The Consumption Behaviour of Farmers: a review of the evidence

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Over recent years there has been marked instability in incomes earned from farming. The instability, which affects the economy generally, is transmitted partly through the consumption spending of farmers. A conventional view of the short-run marginal propensity to consume of farmers, supported by some analyses of aggregate data, is that it is zero. It is argued that this view is implausible on theoretical grounds, that the analysis giving rise to this view used aggregate data which contained serious flaws, and that evidence from micro-studies and other macro level analyses present a more realistic assessment that the short-run mpc of farmers is not zero but likely to be lower than that of non-farmers. A non-zero mpc has implications for how the farm sector interacts with the rest of the economy and is incorporated in models of the economy.

1. Introduction

The consumption behaviour of farm families has been a topic of interest to economists for some decades. This interest stemmed from both the size of the farm sector and the instability of farm incomes, which meant that changes in the farm sector had considerable effects on the overall economy. Although the relative contribution of the farm sector to the Australian economy has been declining in terms of Gross Domestic Product and employment, the instability element remains. Further, there appears to have been a strengthening of the links between the farm sector and the rest of the economy (Powell 1978). These factors were highlighted during the last widespread drought when many commentators indicated that the drought was a significant additional factor in the economic downturn in the early 1980s, and a major contributor to the subsequent recovery (Campbell *et al.* 1983; O'Mara 1985a).

In this paper our purpose is to review some features of the consumption of farmers as discussed in the literature. The emphasis is on the short-run marginal propensity to consume (mpc) of farmers both because of previous work on that issue, and because it is significant in a variety of situations where short-run economic forecasts are made. Subsequently, we also comment on the rate of response over time of farmer consumption to changes in income, and the long-run mpc. In the next section some background is provided on consumption issues followed by some discussion of the theoretical implications of a zero short-run mpc. The evidence is then reviewed under two headings; that which supports the zero short-run mpc view and that which does not. Finally, we discuss some implications of the findings, particularly in terms of how modellers and forecasters might best incorporate the farm sector into their models.

2. Background

The background to this review is the substantial changes in the farm sector in the past four decades which are important to understanding farm household consumption. The conventional view has been that farm consumption expenditure varies very little in the short-run.[1] This has

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The authors of this paper were brought together through a concurrence of research on empirical aspects of the rural sector, its relationships with the rest of the economy, and our concern about the inadequacies of the literature and an understanding of those topics. The work at the University of New England included that of John Mullen and was assisted by the Rural Credit Development Fund of the Reserve Bank of Australia. Paul O'Mara is now at the Bureau of Agricultural Economics in Canberra whilst Barry Reece is at the N.S.W. Department of Finance in Sydney.

1. The short-run mpc is the instantaneous change in consumption created by a once-only unit change in income. Formally, it is the partial derivative of consumption with respect to income. Another definition, applicable in the context of the

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been based on the proposition that farm households maintain a normal level of expenditure on consumption and some current farm business inputs which are essential to production. The remaining funds are ploughed back into the farm business as expenditure on capital goods and other key inputs over which farmers have discretion, such as fertiliser. Being a residual, these components of farm expenditure are more volatile than the consumption expenditure of farmers (Campbell, 1958).

Two factors confound empirical analysis of this hypothesis. First, there is the distinction between the marginal propensity to consume out of farm income, and the marginal propensity to consume of farm households (out of all income). Because aggregate, time series farm income data are readily available, a number of analysts have used that data to examine the marginal propensity to consume out of farm income. The second confounding issue relates to the use of quarterly data in some analyses and annual data in others. Apart from the problems in estimating quarterly data for essentially annual farming activities, these differing data do lead to the short run having varying time specifications. Some comments follow on the first issue.

Arndt and Cameron (1957, p. 109), in an early Australian consumption function study, were ". . . tempted to proclaim, as an empirical law for the Australian economy, that consumption equals non-farm disposable income". A corollary of that finding was a zero mpc for farmers, and they rationalised the result on the basis of strong demonstration effects flowing from non-farmer consumption to farmer consumption. Their conclusion is not supported by any evidence on the existence of demonstration effects. Furthermore, the mechanisms of urban-rural contact such as television, which would provide the basis of such an effect, were not well developed in the period covered by their study.

The conventional view became that the short-run mpc of farmers was zero or close to zero. It was reasserted by the Institute of Applied Economic and Social Research (1979). The context of that reassertion was discussion of the variability of the Australian saving ratio in the 1970s, part of which was attributed to a rise of farm income of over 100 per cent in 1978–79. Others seeking to explain the rise in the saving ratio have also invoked, as a partial explanation, greater variability of the saving ratio of farm households as compared with non-farm households (Treasury 1982). Furthermore, the Treasury now distinguishes between the saving ratios for all households and non-farm households when discussing saving behaviour, on the ground of "the volatility in farm income which tends not to be reflected in farm consumption" (Treasury 1982, Table 3, footnote c, p. 16). Williams (1979, p. 141) in his review of household saving and consumption pointed to the lack of definitive data on farm household saving in the 1970s and remarked that "Fluctuation in farm income had some effect on the timing of the build-up in household saving", suggesting support for the zero or low short-run mpc hypothesis.

