

# Marginal Propensity to Consume: An Application to Small Farmers of Punjab

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## ABSTRACT

The marginal propensity to consume (MPC) of small farm households of Punjab for the period 1980-81 to 1991-92 was estimated. Three consumption models (i.e. partial adjustment, relative income and permanent income models of consumption) were used to specify consumption functions. The models were estimated using disposable household income as a measure of consumption. The models estimates indicated that household consumption responded little to change in income particularly in the short run. The results of relative income model explained consumption better than the other two models. Estimated short run and long run MPC ranged from 0.205 to 0.313 and 0.485 to 0.630, respectively.

**Key Words:** Consume; Small farmers; Punjab

## INTRODUCTION

Agricultural growth primarily is a function of capital investment, which acts as a carrier of improved technology such as increased use of fertilizers, adoption of new varieties, of seeds, making up irrigational water deficiency through tube wells, mechanical cultivation through tractors and mechanical harvesting and threshing. However, there is considerable evidence that small farmers operating holding up to 12.5 acres of land in Punjab have much little excess to institutional and non institutional sources of acquiring capital at appropriate prices to fulfill their agricultural production needs. Therefore, farmers to continue agricultural production activity, are compelled to depend on their own savings. However, consumption behavior of farm families have an important bearing on the saving of households, and is an important determinant of level of economic activity, the type of goods and services to be produced and allocation of limited resources among alternative uses. It influences their ability to save and make use of good quality seeds, fertilizers, pesticides, and the use of superior technology. Thus consumption behavior of farm families effects farm growth, debt repayment, and farmer responses to agriculture and economic policy changes. The purpose of this paper is to estimate marginal propensity to consume for a sample of small farm house holds of Punjab.

## METHODOLOGY

Several theories have been used to explain the relationship between disposable income and expenditure. For instance models based on relative income, the permanent income and partial adjustment are widely recognized to determine consumption behavior. Langmeier and Patrick (1990) used these models to estimate marginal propensity to consume of Illinois grain farms. The same

models have been used in this paper to estimate consumption function and marginal propensity to consume in Punjab. The variables included in the study have been chosen according to the socio-economic conditions of the study area. Relative income, permanent income and partial adjustment Hypotheses have been specified in the form of models on the lines framed by Langemeier and Patrick (1990). The idea behind estimating consumption function by using various models is to determine that which of these models explain consumption behavior better than the others. The data for this study have been taken from reports entitled "Farm accounts and family budgets of rural families in Punjab", for the period 1980-81 to 1991-92, published by Punjab Economic Research Institute (PERI), Lahore. The data contains observations over time and of cross section of small farmers of various farm sizes. The statistical model used in this study is based on the cross-sectionally correlated and time wise autoregressive model, described by Kmenta (1986). The specifications of these models are given as under:

**Relative income hypothesis model.** According to this hypothesis, individuals become accustomed to a certain standard of living and find it difficult to reduce consumption when income decreases. The specification of the model is as under:

$$C_t = b_0 + b_1 Y_{t-1} + b_2 (Y_t - Y_{t-1}) + e_t$$

Where,  $C_t$  = Farm family consumption expenditure,  $b_0$  = Intercept of the model,  $b_1$  &  $b_2$  = Regression coefficient of respective variable,  $Y_{t-1}$  = Previous year farm household disposable income,  $e_t$  = error term, and  $t, t-1$  = subscripts refer to years

**Permanent income hypothesis model.** The hypothesis states that permanent consumption is a function of permanent income. Friedman (1957) distinguished between permanent and transitory components of income. Permanent Consumption was hypothesized to be a function of

permanent income. Friedman suggested that permanent income be estimated by weighted average of current and past income and that measured consumption as a proxy for permanent consumption. Accordingly Permanent income hypothesis is specified as under:

$$C_t = c_0 + c_1 PY_t + c_2 C_{t-1} + e_t$$

Where,  $C_t$  = Farm family consumption expenditure,  $c_0$  = Intercept of the model,  $c_1$  &  $c_2$  = Regression coefficient of respective variable,  $PY_t$  = Permanent income,  $t, t-1$  = Subscripts refer to years, and  $e_t$  = error term

