THE INCOME AND CONSUMPTION EXPERIENCES OF A SAMPLE OF FARM FAMILIES*

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The way in which the consumption of farm families is adjusted to fluctuations in income has important implications at the national, regional and farm levels. In this paper, hypotheses about the consumption of farm families are examined using data from 16 families in a wheat-sheep region of New South Wales for the eight-year period 1968/69 to 1975/76. The results of the study indicate that lagged effects are important in explaining consumption by farm households. It was not possible to partition these lag effects between partial adjustment and normal income influences. Estimates of the short-run (one-year) marginal propensity to consume (mpc) were quite low, ranging from 0.13 to 0.16. The best estimates of the long-run mpc ranged from 0.19 to 0.25.

Introduction

Most consumption studies are dominated by the consumption behaviour of families who rely mainly on wages and salaries for their income. This arises because wage and salary earners are such a large group in the economy and because data on disposable income and consumption in the Australian National Accounts cannot be disaggregated and associated with particular groups. However, the income of wage and salary earners is more stable than the income of those who own and operate their own businesses and hence the consumption behaviour of the two groups may be quite different. Little is known about the consumption behaviour of those groups whose incomes fluctuate markedly through time.

In this paper, an analysis of the consumption behaviour of 16 farm families is reported. The instability of farm incomes over time is well recognised and several writers have addressed themselves to the implications of this variation in income for farm expenditure of various kinds and for the economy generally. However, the debate about the way in which consumption is influenced by changes in income has not been conclusive because empirical analysis of the various propositions advanced is difficult in the absence of time series data on farm household disposable income and consumption. Prior to this study, only the work of Campbell and Archer (1955) addressed this problem in Australia at an individual farm level. Furthermore, overseas analyses of individual farm data are

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rare, with the work of Macmillan and Lyons (1969) and Girao, Tomek and Mount (1974) being among the few reported.

Interest in farmer consumption has generally been motivated by three considerations. First, at the farm level, because of the competitive relationship between consumption and saving, consumption has important implications for farm-firm growth. Hypotheses about farm-firm investment and growth, such as Campbell's (1958) residual funds hypothesis, imply specific modes of consumption behaviour which have not been verified. Consequently, the development of models of growth of the farm firm has been inhibited.

The second consideration is the effect of variation in farm income on general economic activity, with implications for economic management. The Treasury in its *Australian Economy* papers has often speculated on the relationship between farm incomes, farm consumption and aggregate demand, but not always consistently. For example, the position adopted by the Treasury that 'the evidence suggests that farmers' consumption habits are more stable than their incomes' (1973, p. 9), did not preclude a later assertion that attributed part of the increased consumer demand in 1972/73 to higher farm incomes (1973, p. 14). Furthermore, some studies of Australian farm consumption at the aggregate level have suggested that the consumption behaviour of farm families is different from that of other groups and that the short-run marginal propensity to consume (mpc) is very low.[1] A measure of the continued acceptance of this view is the judgment in the *Australian Economic Review* that 'It has long been part of the conventional wisdom of quantitative economic analysis in Australia that farmers' marginal propensity to consume is zero or close to zero in the short run' (Institute of Applied Economic and Social Research 1979, p. 34). However, Freebairn (1977) has reported finding no difference between the mpc of farm and nonfarm groups. His best estimates of the mpc were in the range of 0.4 to 0.6. Thus no consensus exists as to the impact of changes in farm income on farm consumption.

A third reason for considering farmer consumption, and that which motivated this study, focuses on its effects on the rural regional economy. The work of Powell and Mandeville (1978) was oriented to measuring the effect of fluctuations in farm income on the stability of the rural regional economy. They found that most rural output and inputs are either sold or produced outside the region, and that 'the most important single connection between the rural sector and the rest of the rural region operates via consumption expenditure' (1978, p. 242). However, their analysis was based on assumptions about how expenditure was adjusted to variations in income and not on the results of empirical analysis.