However, hypotheses about the consumption behaviour of farm families focusing on the mpc from farm household incomes are best tested using models and data specifically related to farm households; data that are especially difficult to obtain. Consequently there are few studies based upon individual family data and most do not support the zero mpc hypothesis. One exception to this is the view of Campbell (1958). Campbell and Archer (1955) reported evidence on spending (both business and consumption)

geometrically declining distributed lag model, is that the short-run mpc is the first weight in the series of geometrically declining weights (Challen and Hagger 1979, pp. 53–4). The instantaneous short-run mpc and the mpc estimated as the first weight are equivalent. When account is taken of cumulative changes in consumption as the number of time periods increase, the estimated instantaneous mpc will be less than an estimate of the mpc after (say) one period had elapsed following the initial once and for all income increase of one unit. This is because the influence of the initial income change persists over succeeding time periods though in a weaker manner. The sum of these changes in consumption, over some specified period, usually infinity, provides a definition of the long-run mpc. In this paper the instantaneous multiplier version of the short-run mpc is used. This short-run period may be quarterly or annual, depending on the data used in the studies cited.

for a sample of farm families. They did not test any consumption hypotheses and were inconclusive about the relationship between income and consumption. Later, Campbell favoured the permanent income hypothesis and observed that "Farmers' consumption expenditure appears to be comparatively unresponsive in the short-run to farm income fluctuations. . ." (1958, p.98). However, Campbell fell short of supporting a zero short-run mpc; rather, he was indicating that the short-run mpc was likely to be low, and his observations were made at a time when non-farm income earned by farmers was small.

Work on farmer investment was reviewed by Powell (1982) who concluded that there was some evidence that residual funds (a proxy for income) influence the level of farm investment. However, the identification of that relationship is confounded by correlations between high levels of residual funds and high levels of farmer expectations about future returns. Furthermore, developments in the financial sector, and in the financing of agriculture, have lessened the importance of internally generated finance as a determinant of investment. As a corollary the implication that the short-run mpc is zero is also weakened.