To determine permanent income, weighing scheme is as follows.

$$PY = 1/2Y_t + 1/3Y_{t-1} + 1/6Y_{t-2}$$

**Partial adjustment hypothesis model.** Consumers are assumed to adjust consumption expenditure only partially when income fluctuates because of habit or lack of information (Jonston, 1984). The actual change in consumption 'C' from previous year 't-1' to current year 't' is some function of the desired change in income between periods. Partial adjustment hypothesis has been specified as under:

$$C_t = a_0 + a_1 Y_t + a_2 C_{t-1} + e_t$$

Where,  $C_t$  = Farm family consumption expenditure,  $a_0$  = Intercept of the model,  $a_1$  &  $a_2$  = Regression coefficients of respective variable,  $Y_t$  = Farm household disposable income,  $t, t-1$  = Subscripts refers to years, and  $e_t$  = error term

Though the models developed on the three hypotheses are similar, but the way in which consumption behavior is modeled, makes a slight difference among them. Non-nested hypothesis as proposed by Langemeier and Patrick (1990) has been used to determine that which of the models explain consumption significantly better than the others. Orthodox tests suggested by Godfrey and Parasian (1983) have been used to determine the significance of the modeled variables.

The null hypothesis for each consumption model is that the coefficients of the variables excluded from that consumption model are not significantly different from zero. If all three null hypotheses are rejected, the pooled model is used. If we fail to reject all three hypotheses, then we conclude that there is no significant difference between the models. If we reject a subset of null hypotheses, then the models associated with the null hypotheses, that we failed to reject, explain consumption significantly better than the other models.

The three model discussed above, have been used to estimate the marginal propensity to consume (MPC) for the farm household of the Punjab.

To determine the consumption of farm house hold over time, the short-run MPC and long run MPC is estimated. The regression coefficient ( $\beta$ ) of a lag variable in the model is interpreted as short-run marginal propensity to consume (Mincer, 1988). Longrun marginal propensity to consume can be calculated by the following formula:

$$\text{Long Run MPC} = \frac{\text{Short-Run MPC}}{1 - \text{lag coefficient}} \quad (\text{Ali 1985}).$$

## RESULTS AND DISCUSSION

Table I presents information on average annual consumption, disposable household income, lagged consumption, lagged income and permanent income, the variables included to check their influence on consumption behavior.

In order to check the influence of different variables on consumption behavior under different hypotheses, consumption functions were estimated. The estimated consumption functions are presented in Table II.

The theory underlying the different models suggests that signs of all the independent variables should be

**Table I. Annual consumption, income, and permanent income per household for the farm household families of Punjab (1980-81 through 1991-92). (in Rupees.)**

| Year    | Average annual consumption (C <sub>t</sub> ) | Disposable farm household income (Y <sub>t</sub> ) | Lagged consumption C <sub>t-1</sub> | Lagged income Y <sub>t-1</sub> | Permanent income (PY <sub>t</sub> ) | Y <sub>t</sub> - Y <sub>t-1</sub> Change in income |
|---------|--|--|-------------------------------------|--------------------------------|-------------------------------------|--|
| 1980-81 | 13964  | 19478  | 12881                               | 18725                          | 218107                              | 753  |
| 1981-82 | 14282  | 19874  | 13964                               | 19478                          | 19546.17                            | 396  |
| 1982-83 | 14936  | 20457  | 14282                               | 19874                          | 20099.5                             | 583  |
| 1983-84 | 15109  | 20178  | 14936                               | 20457                          | 20220.33                            | -279   |
| 1984-85 | 15282  | 21480  | 15109                               | 20178                          | 20875.5                             | 1302   |
| 1985-86 | 18799  | 25729  | 15282                               | 21480                          | 23387.5                             | 4249   |
| 1986-87 | 18498  | 22567  | 18799                               | 25429                          | 23439.83                            | -3162  |
| 1987-88 | 18679  | 24774  | 18498                               | 22567                          | 24197.5                             | 2207   |
| 1988-89 | 19947  | 35031  | 18679                               | 24774                          | 29534.67                            | 10257  |
| 1989-90 | 19687  | 28448  | 19947                               | 35031                          | 30030.01                            | -6583  |
| 1990-91 | 20259  | 39550  | 19687                               | 28448                          | 35096.17                            | 11102  |
| 1991-92 | 25342  | 37418  | 20259                               | 39550                          | 36633.67                            | -2132  |