In follow-up research to the work of Powell and Mandeville, the emphasis has been placed on assessing the extent of income fluctuations for a sample of Central Macquarie Statistical Subdivision (CMSS) farmers and relating variations in the various categories of expenditure to those incomes. The project involved surveying 101 farm businesses to collect income and expenditure data for the eight-year period 1968/69 to 1975/76. During this period there were marked fluctuations in the prices

[1] See, for example, Arndt and Cameron (1957), Nevile (1970), Smyth and McMahon (1972 and 1975) and Rutledge and Madden (1974).

for wool, beef and wheat which, together with changing seasonal conditions, generated fluctuations in farm incomes. Hence, the survey period was ideal to study how farm families adjusted expenditure to variations in income.[2]

The consumption spending of 16 of these farms was analysed and the results are reported here. In selecting the families, only those assessed as having records adequate for making acceptable estimates of consumption and household disposable income were included. Although the full survey consisted of a random stratified sample of 101 farms, it is not possible to claim that the 16 used in this analysis are either adequate in number or representative as a sample.[3] Thus the results must be interpreted cautiously. However, there are major problems in obtaining time series data on individual farm income and consumption. These problems account for the limited analysis of this topic both in Australia and overseas.

In the next section the problems of defining and estimating disposable income and consumption are discussed. The models used to test a number of consumption hypotheses are presented in the following section. The statistical techniques adopted to pool the data and the results of the analysis then follow. The economic significance of the results is discussed and concluding comments offered.

Definition and Estimation of Household Disposable Income and Consumption

The value of consumption is usually defined as purchases of nondurable goods and services plus the use-value of durable goods in the current period. However, in estimating the consumption of the CMSS farm families, purchases of durables and nondurables could not be satisfactorily distinguished and therefore, as in many other consumption studies, expenditure on durable goods was included in consumption. Consequently, if spending on durable goods is directly related to income then consumption will be overestimated (underestimated) in years of high (low) income by this approach.

There are particular problems in estimating farm family consumption which stem, first, from the overlap of some expenditure items between the business and the household, and, second, the consumption of goods produced on the farm, such as meat, milk, etc. Some procedures were developed to adjust household consumption estimates on account of these factors. On average, these adjustments accounted for about 15 per

[2] The results of the survey in terms of movements in average income and expenditure have been reported elsewhere (Mullen, Davis and Bryant 1978 and Davis, Mullen and Bryant 1979).

[3] Only a restricted comparison of the 16 farms with the full sample is possible because data on the pertinent variables for such a comparison (household disposable income and consumption) are not available for the full sample. With respect to two general farm characteristics, farm area and net cash income, the 16 farms were about 20 per cent lower than the full sample. They also seem to have had a slower growth in real income but this cannot be determined precisely. In part, these differences may be due to the concentration of these farms in the eastern part of the CMSS where farms are smaller and wheat production is relatively less important. The high incomes from wheat production in the latter part of the period contributed to the higher rate of growth of income of the total sample of CMSS farms.

cent of total consumption, but were as high as 40 per cent in some cases. The importance of this imputed portion of consumption detracts from the reliability of the data and would appear to make imputed consumption worthy of more refined analysis in future research.

The definition of income is a central issue in work on consumption.[4] In this study, household disposable income (HDY) has been used to measure income where HDY is defined as current income less the costs of earning that income where the costs include taxes and the depreciation of capital assets. HDY was estimated from the farm business records as gross income less operating expenses and personal income tax. Gross income included all cash receipts including livestock sales, the value of farm produce consumed on the farm, and off-farm income. Operating expenses included all cash costs including livestock purchases, but not investment expenditure.[5]

Information on average real income and consumption, and average propensities to consume (apc) is reported in Table 1. A visual appraisal of the trend in income and consumption for the individual families suggested that families did not consistently adjust consumption to changes in current income. The consumption of none of the families moved in the same direction as income in every year and consumption exceeded income in at least one year for all families (Mullen 1979). Three families had apc's over the eight-year period which were greater than one. The average annual rates of growth of real income and of consumption were −1.53 and −0.79 per cent, respectively.

Consumption Hypotheses and Models

The two variables normally thought to have greatest influence on consumption are income and wealth.[6] A major issue in consumption theory is the manner by which income influences consumption. The present study is most concerned with this issue.

Household size has been included as an explanatory variable in all models because it was anticipated that it could be important in explaining differences in consumption between families. It was measured as the total number of family members dependent on household disposable income, but it is recognised that this approach ignores the use of the measure 'adult equivalents' which is preferred by some writers (Modigliani and Ando 1957, p. 106).