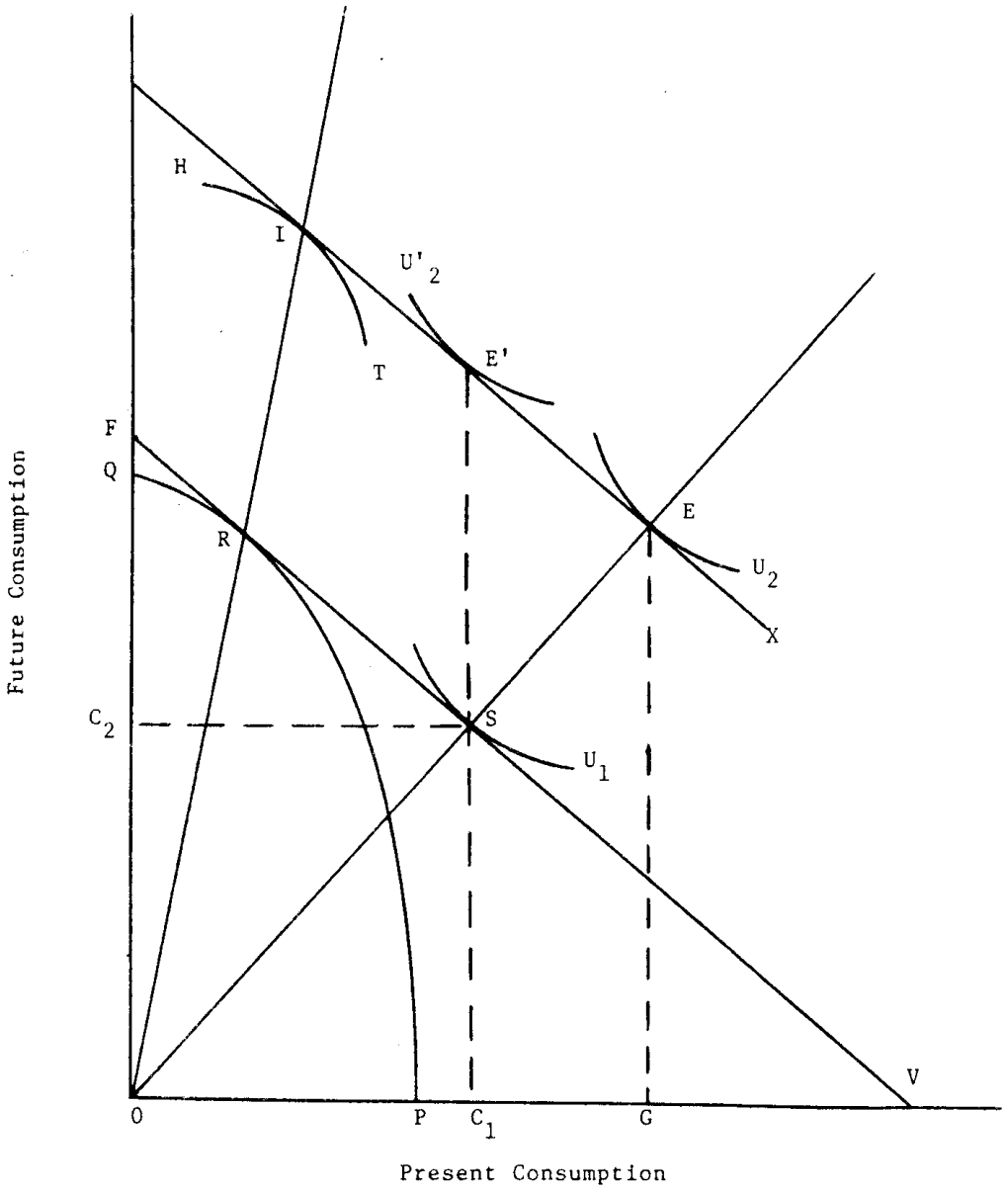
3. Theoretical Issues

The concept of a zero mpc implies, in the first instance, that the consumption function has no slope. To advance beyond this, the consumption and investment decisions that face a farm household need analysis. Following Hirshleifer (1958) as shown in Figure 1 it is assumed that a farmer who seeks to maximise utility from consumption in a two-period model,[2] starts from an initial wealth position on a production transformation curve PQ and, assuming that the capital market is perfect, faces unlimited lending and borrowing opportunities at a given rate of interest represented by the market line FRSV. The farmer's preferences are represented by U_1 and U_2. The optimal investment and consumption decisions are for the farmer to move along the production transformation curve to R by investing, then, by borrowing, to move along the market line to S in order to reach the highest possible indifference curve. Consumption is therefore OC_1 and OC_2 in the first and second periods, respectively. Now suppose, for exogenous reasons, the farmer's income increases in period one, and that the production transformation curve, assumed to be homethetic, shifts outward in a parallel fashion to HJT so that R and I lie on a straight line from the origin. Normally, an increase in consumption would be predicted. Such a solution is shown in the tangency of U_2 to the highest market line IEX at E. It implies an increase in consumption in period one from OC_1 to OG. Assuming the indifference curves to be homothetic, the result is a constant ratio of consumption to income which is reflected in the consumption expansion path being the straight line OSE.

This conventional presentation of the farmer's utility maximisation problem prompts consideration of the conditions under which a zero mpc might be observed. A zero mpc means consumption remains fixed at OC_1 when income rises. This implies that, at the higher income, the farmer's indifference curve must be tangent to the market line at a point directly above C_1; U_2^1 represents such an indifference curve. Hence, one possible explanation of the proposition that the mpc is zero depends on a particular set of indifference curves where each curve is displaced vertically to maintain the original equilibrium marginal rate of substitution between consumption in the two periods. That is, at any given level of consumption, the marginal rate of substitution must be the same on each indifference curve. This proposition can only be true if the indifference curves are parallel to each other; a condition that is restrictive rather than general in its nature. Furthermore, the argument requires that

2. The farmer's problem involves optimisation over many periods. To use a two-period model is, therefore, to adopt a simplification in which the second period represents the remainder of the farmer's lifetime, during which the farmer benefits from decisions made in the first period by receiving a stream of perpetuities (Hirshleifer 1958, p. 343). The simplification is equivalent to imposing a separability condition upon the utility function.

Figure 1: Theoretical allocation of income among present and future consumption.



the indifference curves for non-farm households are not so arranged. This point, relevant though it is, is derived from a simple, static model whose other assumptions, if relaxed, would open up further avenues for investigation. Amongst these assumptions are that the farmer seeks to leave no bequests, that fluctuations in prices and seasonal conditions are adequately portrayed by assuming a parallel shift in the transformation curve and that capital markets are perfect.[3] However, the main rationale for a zero mpc is not to be found in that direction, even though it would provide many insights, but by examining the model from a permanent income theory perspective.

3. These assumptions may be relaxed by introducing bequests; allowing unequal borrowing and lending rates (*cf.* Hirshleifer 1958, p. 333); having non-parallel transformation function shifts with unequal borrowing and lending rates; introducing quantitative restrictions on borrowing levels (*cf.* Deaton and Muellbauer 1980, p. 318); or allowing for the effects of after-tax incomes on consumption (*e.g.* Ouliaris 1981).

A second, more important interpretation of Figure 1, relies on Friedman's theory of permanent income. In this interpretation all the income change, being regarded as positive transitory income, has no effect on permanent income. FRSV by implication, remains the constraint, and hence permanent consumption remains equal to OC_1. A strictly zero effect on consumption requires the transitory income to induce no effect on consumption, either permanent or transitory. That Friedman (1957, p.27) saw his assumed lack of correlation between transitory income and transitory consumption as a strong assumption ought to warn against basing the zero mpc case on just such an assumption, for there are at least two reasons for doubting that the correlation is zero. First, the evidence testing Friedman's view that transitory income and transitory consumption are uncorrelated is inconclusive (Ott *et al*, 1975 p. 79–80). Second, Friedman's (1957, p. 215) own view of how transitory income and transitory consumption are related in practice is not that the mpc out of transitory income is zero, but that its size varies inversely with the length of the consumer's planning horizon. For example, Friedman considered an appropriate planning horizon for consumption to be three years. He predicted any transitory increase in income would be spent over that period. But, while the amount spent in each year would fall as the planning period increased, it would not be expected to fall to zero.[4] Hence the internal consistency of the zero mpc argument with Friedman's theory is suspect.

On either interpretation, for the solution of this theoretical model of the representative farmer's inter-temporal utility maximisation problem to predict a zero mpc requires assumptions which are both strong and restrictive. Judging a zero mpc implausible, we turn now to examine whether the zero mpc reported in other studies is perhaps due to the data, the assumptions made or the estimation methods used.

4. Recent Empirical Evidence Supporting a Zero mpc

Most of the support for the hypothesis that the short-run mpc from farm income is zero comes from analysis of aggregate data taken from the Australian National Accounts (ANA). A useful specification to test hypotheses about farm and non-farm consumption behaviour has the form:

$$(1) \quad C_t = a(1-\lambda^n) + a(1-\lambda^f) + b_n(1-\lambda^n)Y_{n,t} + b_f(1-\lambda^f)Y_{f,t} + \lambda^n C^n_{t-1} + \lambda^f C^f_{t-1} + u_t,$$

where C = private consumption expenditure;

Y_n and Y_f = the disposable incomes of non-farm and farm housholds, respectively;

b_n and b_f = the long-run mpc of non-farm and farm households, respectively;

$(1-\lambda^n)b_n$ and $(1-\lambda^f)b_f$ = the short-run mpc and of non-farm and farm households, respectively; and

u_t = disturbance term.