**Table II. Estimated consumption functions for the farm household families of Punjab, 1980-81 through 1991-92**

| Independent Variables             | Consumption Models                 |                                      |                                    |
|-----------------------------------|------------------------------------|--------------------------------------|------------------------------------|
|                                   | Partial Adjustment                 | Relative Income                      | Permanent Income                   |
| Intercepts                        | 1605.83<br>(0.535)*<br>(0.605)**   | 5587.321<br>(3.537)*<br>(0.0063)**   | 1456.13<br>(0.525)*<br>(0.611)**   |
| C <sub>t-1</sub>                  | 0.646205<br>(2.366)*<br>(0.0421)** | -                                    | 0.503158<br>(1.747)*<br>(0.114)**  |
| Y <sub>t</sub>                    | 0.205<br>2.039<br>0.072            | -                                    | -                                  |
| Y <sub>t-1</sub>                  | -                                  | 0.485358<br>(7.993)*<br>(0.000023)** | -                                  |
| Y <sub>t</sub> - Y <sub>t-1</sub> | -                                  | 0.210397<br>(2.655)*<br>(0.0262)**   | -                                  |
| PY <sub>t</sub>                   | -                                  | -                                    | 0.313171<br>(2.420)*<br>(0.0385)** |
| R <sup>2</sup>                    | 0.840                              | 0.877                                | 0.858                              |
| R <sup>2</sup> (Adjusted)         | 0.805                              | 0.850                                | 0.826                              |

\*t-statistical significance; \*\*P-values; R<sup>2</sup> is interpreted as the proportion of the variation in dependent variable that is explained by the explanatory variables included in the model in which R<sup>2</sup> = 1 and if fit is not good, R<sup>2</sup> is close to zero)

positive. All the variables have the expected sign. The hypothesis of no autocorrelation was rejected for each of the four variables.

The regression results of partial adjustment model indicate that the coefficient of disposable income variable (i.e MPC) is 0.205. The marginal propensity to consume, gives the impact on consumption ( $C_t$ ) of a unit increase in disposable income ( $Y_t$ ), while holding lagged consumption ( $C_{t-1}$ ) constant. The value of this coefficient is very low but statistically significant at less than ten percent level of significance. The coefficient of  $C_{t-1}$  lagged consumption is 0.64 which indicates the effect of lagged consumption on increase in consumption ( $C_t$ ). The results of the estimated model support the hypothesis that consumer adjusts consumption only partially when income fluctuates.

The estimated MPC of relative income model gives the impact on consumption ( $C_t$ ) of a unit increase in  $Y_{t-1}$ , as 0.485, while holding ( $Y_t - Y_{t-1}$ ) constant. The coefficient is statistically significant at less than 1 % level of significance. Similarly the effect of ( $Y_t - Y_{t-1}$ ), while holding  $Y_{t-1}$  constant, is 0.21 (Table II). This coefficient is also statistically significant at less than 5% level of significance. The previous year disposable income  $Y_{t-1}$ , and short run income  $Y_t - Y_{t-1}$ , variables were significant influencing the consumption for the relative income model. Result of the model support the hypothesis that the individuals who are accustomed to a certain standard of living, find it difficult to reduce consumption when income decreases.