[4] Some definitions of income involve important temporal components such as Friedman's permanent and transitory components of income, while capital transactions can also be significant for income. Because these factors are important for farm families, the measurement of farm family income is more difficult than in the case of families whose income is predominantly received as wages and salaries. However, not all of these income concepts can be directly observed or obtained from normally available accounting records. Therefore, in this study, simple concepts such as HDY are used.

[5] Further details on the data collection and analysis, including a comparison with the Australian National Accounts, can be found in the Appendix.

[6] It was not possible to collect satisfactory data on wealth during the CMSS survey and so models to test wealth hypotheses directly could not be estimated. The problem is not peculiar to this study. These hypotheses are often tested indirectly (Surrey 1976) using models containing current income and lagged consumption, similar to models estimated in this study.

TABLE 1

Average and Range of Real Income, Consumption and Average Propensities to Consume, 1968/69 - 1975/76

	Averages for whole period		
	Y	C	apc
	$10³	$10³	
Highest	9.34	6.77	1.16
Lowest	2.32	1.17	0.40
Overall average	4.75	3.55	0.75
	Averages for particular years		
	Y	C	apc
	$10³	$10³	
Highest	5.83	3.88	0.94
Lowest	3.89	3.21	0.64
Overall average	4.75	3.55	0.75

The terms in the equations below have the following meanings:

C = real consumption
Y = real household disposable income
Y_o = previous peak level of real household disposable income
HS = household size
u = error term
t, $t-1$, $t-2$ as subscripts refer to years.

There are a number of hypothesised relationships between income and consumption. The simplest relationship is that where current consumption is directly related to current income. This model is derived from the work of Keynes (1936) and is shown in equation (1):

$$C_t = a + bY_t + eHS_t + u_t. \tag{1}$$

The drawback of this simple model is that it ignores the possibility that consumption may be only partly adjusted in the current year to a change in income and/or that it may be influenced by the consumer's expectations about future income. These two influences may be important for those with unstable incomes, such as farm families, and are incorporated in the partial adjustment and adaptive expectations models, respectively.

The partial adjustment model is based on the hypothesis that consumers only partially adjust consumption to current income because of factors such as ignorance, habit, inertia and costs of change. The most general form of the model[7] is

[7] The derivation of this model can be found in Johnston (1972, p. 300) who also discussed the statistical problems of estimating such a model when an explanatory variable, lagged consumption, is not independent of the error term. He suggested that, provided the error term is serially independent, the application of OLS yields consistent and asymptotically efficient estimators, although in small samples these estimators are biased. The mean squared error of the OLS estimator is also smaller than that of other estimators.

(2) $$C_t = a + bY_t + dC_{t-1} + eHS_t + u_t.$$

An alternative specification to equation (2), the relative income hypothesis, suggests that the consumption of families is related to the consumption of other families and to previous levels of income (Duesenberry, 1952). A model of the form:

(3) $$C_t = a + mY_o + n(Y_t - Y_o) + eHS_t + u_t,$$

which was suggested by Guise (1978, University of New England, personal communication), was estimated to test this hypothesis. In this model, n is the short-run marginal propensity either to increase or to decrease consumption when current income diverges from established levels of income. It is expected to be less than the long-run mpc. If the long-run relationship between income and consumption is proportional, a should be close to zero. In equation (3), inertial influences are taken up by previous peak income[8], whenever that occurred, whereas, in equation (2), the influence on consumption of income in previous years is allowed for by the lagged consumption term.

The adaptive expectations model is based on the hypothesis that consumption decisions are made with some expectations about future income such that $C_t = a + bY_t^* + eHS_t + u_t$, where $Y_t^* =$ expected income in year t. In this model, expected income, or normal income, as it is often referred to, is unobservable. Two common approaches to estimating it are to assume either that it is a weighted average of past incomes where the weights decline geometrically or that expectations are revised according to the function $Y_t^* - Y_{t-1}^* = \delta(Y_t - Y_{t-1}^*)$, $0 < \delta \leq 1$, where δ is a coefficient of adaptive expectation. In both cases the general form of the adaptive expectations model[9] is:

(4) $$C_t = a + bY_t + dC_{t-1} + eHS_t - \lambda eHS_{t-1} + (u_t - \lambda u_{t-1}),$$

where $\lambda = 1 - \delta$.[10]

An important variant[11] of this model is Friedman's (1957) permanent income hypothesis. He suggested that, for those earning incomes which fluctuated through time, there were in effect two kinds of income — permanent income and transitory income. He then argued that consumption was related to permanent income and that the relationship was a proportional one. Because permanent income could not be measured directly,

[8] In this analysis, previous peak income in the first year was assumed to equal estimated current income to enable that year's data to be used.