This specification is consistent with both partial adjustment and adaptive expectations hypotheses of consumption behaviour (Johnston 1972, pp. 300–302). The disturbance term has been included but its form depends on which hypothesis the specification is derived from. The problem is that aggregate time series income and consumption data are unavailable for farm and non-farm households, and the approaches taken by researchers to these data deficiencies in testing consumption hypotheses are now reviewed.

(i) Smyth and McMahon (1972)

Smyth and McMahon adopted an

4. If ΔY, a once-off change in income was received then permanent income over an infinitely long planning horizon would rise by $r\Delta Y$ where r is the real interest rate. That is, an annuity of $r\Delta Y$ for such a period has a present value ΔY. For shorter periods, the increase in permanent income exceeds $r\Delta Y$. The important point is that provided the real interest rate is positive, then permanent income, and hence consumption, would increase even where the planning horizon is infinitely long. If, however, the interest rate was zero, as would be the case if income were hoarded, then the above result would not hold.

approach used by Arndt and Cameron (1957) and Nevile (1970), and later by Rutledge and Madden (1974) and Freebairn (1977), to estimate disposable farm income. Using the terminology of the ANA, disposable farm income was estimated by applying the ratio of total household disposable income to total household income, to the income of farm unincorporated enterprises. All analyses based on these concepts relate to consumption from farm income, thereby ignoring any non-farm earnings.

This procedure for estimating farm disposable income can be questioned on a number of grounds. First, there is an assumption that farm families pay tax at the same rate as non-farm families. This assumption is doubtful given the different income experiences of the two sectors, the greater opportunity for diverting taxable income to non-taxable capital gains in the rural sector and the special tax legislation applying to the rural sector such as the averaging provisions. Furthermore, the opportunities available to owner-operator businesses of including some personal expenditure in business deductions, the more frequent splitting of income through family partnerships in farming and, at least until the early 1970s, the treatment of many items of capital expenditure as allowable deductions in the year incurred, also make the above tax rate assumption questionable. Second, the income of farm unincorporated enterprises seems likely to be a poor estimate of the income of farm families because, by definition, the income of farm families operating as companies is not included, and because the earnings of farm families from the non-farm sector are also excluded. Third, in none of the studies, with the exception of that by Freebairn (1977), were the data expressed on a per caput (or per family) basis, yet there has been a marked decline in the number of farm families. Hence, for these three reasons, farm disposable income is likely to be underestimated. In cases where some of the components of these measurement errors have a random distribution, the "errors in variables" problem biases downward the estimate of the short-run mpc (Koutsoyiannis 1977, p. 261).

Confronted with a lack of farm consumption data, Smyth and McMahon assumed that λ was the same for both farm and non-farm families. The significance of this assumption was that it eliminated the need for disaggregated consumption data and allowed them to test their hypothesis using equation (2) (which follows from (1) when λ^n is set equal to λ^f)

$$(2) \quad C_t = a(1-\lambda) + b_n(1-\lambda)(Y_{n,t} + Y_{f,t}) - (b_n - b_f)(1-\lambda)Y_{f,t} + \lambda C_{t-1} + u_t.$$

The equation was estimated using ordinary least squares (OLS) regression and seasonally adjusted, real quarterly data from the fourth quarter of 1958 to the third quarter of 1968 inclusive, giving:

$$(3) \quad C_t = \underset{(38.8)}{148.1} + \underset{(0.099)}{0.492}Y - \underset{(0.121)}{0.465}Y_f + \underset{(0.116)}{0.427}C_{t-1},$$

$R^2 = .9955$, $h = .35$

where Y = personal disposable income and the figures in parentheses are standard errors. Smyth and McMahon did not specify the structure of the error term but accepted the hypothesis of no serial correlation. An implication is that their model is more consistent with partial adjustment of consumption to income change rather than with adaptive expectations or permanent income hypotheses.

In testing the significance of the short-run mpc farm income, Smyth and McMahon (1972, p. 225) pointed out that the coefficients of Y and Y_f "are very close to each other in magnitude but opposite in sign. Thus the coefficient of b_f is not significantly different from zero".[5] Smyth and McMahon did not offer any

5. A more rigorous test of the null hypothesis that b_f is zero would have been to estimate:

$$C_t = a(1-\lambda) + b_n(1-\lambda)(D/FD) + \lambda C_{t-1},$$

where D = national household disposable income, and

FD = the ratio of farm household income to D,

and, using an F-test, test the significance of the increase in the residual sum of squares from equation (2), the alternate hypothesis. However, it is highly unlikely that b_f would become significantly different from zero.

explanation as to why farm families might have a zero short-run mpc. Presumably, they would have argued in similar fashion to Nevile (1970, p. 83) who suggested that:

> Unincorporated farm income fluctuates much more from year-to-year than non-farm disposable income. Hence farmers are likely to give much less weight to the current level of income than are the rest of the community. Moreover, there has been virtually no trend in real farm incomes over the last fifteen years. One would expect, therefore, that consumption by farmers would be more or less constant over the last fifteen years and that the marginal propensity to consume from farm income would be very low.

Nevile's study period was 1953–54 to 1966–67 and his argument is similar to the second interpretation of Figure 1 above. However, neither Smyth and McMahon nor Nevile examined specifically the trend in real farm disposable income.

The result is dependent upon an assumption that the value of the lag parameter, λ, is common to both farm and non-farm households. However, Smyth and McMahon correctly noted that, as farm incomes tend to be more volatile than non farm incomes, it is possible that the value of the lag parameter would differ between the two groups. In particular, they suggested that the value of λ in the farm sector could be *less* than that in the non-farm sector, in which case their empirical results would be consistent with a value for b_f greater than zero (this result can be checked by reference to equation (2)). However, it would seem more reasonable to suppose that the value of λ in the farm sector would be *larger* than that in the non-farm sector (so that the weighting given by farm households to the current period's income would be relatively less than for non-farm households). Of course, if it was accepted that the value of λ in the farm sector would be larger than in the non-farm sector, then the Smyth and McMahon results would imply that, if anything, $b_f < 0$, *i.e.* a negative long-run mpc!

