	5,551	4,885	3,701	4,130	132,923
1983	84	5,820	9,349	3,542	3,577	128,130
1984	97	5,608	5,958	4,795	2,911	106,429
1985	99	5,212	4,496	5,255	3,709	101,354
1986	98	5,303	2,953	9,507	3,499	84,698
1987	95	5,503	5,738	10,366	3,768	76,375
1988	98	5,900	10,924	8,394	3,565	66,648
1989	101	5,508	2,690	5,398	3,909	71,151
1990	86	5,717	5,542	7,873	3,499	72,080
Average[b]	165	5,501	7,323	5,158	4,091	105,108
Standard Deviation[b]		1,230	9,846	3,221	2,632	31,528

[a] Adjusted net farm income is accrual-basis net income plus depreciation.
[b] Average of the 165 farm-specific means and standard deviations.

member in 1981 to $28,161 per family member in 1979.

Procedures and Empirical Considerations

We estimated the consumption function in (5) using the data described above. Dependent and independent variables were measured in real per-family-member terms. Real per-family-member beginning net worth of the farm was used as the wealth measure. Initially, our model was estimated under the assumption that incomes from different sources are fungible (a common MPC):

$$(7) \quad C_t = \beta_0 + \beta_1 Y_{T,t} + \beta_2 C_{t-1} + \beta_3 W_t.$$

The variables are defined in table 2. We then estimated the model allowing MPCs to differ by income source

$$(8) \quad C_t = \beta_0^* + \beta_{11} Y_{F,t} + \beta_{12} Y_{G,t} + \beta_{13} Y_{0,t} + \beta_2^* C_{t-1} + \beta_3^* W_t.$$

Our pooled cross-section time-series model follows Johnston (p. 397). A common intercept and common parameter estimates are assumed across all cross sections. Due to the unbalanced nature of the time-series component of the sample, we assume serially and contemporaneously

Table 2. Variable Definitions

Variable	Definition
C_t	Per-family-member consumption expenditures ($)
g	Average annual growth rate in per-family-member consumption expenditures
LMPC_s	Long-run marginal propensity to consume income from source s
SMPC_s	Short-run marginal propensity to consume income from source s
W_t	Per-family-member beginning net worth ($)
$\bar{\omega}_s$	Average ratio of wealth to income from source s
$Y_{F,t}$	Per-family-member adjusted net farm income (accrual-basis net farm income plus depreciation, not including income from government payments or off-farm sources) ($)
$Y_{G,t}$	Per-family-member income from government payments ($)
$Y_{GO,t}$	Per-family-member income from government payments plus income from off-farm sources ($); $Y_{G,t} + Y_{O,t}$
$Y_{O,t}$	Per-family-member income from off-farm sources ($)
$Y_{T,t}$	Per-family-member disposable income from all sources ($); $Y_{F,t} + Y_{G,t} + Y_{O,t}$

Note: All monetary variables are measured in real (1990 = 100) dollars.

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independent errors. However, we allow for cross-sectional heteroskedastic error variance between farms since it is reasonable to expect each farm to have a different dispersion of consumption. Judge et al. (1988, pp. 462–64) discuss the estimation of a Seemingly Unrelated Regression (SUR) system when the number of observations in each equation differ. The error structure assumed in the present specification is a special case of that model.[7]

Two-stage weighted least squares estimation is used to obtain parameter estimates (Kmenta, pp. 524–25). Heteroskedastic error variance is tested across the 165 cross sections, following the procedure described by Judge et al. (1988, pp. 369–71) for multiplicative heteroskedasticity. Resulting parameters are best linear unbiased estimates.

Results

Weighted least squares estimates are presented in table 3. All coefficients are consistent with theory and are statistically significant at the 10% level.[8] The F-statistic suggests the coefficients of $Y_{F,t}$, $Y_{G,t}$, and $Y_{O,t}$ are not statistically equal to one another in the "3 Income Components" model. Further testing indicates the coefficients of $Y_{G,t}$ and $Y_{O,t}$ are not statistically different from one another; therefore, we re-estimate the consumption function combining these two incomes into $Y_{GO,t}$.[9] Again, the F-statistic indicates the $Y_{F,t}$ and $Y_{GO,t}$ coefficients are not equal to one another. Because the standard R^2 measure may not fall between 0 and 1 under generalized least squares estimation such as the Aitken procedure used here, the Buse R^2, which does fall within these bounds, is reported (Buse).

Short-run and long-run MPCs ($SMPC_s$ and $LMPC_s$) calculated from the "Combined Income" and "2 Income Components" estimates are presented in table 4. The $SMPC_s$ of total disposable income (Y_T)—0.03188—is comparable to Langemeier and Patrick's short-run MPC estimates. Similarly, Y_T's $LMPC_s$ of 0.10383 is comparable to Langemeier and Patrick's estimates of 0.102 to 0.132.