[9] The derivation of this model can be found in Johnston (1972, p. 301). The statistical problems associated with estimating the model are quite complex because lagged consumption is contemporaneously associated with the error term and the error term, which has a moving average structure, is unlikely to be serially independent. Under these two conditions OLS is an inconsistent estimator and this should be borne in mind when interpreting the results for this model.

[10] If household size were omitted from equation (4), then equations (2) and (4) would only differ by the structure of their error terms and could only be distinguished empirically by testing for the presence of serial correlation in the residuals. The presence of serial correlation could be regarded as evidence supporting the adaptive expectations hypothesis rather than the partial adjustment hypothesis. However, it is often difficult to test satisfactorily for serial correlation, making empirical identification of these two hypotheses inconclusive.

[11] Another important variant, the life cycle hypothesis, which is similar in many respects to the permanent income hypothesis, has not been tested in this study because wealth data were unavailable.

he estimated it as a weighted series of past incomes where the weights summed to one and declined geometrically. Rather than estimate an equation with a series of past incomes as explanatory variables, the Koyck (1954) transformation can be exploited to simplify the model to:

$$C_t = bY_t + dC_{t-1} + eHS_t - \lambda eHS_{t-1} + (u_t - \lambda u_{t-1}), \tag{5}$$

which is similar to equation (4) but for the omitted constant term. This omission is necessary to incorporate Friedman's assumption of proportionality.

Finally, the hypotheses that consumption partly adjusts to changes in income and that consumption is influenced by expectations about future income can be incorporated in the one model, the partial adjustment-adaptive expectations model[12], which has the form:

$$C_t = a + bY_t + dC_{t-1} - fC_{t-2} + eHS_t - gHS_{t-1} + (u - \lambda u_{t-1}). \tag{6}$$

Pooling Time Series and Cross Section Data

The available data consist of both cross section (for 16 families) and time series (over eight years) observations. Pooling techniques are available to use these data to the best advantage. The first and simplest procedure used was to combine all the data and estimate the various models using ordinary least squares (OLS) regression. The approach, however, ignores the likely complexity of the resulting error structure. When time series and cross section data are pooled, the effects of some of the omitted variables or indeterminancy of the relationship, which are taken up by the error term, are likely to be specifically associated with the time or cross section dimensions. In this situation the usual OLS requirements that the error term be serially independent and homoscedastic are unlikely to be met. Hence, although the estimates of the coefficients are unbiased, the estimates of the variance of these coefficients and their associated t-statistics are biased (Fuller and Battese 1974, p. 70). Additionally, when the models include a lagged dependent variable as an explanatory variable and a serially correlated error term, OLS is not a consistent estimator. In spite of these deficiencies, the OLS estimates of the models have been reported in Table 2, but are not discussed in detail.

In an attempt to remove the cross section and time series effects from the error term, some equations were estimated as covariance and crossed error models. Covariance analysis involves the introduction of dummy variables associated with the intercept term representing particular families and years (Johnston 1972, pp. 192–207). An important assumption of the covariance model is that the disturbance term remains constant over time and households. Dummy variables associated with the slope terms were also introduced. The significance of the introduced dummy variables was tested by an F-test. A difficulty with the use of covariance analysis is that the dummy variable coefficients are not easily

[12] The derivation of this model can be found in Johnston (1972, p. 303). The model has a serially correlated error term and a lagged dependent variable. Doran and Griffiths (1978) pointed out that the use of OLS to estimate this model is likely to lead to an overestimation of the short-run mpc and either an underestimation of the negative size of the coefficient of C_{t-2} or to give a positive estimate of this coefficient if the disturbance follows a first-order moving average.

interpreted because the factors causing the variation between households and over time are not identified.