(ii) Rutledge and Madden (1974)

Rutledge and Madden (1974) were particularly critical of the assumption that the lag parameter was common to both farm and non-farm households and attempted to test the hypothesis that the short-run mpc from farm income is zero using different values for λ. To overcome the need for disaggregated consumption data, they estimated a model where consumption was a function of a weighted series of past farm and non-farm incomes.[6] They used the same date as Smyth and McMahon (although seasonality was treated differently) and a generalised least squares estimator. The model took a form similar to:

$$(4) \quad C_t = a + b_n(1-\lambda) \sum_{i=0} \lambda^i Y_{n,t-i} + b_f(1-\mu) \sum_{i=0} \mu^i Y_{f,t-i} + u_t,$$

where λ^i = weights on the series of non-farm income;
μ^i = weights on the series of farm incomes; and
u_t = random disturbance term.

Maximum likelihood estimates were obtained for the parameters λ, μ, $b_n(1-\lambda)$ and $b_f(1-\mu)$. The reported estimates were (with standard errors in parentheses):

λ	= 0.432 (.053),	μ	= 0.598 (.054)
$b_n(1-\lambda)$	= 0.414 (.038),	$b_f(1-\mu)$	= 0.0748 (.055)
b_n	= 0.729,	b_f	= 0.186.

As would be expected (and contrary to the suggestion made by Smyth and McMahon), the estimated lag paramater for the farm sector was significantly larger than that for the non-farm sector, implying that farm households' perception of their permanent income adjusts more slowly to a change in current income than is the case for non-farm households. The estimated short-run (quarterly) mpc by farm households was positive but relatively small at 0.07 and significantly smaller that its non-farm counterpart at 0.41. (A similar conclusion also holds for the estimated long-run mpc which implies

6. Because both Smyth and McMahon (1972) and Rutledge and Madden (1974) expressed consumption as a function of a weighted series of past incomes, their models can be interpreted as adaptive expectations models and and can be interpreted as coefficients of adaptive expectations or the weighting patterns on past incomes. Partial adjustment models can be derived from a weighted series of past consumption (Johnston 1972, p. 302) and hence in these models is the coefficient of partial adjustment or the weighting pattern on past consumption.

that the relationship between consumption and permanent income in the farm sector is significantly different from that in the non-farm sector.)

A final point concerning a short-run mpc of zero is that estimates of a long-run mpc will necessarily be zero. If the long-run mpc is defined as the short-run mpc divided by the coefficient of partial adjustment or adaptive expectations, the long-run mpc must be zero. In the case of geometrically declining distributed lag models, when the lag factor is positive but less than one, the long-run mpc must also be zero. This result follows because, if the first weight—which comprises a term representing the sum of the weights times one minus the lag factor—is zero, then each successive weight will be zero, and hence the long-run mpc is zero (Challen and Hagger 1979, Ch 2.10). This consequence of a zero long-run mpc necessarily following from a zero short-run mpc adds to the unsatisfactory nature of the analysis purporting to establish that the short-run mpc of farmers is zero.[7]

5. Empirical Evidence Supporting a Non-zero mpc

(i) Zerby (1969)

Zerby (1969) was amongst the first to develop and publish a small econometric model of the Australian economy. Zerby explicitly allowed an independent role for farm income in the consumption functions in his model. He specified expenditure on consumer durables to be a function of non-farm household income, farm household income, total personal tax payments, a short-term interest rate and a lagged dependent variable. The specification for consumption expenditure on non-durables was similar except for the exclusion of the interest rate variable. Zerby handled the data problem by using pre-tax household income and including a variable for total personal tax payments. The model was estimated using annual data over the period 1948–49 to 1965–66. Zerby reported parameter estimates obtained using ordinary least squares (OLS), two stage least squares (2SLS) and three stage least squares (3SLS).

Unfortunately, the specification of these consumption equations does not permit the direct derivation of the annual mpc by farm households out of disposable income. However some feel can be obtained for the implied value of the mpc out of disposable income by making some reasonable assumption about the size of the marginal rate of taxation. Assuming a single tax rate where marginal equals average tax ($Y_d = (1-t)Y$), the total derivative of the identity $C \equiv C_N + C_D$ with respect to disposable income is:

$$(5) \quad dC/dY_D = (\partial C_N/\partial Y + \partial C_N/\partial TP \cdot \partial TP/\partial Y + \partial C_D/\partial Y + \partial C_D/\partial TP \cdot \partial TP/\partial Y)/(1 - \partial TP/\partial Y),$$

where:
- C = consumption expenditure on non-durables and durables combined;
- Y_D = disposable income;
- Y = pre-tax income;
- C_N = consumption expenditure on non-durables;
- C_D = consumption expenditure on durables; and
- TP = total personal taxation.

The numerator on the right hand side of equation (5) represents a measure of the change in household consumption expenditure on durables and non-durables which would be expected in the presence of a change in pre-tax household income. The denominator on the right hand side has the effect of converting the marginal propensity to consume out of pre-tax income into a marginal propensity to consume out of post-tax income.