The estimated MPC, in permanent income model, shows that influence on consumption  $C_t$  by one unit increase in  $PY_t$ , while holding lagged consumption ( $C_{t-1}$ ) constant, is 0.313. This coefficient is significant less than 5% level of significance. It indicates that the variable  $PY_t$  is significantly influencing consumption ( $C_t$ ). Similarly the effect of lagged consumption ( $C_{t-1}$ ) while holding  $PY_t$  constant, on consumption ( $C_t$ ) is 0.503. This coefficient is significant at 12% level of significance, which means that this variable is also influencing consumption (Table II).

The results of the model support the hypothesis that permanent consumption is a function of permanent income. In fact past consumption based on, permanent income becomes the habit of the consumer and current consumption becomes its permanent habit due to confidence on permanent income. Farm family spends keeping in view its permanent income.

**Tests of the non nested hypotheses.** To determine that which of the models explain consumption significantly better than the others, non nested hypothesis tests were carried out. The null hypothesis for each model was carried out.

The null hypothesis for each model is that the coefficients of the variables excluded from that consumption model are not significantly different from zero. An F test was used to determine the significance of excluded variable coefficients. Table III present the results of the non-nested hypotheses tests. The null hypothesis for each consumption

**Table III. Tests of the Non-Nested Hypotheses**

| Consumption Model  | Orthodox Test Statistics* |
|--------------------|---------------------------|
| Partial adjustment | 4.67                      |
| Relative income    | 2.43                      |
| Permanent income   | 5.20                      |

**Table IV. Marginal propensity to consume (MPC) for the estimated consumption function for the farm household families of Punjab (1980-81 through 1991-92).**

| Model              | Short-run MPC | Long-Run* MPC |
|--------------------|---------------|---------------|
| Partial adjustment | 0.205         | 0.581         |
| Relative income    | 0.210         | 0.485         |
| Permanent income   | 0.313         | 0.630         |

model is that the coefficients of the variables excluded from that consumption model are not significantly different from zero. The results of the non-nested hypothesis tests rejected the null hypotheses for the partial adjustment and permanent income consumption models. For the relative income model, we fail to reject the null hypothesis. Thus, the orthodox test results indicate that the relative income model, which includes previous year disposable income ( $Y_{t-1}$ ) and short-run income effect ( $Y_t - Y_{t-1}$ ) as a variable, explains consumption behavior significantly better than the other models.

#### **Short run and long run marginal propensity to consume.**

The short run and long run marginal propensity to consume (MPC) are reported in Table IV. The estimates of short-run and long-run MPCs ranged from 0.205 to 0.313 and 0.485 to 0.630, respectively, using disposable household income as income measure. The estimated MPC of the farm households for all these three models was low. Friedman suggested that individuals with a volatile income stream will have relatively low marginal propensity to consume. The results of this study support his views.

## **CONCLUSIONS AND IMPLICATIONS**

The study determined the consumption behavior and marginal propensity to consume for farm families of Punjab over the 1980-81 to 1991-92 periods. The partial adjustment, relative income and permanent income models of consumption were used to specify consumption functions.

The results of the models indicated that the relative income hypothesis explained consumption better than the other two models. In the relative income model, previous year disposable income ( $Y_{t-1}$ ) and short-run income effect ( $Y_t - Y_{t-1}$ ) were significantly influencing the consumption behavior. The estimates of short-run and long run MPCs ranged from 0.205 to 0.313 and 0.485 to 0.630, respectively. The low MPC of farm families has important implications for farm activity and family behavior. The consumption does not react one-for-one to changes in income. An increase in income for a particular year will result in a substantially smaller proportional increase in consumption. Thus, money is available for other uses such as expansion of the farm, debt repayment or saving for future. Similarly, a

decline in income will result in a little decrease in consumption. During low income years, the other uses of funds such as for machinery, buildings and other purchases, saving and principal payments would be curtailed. Furthermore, with recovery of the agricultural sector, until incomes exceed the nearly fixed levels of family consumption, increases in farm family income will have little effect on other farm expenditure.

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(Received 12 November 2004; Accepted 10 January 2005)