In using the crossed error technique, the time series and cross section effects are treated as part of a composite error term (Fuller and Battese 1974). While the composite error term cannot be assumed to be serially independent and have a constant variance, these assumptions can be made about the time series, cross section and combined error components. The crossed error technique is a more general approach than covariance analysis but is quite complex and requires extensive data transformations. The method suggested by Fuller and Battese has been adapted by H. Doran of the University of New England for use in this study. At this stage, the covariance and crossed error techniques have not been adapted to handle equations with moving average disturbance terms. Consequently, only the inconsistent OLS estimates are available for equations (4), (5) and (6).

The Estimated Models

The estimated models are presented in Table 2. Each of the estimated models is numbered in such a way that the first number refers to the hypothesis being tested and corresponds to the number of the equation in the text. The second number refers to the estimation technique used where 1, 2 and 3 refer to the OLS, covariance and crossed error techniques, respectively. The figures in parentheses are t-statistics. In this study, the number of degrees of freedom exceeded 70, even for models including the time series and cross section dummy variables and having as an explanatory variable, consumption lagged two periods (eliminating the observations for two years). Hence, the calculated t-statistic can be as low as 1.67 and 1.30 and still meet the 5 and 10 per cent one-tail tests of significance, respectively. Multiple correlation coefficients (R^2) have also been reported, although, because the observations on the dependent variable are transformed, the R^2s of the crossed error models are not comparable with the other equations nor with each other. The R^2 for Friedman's model, which has no intercept term, was estimated as the square of the sample correlation coefficient between observed consumption and consumption predicted using an OLS estimator (Battese and Griffiths 1979, p. 2).

It was not possible to test effectively for the presence of serially correlated residuals in this study. Because some of the data were cross sectional, the Durbin Watson test could not be applied. An alternative was to test the significance of the R^2 of the regression of the residuals on a series of residuals lagged one period for each model. While the R^2s were not significant, indicating the absence of serial correlation, the critical value of the R^2 was so high, because of the short time series, that rejection of the null hypothesis of no serial correlation was difficult. As pointed out in footnote 10, the presence of serial correlation is normally pertinent to choosing between the partial adjustment and adaptive expectations models. Equation (2) has been estimated on the assumption that it has a simple error term.

All models were first estimated using OLS. Then cross section and time series dummy variables associated with the intercept and slope terms

TABLE 2

Estimated Consumption Functions

Reg. no.	Dep. var.	Constant	Y_t	C_{t-1}	C_{t-2}	Y_o	$Y_t - Y_o$	HS	HS_{t-1}	R^2
1.1	C_t	780	0.24					418		0.45
		(2.2)[a]	(7.5)					(5.0)		
1.2[b]	C_t	1713	0.13					0.07		0.73
		(3.0)	(4.3)					(0.0)		
1.3	C_t	344	0.13					109		0.16[c]
		(2.6)	(4.7)					(0.6)		
2.1	C_t	89	0.18	0.54				176		0.66
		(0.3)	(6.4)	(7.9)				(2.2)		
2.2[b]	C_t	1418	0.13	0.11				−5		0.74
		(2.1)	(4.0)	(1.0)				(−0.0)		
2.3	C_t	149	0.16	0.34				235		0.36[c]
		(1.0)	(5.5)	(4.0)				(1.7)		
3.1	C_t	295				0.34	0.18	293		0.55
		(0.9)				(9.9)	(5.7)	(3.7)		
3.2[b]	C_t	1705				0.13	0.13	0.3		0.73
		(2.7)				(2.4)	(4.3)	(0.0)		
3.3	C_t	302				0.19	0.14	115		0.18[c]
		(2.3)				(3.4)	(4.8)	(0.6)		
4.1	C_t	15	0.18	0.52				−643	834	0.69
		(0.1)	(6.7)	(8.1)				(−2.4)	(3.2)	
5.1	C_t		0.18	0.53				−645	835	0.69
			(6.8)	(8.4)				(−2.4)	(3.2)	
6.1	C_t	119	0.16	0.48	0.14			−739	823	0.70
		(0.4)	(5.2)	(5.8)	(1.7)			(−2.7)	(3.1)	

[a] The figures in parentheses are t-statistics.
[b] In these covariance models, the dummy variables are associated with the intercept term. The estimated coefficients and t-statistics are not reported here.
[c] The R^2s in the crossed error models, 1.3, 2.3 and 3.3 are not comparable with each other or the other R^2s.