Values for the terms $\partial C_N/\partial Y$, $\partial C_N/\partial TP$, $\partial C_D/\partial Y$ and $\partial C_D/\partial TP$ can be obtained directly from Zerby's published parameter estimates, for both farm and non-farm households. Three alternative values, 0.1, 0.2 and 0.3, were used for the term $\partial TP/\partial Y$. This would seem to cater for most values for that parameter over the observation period considered by Zerby. His results are summarised in Table 1.

7. This conclusion applies to adaptive expectations models which assume income can be known currently, as in $Y^*_t - Y^*_{t-1} = (1 - \lambda)(Y_t - Y^*_{t-1})$. If expectations are formed as in $Y^*_t - Y^*_{t-1} = (1 - \lambda)(Y_{t-1} - Y^*_{t-1})$, for example, then zero short-run and positive long-run mpcs are possible. However, all studies referred to in this paper have used the former model and hence our conclusion stands.

Table 1: Approximate Marginal Propensities to Consume Implied by Zerby's Estimates

Marginal = average tax rate	Estimation procedure OLS	2SLS	3SLS
		mpc farm households	
0.1	0.17	0.45	0.75
0.2	0.04	0.29	0.57
0.3	-0.13	0.09	0.34
		mpc non-farm households	
0.1	1.00	1.04	1.17
0.2	0.98	0.96	1.04
0.3	0.94	0.86	0.87

Source: Calculated from Zerby (1969).

It is clear that the implied values for the mpc of non-farm households are relatively insensitive to the choice of estimation technique and to the assumed value for the marginal rate of taxation. In contrast, the implied values for the farm mpc are sensitive to both of these factors, ranging from around zero under OLS and a high assumed marginal rate of taxation to around 0.75 under 3SLS and a low assumed marginal rate of taxation. From the standard errors reported by Zerby, the differences in the estimates between OLS and 3SLS are, for the most part, statistically significant for non-durable consumption expenditure. This may indicate the presence of a degree of simultaneous equations bias in the OLS estimates. The differences between the estimates for farm and non-farm households also appear to be statistically significant for non-durable consumption expenditure under each of the estimation techniques.

(ii) Freebairn (1977)

Aggregate consumption functions using ANA-based data were also estimated by Freebairn (1977). Whilst the measurement problems all earlier authors had to contend with remain in the ANA data he used, Freebairn expressed the variables in per caput form to take account of population growth. His preferred short-run estimates were 0.4 to 0.6, the long-run estimate being around 0.9. His method of testing the effect of farm income variability on consumption was to include the ratio of farm income to aggregate income as a variable in his estimating equations. He found the variable to be significant only when lagged income or consumption was not included and, therefore, suggested that it was a proxy for those variables. He analysed data for the period 1948 to 1975 (compared to the shorter period of 1958 to 1968 used by Smyth and McMahon), thereby incorporating part of the 1970s when farm income varied substantially (Williams 1979, p. 137). Over this period, the ratio of farm income to aggregate income had declined significantly, but the decline was not associated with any tendency for the mpc to increase which would have been expected had the farmer mpc been markedly different from, and below, that of non-farmers (Freebairn 1977, p. 208).

Freebairn's use of annual ANA data over a longer period distinguishes his work

from that of earlier writers and may explain some of the difference in his results compared to those of Smythe and McMahon and Rutledge and Madden. Other factors include first, an analysis of farm income and consumption is more realistic when done in a yearly, as opposed to quarterly, context. Because many farm households receive income in large infrequent payments, we consider that they would have a poor perception of what might be estimated as quarterly income, relative to their perception of annual income. Second, over time, any demonstration effects of non-farm consumption on farm consumption will become stronger. Third, the longer observation period included those years, from 1968 onwards, when the stability of farm income, which characterised the period Smyth and McMahon examined, diminished markedly. Thus, not only did Freebairn fail to detect any differences in the consumption behaviour of farmers and non-farmers, but estimated the mpc of non-farmers to be lower than Smyth and McMahon's earlier estimate of about 0.8. Both differences may be due to the three specific factors discussed above.

(iii) Micro level studies

There have been a small number of studies on farm consumption behaviour using individual family data and these results, along with the results discussed above, are summarised in table 2. The main deficiency of these farm family studies has been their small sample size, hence the results must be interpreted cautiously. However, they appear to provide useful insights into farm consumption behaviour. Furthermore, data on farm family income and consumption, particularly of a time series nature, are scarce and likely to remain so. Thus, conclusions on this topic will continue to be based on limited empirical evidence, although it is probably no more limiting than data used in the aggregate analyses referred to above. Here we have also drawn on some North American studies which appear relevant because of broadly similar agricultural production techniques, a rise in off-farm sources of income, and a fall in farm household numbers.

Friedman (1957) analysed the consumption behaviour of farm and non-farm households in the U.S.A. using cross-sectional data obtained from separate sources for 1935–36 and 1941. The mpc of

Table 2: Estimated Propensities to Consume of Farm Families

Study	Country	Data source & type		Short-run period	mpc - best estimate	Long-run mpc	apc
Smyth & McMahon (1972)	Aust.	Aggregate	TS	Quarter	0	n.a.	n.a.
Rutledge & Madden (1974)	Aust.	Aggregate	TS	Quarter	0	n.a.	n.a.
Freebairn (1977)	Aust.	Aggregate	TS	Year	0.4–0.6	0.9	0.9
Girao et al. (1974)	U.S.A.	Farm family	TC	Year	0.24	0.46–0.51	0.53
MacMillan & Loyns (1969)	Can.	Farm family	CS	Year	n.a.	0.24	0.59
Mullen et al. (1980)	Aust.	Farm family	TC	Year	0.13–0.16	0.25–0.45	0.75

Notes: [a] TS = time series, CS = cross-section, TC = combined time series and cross-section data.

farm households was estimated to be about 0.6, compared to about 0.7–0.8 for non-farm households. More recently, Girao, Tomek and Mount (1974) examined the impact of income instability on consumption and investment using data from 50 American farm families over a seven-year period. With respect to consumption, their best estimate of the short-run mpc was 0.24 from a life-cycle model for the sub-sample which had "stable" incomes, 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 average propensity to consume (apc) of their sample of families was 0.53.