[7] The proposed specification is equivalent to restricting the SUR parameters to be equal between equations and setting the off-diagonals of the variance-covariance matrix to zero.

[8] The regression-coefficient variance decomposition indicates that multicollinearity in the three models was not "severely degrading" (Belsley, Kuh, and Welsch).

[9] Reestimation required following the same two-stage weighted least squares procedure performed for the "Combined Income" and "3 Income Component" estimates.

Table 3. Consumption Function Weighted Least-Squares Coefficient Estimates, 165 Kansas Farms, 1977–90

Variable[a]	Combined income	3 income components	2 income components
Intercept	1455.903	1422.816	1423.711
	(13.443)	(13.179)	(13.194)
$Y_{T,t}$	0.031880	—	—
	(9.120)		
$Y_{F,t}$	—	0.026150	0.026147
		(6.719)	(6.722)
$Y_{G,t}$	—	0.052432	—
		(5.873)	
$Y_{O,t}$	—	0.048195	—
		(5.146)	
$Y_{GO,t}$	—	—	0.050407
			(7.847)
C_{t-1}	0.623133	0.607048	0.607295
	(33.482)	(31.788)	(31.839)
W_t	0.001236	0.001136	0.001131
	(2.040)	(1.869)	(1.863)
Buse R^2[b]	0.7074	0.7403	0.7394
F-statistic[c]	—	5.8772	11.6604

[a] See table 2 for variable definitions. T-ratios are in parentheses.
[b] See Judge et al. (1985), pp. 29–32.
[c] The reported F-statistic is a joint test of the null hypothesis that the coefficients on the separate income source variables are equal to one another. We reject the null hypothesis of equal coefficients in both equations.

When allowance is made for incomes from different sources, substantial differences are apparent between the $SMPC_s$ and $LMPC_s$ estimates. Results imply short-run per-family-member consumption expenditures are nearly twice as sensitive to changes in off-farm or government payment income ($SMPC_s$ of 0.05041) as they are to changes in farm income ($SMPC_s$ of 0.02615). Similarly, in the long run, a permanent change in income from government payment or off-farm income produces nearly twice

Table 4. Short-Run and Long-Run Marginal Propensities to Consume, 165 Kansas Farms, 1977–90

Income	Source	Short-run MPC	Long-run[a] MPC
Y_T[b]	Total disposable income	0.03188	0.10383
Y_F[c]	Adjusted net farm income	0.02615	0.12014
Y_{GO}[c]	Government payments and off-farm income	0.05041	0.21785

[a] Calculated using an average annual consumption growth rate (g) of 0.0493 and average ratios of net worth to income ($\bar{\omega}_s$) of 8.3273, 21.6311, and 36.5721 for Y_T, Y_F, and Y_{GO}, respectively.
[b] From the "Combined Income" equation estimate in table 3.
[c] From the "2 Income Components" equation estimate in table 3.

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the change in consumption ($LMPC_s$ of 0.21785) as does an identical change in farm income ($LMPC_s$ of 0.12014). Our results do not support Holbrook and Stafford's suggestion that the single SMPC is a weighted average of the SMPCs of incomes from separate sources. Based on the average weights of 44% for Y_F and 56% for Y_{GO}, the weighted SMPC is 0.039 and is statistically different from our total-income SMPC estimate of 0.03188.

Concluding Comments

Consumption studies traditionally suppose that the marginal propensity to consume (MPC) is invariant with respect to disposable income source. Our results do not support such income fungibility. Instead, we find that the MPC of per-family-member farm income is considerably lower than the MPC of per-family-member off-farm and government payment income. The relative variability of farm income in a sample of Kansas farms is more than twice that of off-farm and government payment income. Our findings support the notion that MPCs of volatile incomes are lower than MPCs of stable incomes. An implication is that policy analyses which assume a single MPC (and therefore a single income multiplier) may underestimate impacts of government payments and off-farm income opportunities on farm family consumption expenditures.

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Appendix

Derivation of $LMPC_s$

Equation (5) may be rewritten as

$$C_t = \alpha^* + \sum_{s=1}^{z} \beta_{1s} Y_{st} + \beta_2^* \frac{C_t}{(1+g)} + \beta_3^* W_t,$$

where g equals average annual consumption growth. Note lagged consumption (C_{t-1}) is restated as current consumption (C_t) discounted by g. Collecting like terms and rearranging provides

$$C_t = \frac{\alpha^* + \sum_{s=1}^{z} \beta_{1s} Y_{st} + \beta_3^* W_t}{1 - \dfrac{\beta_2^*}{(1+g)}}$$

The long-run marginal propensity to consume income from source s is calculated as

$$\mathrm{LMPC}_s = \frac{\partial C_t}{\partial Y_s} = \frac{\beta_{1s} + \beta_3^* \dfrac{\partial W_t}{\partial Y_s}}{1 - \dfrac{\beta_2^*}{(1+g)}}.$$

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