were introduced in equations (1), (2) and (3).[13] An F-test was used to test the significance of the dummy variables at the 5 per cent level. The time series dummy variables were insignificant whether associated with the intercept or slope terms. Cross section dummy variables associated with the intercept term were significant in each equation. Cross section dummy variables were also significant when associated with the slope term for equations (1) and (2) but the intercept dummy variables were preferred.[14]

[13] Although covariance analysis is an inconsistent estimator of models with moving average disturbance terms, dummy variables were also introduced in equations (4), (5) and (6). The time series dummy variables were not significant in the three equations. The cross section dummy variables were significant when associated with the slope term, but not the intercept term in equations (4) and (5), and no dummy variables were significant in equation (6).

[14] For these two models the dummy variables associated with the intercept term have been preferred for three reasons. First, the R^2 for the absolute income model was slightly larger (0.73 as against 0.71) when the intercept dummy variables were included. However, the reverse held for equation (2). Second, from a theoretical viewpoint, it would seem that many of the factors influencing the mpc, such as interest rates, income variability and

For the covariance models, HS_t was always insignificant, presumably because its influence was taken up by the cross section dummy variables, and the constant term was significant in all three models (1.2, 2.2, 3.2). All coefficients associated with income and consumption variables were much lower than in the OLS models and the coefficient of lagged consumption in the partial adjustment model (2.2) was not significant. The coefficient of current income (equivalent to the coefficient on $(Y_t - Y_o)$ in the case of Guise's model, 3.2) was very similar in the three models. The R^2 for all covariance models was approximately 0.73.

For the crossed error models, HS_t was again insignificant in all cases, the constant term was insignificant in the partial adjustment model (2.3) but all other coefficients were significant. In particular, the coefficients of the variables taking up lag effects, C_{t-1} (2.3) and Y_o (3.3), were significant and larger than in the covariance models.

Economic Significance

The short- and long-run mpc's for the estimated models are presented in Table 3. They were calculated using the approach suggested by Evans (1969, p. 70) for growth rates in real income and consumption of -1.53 per cent and -0.79 per cent, respectively, and also assuming zero growth in income and consumption. Only marginal differences in the calculated mpc's were due to the different growth rate assumption.

TABLE 3

Marginal Propensities to Consume

Regression	Short-run mpc	Long-run mpc[a]	
		$g = -0.0079$ $r = -0.0153$	$g = 0$ $r = 0$
1.1	0.24	0.24	0.24
1.2	0.13	0.13	0.13
1.3	0.13	0.13	0.13
2.1	0.18	0.40	0.40
2.2	0.13	0.15	0.15
2.3	0.16	0.25	0.25
3.1	0.18	0.35	0.34
3.2	0.13	0.13	0.13
3.3	0.14	0.19	0.19
4.1	0.18	0.39	0.39
5.1	0.18	0.39	0.39
6.1	0.16	0.45	0.44

[a] g and r are the average rates of growth of consumption and income, respectively.

uncertainty, are likely to be similar across farm families, especially when the families live in the same area. Hence, it seems reasonable to assume that farm families have similar mpc's and that differences in consumption behaviour between families are reflected in differences in the intercept term. Third, this approach facilitates discussion and interpretation of the regressions. If the slope dummy variables are retained then the coefficient of Y_t is the mpc of the first family and the coefficients of the dummy variables are the differences in mpc's of the other families from the first family. Because it is associated with only one family, the coefficient of income is likely to be insignificant.

Because both the covariance and crossed error estimators are preferred to the OLS estimator (for reasons discussed above), and because they have not yet been adapted for application to models with moving average disturbance terms, discussion is restricted to the covariance and crossed error estimates of the first three equations (regressions 1.2, 1.3, 2.2, 2.3, 3.2 and 3.3).

All three covariance models had similar R^2s whilst the estimated short-run and long-run mpc's were alike. The short-run mpc for these models was about 0.13 and the estimates of the long-run mpc were only slightly larger because the coefficient of the variable taking up lag effects was not significant in the partial adjustment model (2.2) and was low and barely significant in Guise's model (3.2). This suggests that partial adjustment and normal income effects are of little importance in explaining farmer consumption behaviour — a finding difficult to reconcile both with the hypotheses about farmer consumption behaviour and with the apparent inclination of the individual families not to adjust their consumption to changes in income, as mentioned earlier.