MacMillan and Loyns (1969, p. 96) in a cross sectional study of household expenditure by 226 Canadian farms, estimated the mpc at 0.24 and the apc at 0.59.[8] They used a model which was based on the life-cycle hypothesis.

Mullen (1979) conducted a study of the consumption behaviour of 16 farm families living in central New South Wales over the eight year period 1968–69 to 1975–76. Income included that from both farm and non-farm sources, and the income and consumption data were derived from cash books and taxation records. Consumption included spending on both durable and non-durable goods, and both income and consumption were adjusted for the estimated value of goods produced and consumed on the farm, and for the estimated share of consumption in expenses common to the business and household. While there is some inevitable subjectivity in the adjustments, which are often quite large, they are necessary to obtain reasonable estimates of the key variables.

The period of the study was one in which output prices, and consequently farm family incomes, fluctuated widely. In real 1968–69 terms, the average income of the 16 farm families was $4 745, ranged from $3 890 to $5 834, and had a coefficient of variation of 0.63. In the case of consumption, the average level was $3 546, ranged from $3 211 to $3 880 and had a coefficient of variation of 0.27. Over the period analysed, the level of real income declined, on average, by 1.5 per cent per year. The average annual apc was 0.75. The implied average propensity to save of 0.25 compares well with that of 0.3 reported by the Australian Bureau of Statistics for self-employed rural households in 1975–76 (Williams 1979, p. 137).

Of the 16 families, 9 were studied in detail as case studies to develop further understanding of the ways in which farm families allocate their income to the various ends (Mullen 1979). Perusal of the case study data revealed that consumption expenditure was more stable than that of income; that in most cases, the change in consumption was in the same direction as the change in income; and that, although many families claimed their consumption was related to "needs" rather than "income", it became apparent that "needs" were related to income in some way.

The data for the 16 families were analysed using a number of models for household consumption as reported in Mullen *et al.* (1980). Over all the models, the estimated short-run mpc ranged from 0.13 to 0.24, with the preferred estimates from the crossed-error models being in the range 0.13 to 0.16. These estimates are highly significant and led to the conclusion that, although the short-run mpc of farm families might be relatively low, it was not zero. In this respect, these findings are similar to those reported from North America based on the analysis of individual farm family data.

A further aspect to consider is the question of how rapidly the consumption of farm households reacts to a change in income. The conventional measure used in consumption studies is the ratio of the value of the instantaneous mpc to the long-run mpc, in the context of geometrically declining distributed lag models (Challen and Hagger, 1979, p. 55).

8. They hypothesised that consumption depended on current income and expectations about future income. The influence of these expectations was taken up by two variables—the change in net worth and the annuitised value of total assets. Hence, no distinction was made between the long- and short-run mpcs. They also suggested that wealth was important in explaining farmer consumption.

The estimated measure from Mullen *et al.* (1980, equation 5.1), expressed in percentage terms shows that 46 per cent of the adjustment occurred instantaneously.[9] This estimate is significant because the immediate adjustment of consumption towards the final long-run mpc value is substantial even though both the long-run and short-run farmer mpcs may be low. We have no estimates from cross-sectional non-farm consumption functions against which to compare this result. However, one available benchmark, based on Freebairn's estimate of a similar Friedman-type function, was that, for all households, 47 per cent of the adjustment occurred instantaneously (Freebairn 1977, Table 1, equation 5). A similarly rapid rate of adjustment was noted earlier from the results of Rutledge and Madden even though they were based on quarterly data. This suggests farm households do not greatly differ from all households in respect of the promptness with which they adjust consumption to changes in household income. At the technical level the explanation of the similarity found is that the ratio of the mpcs, and not the absolute level of the mpcs, determines the speed of adjustment. However the behavioural factors which would account for the similarity cannot be inferred from the technical analysis.

6. Discussion

Analyses of aggregate short-run farm consumption data have yielded results which have been argued to support the view that the short-run mpc farm income is zero. These previous findings have been criticised both because of the lack of a theoretical basis and because the data and methods used in the empirical work are deficient. The cross-sectional analyses have provided estimates of the mpc from total farm family income that are significantly different from zero but generally lower than the mpc of non-farm families. Some aggregate analyses have yielded similar findings. Before proceeding further, consideration is given to the circumstances in which the findings from the cross-section micro studies may be consistent with the zero short-run mpc findings from the macro analysis.

First, it may be argued that farm families alter consumption in response to changes in non-farm income in exactly the same way as non-farm families do but that their mpc from farm income is zero. Hence the mpc observed in cross sectional studies is an income share weighted average of the mpc of farm and non-farm income while in the aggregate studies it relates to farm income only. Such rigid separability of farm and non-farm income in farm family consumption planning seems highly implausible.

Second, the effects of aggregation may also be relevant. If individual mpcs differ, then there will exist differences between the aggregate mpc and each individual (or micro) mpc, due to the fact that the former is a weighted average of the latter. The weights are the respective share of income each individual receives. We can ask if the effect of aggregation would be sufficient to account for the difference between the short-run mpc observed in aggregate and cross-sectional studies? Given observations that the former is zero, while the latter are 0.2 or more, this possibility seems unlikely. That is, we doubt that a significant non-zero short-run mpc at the micro level could be due to the special characteristics of the sample used, or that, in other samples, negative estimates of the short-run mpc might be found for certain families, sufficient to offset the positive estimates expected, so as to give an aggregate short-run mpc of zero.