The results for the crossed error models tend to support the partial adjustment and adaptive expectations hypotheses. For this reason, and because of their more desirable statistical properties, they are the preferred models and yield the best estimates of the short- and long-run mpc's. Estimates of the long-run mpc were higher than the short-run mpc in the Guise (3.3) and partial adjustment models (2.3), indicating that consumption was influenced by lagged or normal income effects.[15] However, in this study, it was not possible to separate these effects and determine their relative importance. The long-run mpc's were 0.19 for Guise's model and 0.25 for the partial adjustment model. The partial adjustment model is preferred to Guise's model because it is more appealing to incorporate inertial influences through an adjustment function than through the experience of one year when income peaked. The short-run mpc for the crossed error estimate of the partial adjustment model was 0.16, compared to the covariance estimate of 0.13.

While estimates of the short- and long-run mpc's for farm families were significantly different from zero, they were much lower than Freebairn's (1977, p. 214) recent estimates of the aggregate mpc's for Australia. His estimates of the short-run mpc ranged from 0.4 to 0.6 and the long-run mpc was estimated to be 0.9. The estimate by Girao, Tomek and Mount (1974, p. 145) of the short-run mpc of American farm families from a life cycle model was 0.24, but estimates from other models were less than 0.09. They obtained several estimates of the long-run mpc in the range 0.46 to 0.51, but many estimates were lower than this. The apc of their families was 0.53. In a cross sectional study of Canadian farm household expenditure, MacMillan and Lyons (1969, p. 96) estimated that the mpc was 0.24 and the apc was 0.60.[16]

[15] The OLS estimates of regressions 4.1, 5.1 and 6.1, while inconsistent, suggest important lag effects with long-run mpc's being as high as 0.45 and more than twice the short-run mpc's. Furthermore, Doran and Griffiths (1978, p. 141) suggested that the inconsistency of the estimate of the long-run mpc from the partial adjustment-adaptive expectations model estimated by OLS may only be important for very small values of the coefficient of adaptive expectations.

[16] They hypothesised that consumption depended on current income and expectations about future income. The influence of these expectations was taken up by two variables —

Conclusions

The results of a study of the consumption behaviour of 16 farm families over an eight-year period have been reported in this paper. The main deficiencies of the study are that the sample is small, that the representativeness cannot be confirmed, and that, by necessity, a proportion of consumption had to be imputed. Nevertheless, the farm families studied were not obviously atypical, whilst the data on income and consumption were judged to be good. Consequently, the study contributes information about farmer consumption behaviour — a relatively neglected area of research.

The estimates of the short-run mpc were similar. The best estimates ranged from 0.13 to 0.16. Hence, the short-run mpc of farm families, while significantly different from zero, appears likely to be quite low. At the farm level, this implies that most of any increase in disposable income will be available for either savings or investment, which conforms to Campbell's residual funds hypothesis. At the regional level, the implication of a low short-run mpc is that the consumption of farm families is a relatively stable influence on those sectors of a regional economy supplying consumption goods and services. The effects of rural income fluctuations are more likely to be borne by the financial sector and those supplying farm inputs. Similarly, at the national level, the consumption of farm families is likely to be a stable component of aggregate demand.

The best estimates of the long-run mpc ranged from 0.19 to 0.25. However, estimates from models with moving average disturbance terms, estimated using OLS, were as high as 0.45. The divergence in the short- and long-run mpc's indicates that adjustments are made to consumption over a period longer than one year. Nevertheless, the estimates of the long-run mpc are so low as to suggest that the consumption of farm families is not influenced by changes in income to the same extent as nonfarm families.

APPENDIX

The Estimation of Consumption and Household Disposable Income

In this Appendix further details relating to the estimation of household disposable income (HDY) and consumption are provided. A comparison is made with the treatment of corresponding items in the Australian National Accounts (ANA).