Taking all the evidence into consideration, the conventional view that the short-run mpc of farmers is zero or near zero appears untenable. Indeed, it might be argued that the view should never have had credibility because the work on which it was based (Smyth and McMahon 1972, Rutledge and Madden 1974) had major deficiencies. The zero short-run mpc of farmers conclusion has not been supported by any micro-level

9. Equation 5.1 is selected because it allows comparison with Freebairn's results for an OLS estimate of a Friedman type consumption function with no intercept. Other estimates of the speed of adjustment were higher than this, with, for example, 64 per cent being obtained for the Mullen *et al.* preferred equation (1980, Table 3, equation 2.3).

studies in Australia or in other comparable developed countries. Our considered view is that farmer consumption expenditure does vary in the short run (within a year) in response to changes in disposable income. The annual mpc would seem to be at least 0.2 and possibly higher.

A further question is, therefore, does the mpc for farmers differ from the mpc for non-farmers? The evidence still suggests that the short-run mpc of farmers is lower than that of non-farmers, but we suspect the difference is becoming less. One particular factor is the trend for more farmers to have significant non-farm earnings as farmers, and members of farm households, undertake off-farm employment and invest outside of agriculture, and as people whose normal work is non-agricultural acquire farms. For example, Paul (1982) indicated that in the sheep industry 90 per cent had off-farm earnings in 1977–80 which averaged $4 269 per farm. Males and Poulter (1987), indicated that for 1985–86, farming enterprises contributed 72 per cent of average farm family income of $24 530. Included in average farm family income was $3 360 from off-farm investments, $2 747 in wages and salaries and $834 from direct government payments. Thus, non-farm earnings must represent an important factor in sustaining farm household consumption in a year of depressed farm income, thereby bringing the consumption behaviour of farm households closer to that of non-farm households.

A number of the issues related to farm household consumption would appear to apply to unincorporated businesses generally and not only to farm businesses. Unincorporated non-farm businesses are more numerous than farms and many would also have unstable incomes; in some instances that instability would arise as flow-on effects of farm instability. The uncertainties related to household consumption in the non-farm unincorporated sector of the economy may be as significant as those relating to farm households. Both groups of households should be of concern to those interested in consumption and in macro-modelling.

Some consideration should be given to the mpc out of farm income if for no other reason than that farm income is relatively well identified in available data and is normally included on a sectoral basis in most macro models. Furthermore, the farm sector is a significant volatile element in those models and generates significant effects on the macro economy (O'Mara 1985a). The farm income-consumption link is a major element in those effects. In most models, the farm sector is not represented by a detailed specification and farm income is exogenously determined with no explicit relationship between farm income and farm consumption. Two types of surrogate relationships are commonly used. The first, such as in the Reserve Bank model, includes farm consumption as a part of total consumption expenditure which is determined by total personal disposable income (Challen and Hagger 1979, Ch. 9). This implies that the mpc of farmers is identical to that of non-farmers. In the second commonly used alternative, total consumption is related to total non-farm disposable income (Nevile 1970). This implies that changes in farm income have no effect on consumption (the zero short-run mpc view). However, non-farm income earned by farmers would be included as part of non-farm household income and hence as a determinant of non-farm consumption.

Both of these extreme approaches are questionable. O'Mara (1985b, pp. 456–60) examined the potential macroeconomic implications of these alternative assumptions and found that they had the potential to influence significantly the macroeconomic effects that might occur in the event of changes in farm income.

The available information and analysis does not allow us to be definitive in recommending exactly how the farm sector should be specified. If the choice were between the two extreme positions, we would opt for that where the farm short-run mpc was equal to the non-farm short-run mpc. In reality the farm short-run mpc is likely to be a little lower than the non-farm mpc, so that analysts may wish to assign some lower subjectively determined value in analytical research.

Our final comment relates to the long-run mpc of farm households. There is even

less empirical evidence on the long-run mpc than the short-run mpc with the weight of evidence suggesting that the farm household long-run mpc is lower than the non-farm household long-run mpc (*e.g.* Rutledge and Madden 1974). However, a zero long-run mpc, as suggested in a few cases, would be difficult to reconcile with most of the accepted theories of consumption. Evidence on the lags in adjustment of consumption to income (Rutledge and Madden 1974, Freebairn 1977, Mullen *et al.* 1980) suggests that farm households adjust consumption as rapidly as non-farmers to changes in income, but not to the same extent. Finally, it would seem that the empirical resolution of these long-run issues is even less likely than the resolution of the short-run problems.

7. Conclusions

The available evidence does not support the view that the short-run mpc of farmers is zero. Yet, as has been shown, some authors and modellers are still acting as though this mpc is zero. While we would not assert that the mpc out of farm and non-farm income is identical, as indicated by Freebairn, we believe that the Freebairn result is closer to the truth than the views of Smyth and McMahon. That is because Freebairn's results are consistent with micro level evidence, because the aggregate data used are subjected to better analysis, and because the data are from a recent period more representative of changing farm conditions.

We are doubtful that the puzzle concerning the respective sizes of farm and non-farm household marginal propensities to consume will ever be resolved. With respect to the macro data, the Australian National Accounts sources are unlikely to be refined further, while the Australian Bureau of Statistics has not yet taken steps to calculate aggregate farm disposable income. On the other hand, for those who believe the resolution of the puzzle lies in the analysis of individual farm household data, the way ahead is the costly, arduous path of data collection from adequate samples of farm households. Ready and cheap empirical resolution of the problem therefore appears unlikely.

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