Consumption

The 16 farm families included in the analysis were selected from the total sample of 101 on the basis of the interviewers' assessment of the completeness and accuracy of their financial records. One or other of two methods of estimation was employed. For eight families, the estimate of consumption was based on the analysis of cash books where the details of all cheques were recorded and all income received was banked. The method of estimating consumption for the other eight

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the change in net worth and the annuitised value of total assets. Hence, no distinction was made between the long- and short-run mpc's. They also suggested that wealth was important in explaining farmer consumption.

families was as a residual amount after business spending was deducted from gross income and after adjusting for changes in cash assets and liabilities. The reliability of the latter method depended on all cash assets and liabilities being recorded in the balance sheet, all income being declared and business spending being correctly estimated. Nine of the families were re-interviewed as a further check on the data and some refinements were made to the original estimates of income and consumption. These estimates of consumption did not allow for the separate identification of spending on durables.

The consumption estimates were further adjusted to account for the overlap of some business and household expenditures, and for the on-farm consumption of farm produced goods. In the former category, the main items were telephone, electricity and motor vehicle expenses. During the survey, the interviewers developed some 'rules of thumb' for the business and consumption shares of these items in consultation with the farmers and their accountants. These rules of thumb were applied to all 16 farms. Thus, one-third of electricity and telephone expenses, and one-quarter of motor vehicle expenses (including the net purchase price on replacement) were added to consumption and the balance was classified as part of farm operating expenses.

With respect to on-farm consumption of farm produced goods, meat was the only item for which reliable data could be collected in the survey. This was then valued at retail prices using data provided by the Bureau of Agricultural Economics. While the surveyed families indicated that they frequently produced their own eggs, milk and some vegetables, it was not possible to estimate the quantities and values.

The portion of consumption which was imputed often represented about 15 per cent of total consumption and in some years, such as low income years, rose as high as 40 per cent. It would seem likely that imputed consumption is relatively more important for farm than nonfarm families. This, combined with the overall magnitude of these items, would appear to justify further study. That could entail more detailed data collection for a sample of farms and some sensitivity analysis of the apportioning and valuation procedures used.

Compared to the ANA estimates of consumption, the items included are similar except for an imputed rental value for housing and some further items of farm produced goods consumed on the farm which are not included in this study. The compilation procedures are also different in that the estimates for this study were based on the expenditure data of individual families, whereas the ANA estimates are compiled by aggregating the value of sales of final goods and services, making it difficult to estimate the consumption by particular groups such as farmers.

Household Disposable Income

The HDY of farm families was defined as gross income less the operating costs of earning it. Gross income was estimated as the cash receipts from all sources, both on and off the farm, in each year, but not including changes in cash assets and liabilities. The imputed value of farm produced goods consumed on the farm was also included in HDY. The data were collected from tax returns and profit and loss accounts on

a financial year basis. Taxable income was not used as an estimate of HDY.

Operating expenditure should not include items of capital expenditure but rather the depreciation of capital and expenditure on repairs and maintenance. The estimation of operating costs was complex because first, there was no clear distinction between operating and capital expenditure in most data sources. Second, it was often difficult to distinguish the replacement and investment components of capital expenditure and third, data were unavailable to compute economic rates of depreciation. Some items of investment spending, particularly on machinery and construction, could be identified in taxation depreciation schedules and from questioning the farmer. Items of spending that were of an investment nature were not treated as part of operating expenditure. Because of the difficulties of establishing real rates of depreciation, other capital spending was treated as operating expenditure. The treatment of capital expenses in this manner is undesirable if, as has been suggested by Campbell (1958), capital spending is directly related to income, in which case fluctuations over time in both HDY and the average propensity to consume will be reduced, although their long-term averages should remain unaffected.

The treatment of livestock sales and purchases is complicated because it is impossible to determine whether changes in stock numbers are investment or operating decisions. All livestock sales and purchases were treated as items of income and operating expenditure in this study. Finally, the operating expenditures for telephone, electricity and motor vehicles were adjusted to allow for that portion attributed to consumption.

In this study the estimate of HDY is based on the cash receipts from all sources less cash operating costs and income tax of the individual farm families, whereas in the ANA, income is estimated by aggregating, on an accrual basis, payments to the household sector less aggregate taxes paid by that sector. Thus, in the ANA, identification of farm household income is difficult, and would normally be related to the income of farm unincorporated businesses, thereby omitting nonfarm income and income of farm incorporated businesses. Likewise, tax paid by farm households cannot be identified in the ANA. Thus, the estimation of HDY from the ANA is not possible.

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