The Determinants of Personal Savings in Ireland: An Econometric Inquiry

KIERAN A. KENNEDY
BRENDAN R. DOWLING*

1. *INTRODUCTION*

THE acceleration in the rate of economic growth in Ireland in the last ten years or so compared with the earlier post-war years has been accompanied by a very considerable rise in the proportion of income saved. This factor has been of crucial importance in permitting, if not actually causing, faster growth. In the absence of the rise in the savings ratio it would have been impossible to devote so large a proportion of national production to investment: an attempt to do so would have involved an increase in the other source of investment resources, foreign disinvestment, to a level that could not conceivably be maintained.

In Ireland personal savings represents the largest component of savings. We examine in this paper the causes of changes in the personal savings/income ratio in the post-war from 1949–68.

2. *THE OVERALL SAVINGS RATIO*

In Chart 1 we show the ratio of total savings to gross national product (GNP), both measured in current values, for each year from 1947–68. Total savings is simply the difference between total consumption (governmental and private) and GNP, measuring consumption and GNP at market prices. The strong and relatively steady rise in the ratio since 1959 contrasts with the substantial fluctuations which characterized the ratio previously. The overall savings ratio in 1959, at 15·4 per cent, had just about recovered from the preceding depression to the highest level previously recorded (i.e. 15·5 per cent in 1953), and it rose to over 19 per cent in 1967 and 1968.

*The authors would like to express their deep gratitude to Brendan Walsh for his invaluable advice in the course of the research underlying this paper. Special thanks are also due to Finola Kennedy, T. J. Baker, J. Durkan, M. P. Fogarty, R. C. Geary and P. R. Kaim-Caudle for helpful comments and suggestions. We are also greatly indebted to G. Baker and P. Mackey for their help with the computer runs.

Major Components of Savings

Total savings are divided for national accounts purposes into two major components: depreciation, which is the estimated provision for consumption of fixed captial during the year, and the balance, which may be called net savings. As may be seen from Chart 1, the ratio of depreciation to GNP has shown a steady secular rise throughout the post-war, so that the ratio of net savings to GNP fluctuated relatively more than the gross savings ratio in the 1950's. The rise in the net ratio from 9·6 per cent in 1959 to 12·1 per cent in 1968 is again impressive.

Net savings are in turn divided into three components: personal savings, company savings and public authorities' savings. The term personal covers all households and unincorporated bodies so that personal savings includes the savings of businesses such as farms, shops, professional partnerships and so on. Company savings are the undistributed profits, net of tax and depreciation, of all public and private companies and certain State-sponsored bodies. Public authorities' savings represent the difference between current revenue and current expenditure of the Central Government and Local Authorities, revenue and expenditure being classified according to national accounting conventions which differ in important respects from the traditional Finance Accounts and Local Taxation Returns. Public authorities' savings assumed negative values (i.e. dissaving) in some years, whereas the other two categories have always been positive in the post-war.

Chart 2 shows the shares of the three components of net savings in total net savings for each year from 1947–68. Personal savings is by far the largest component, representing on average about two-thirds of the total. Company savings on average accounted for about 30 per cent of the total. Public authorities' savings were comparatively small in most years, but they fluctuate very considerably and such fluctuations are, of course, a potentially powerful instrument of short-term economic management.

Clearly the causes of variations in the three components of net savings are likely to be quite different. In the remainder of this paper we concentrate on the determinants of the largest component, personal savings.

3. *THE PERSONAL SAVINGS RATIO*

In explaining variations in personal savings we employ the simplest form of multivariate regression analysis using single equation, least squares on annual time series data for the post-war period. There are a variety of possible formulations of the dependent variable. One might, for instance, attempt to explain variations in the level of personal savings or personal savings *per capita* (i.e. per head of population). However, it seemed better to us to face the more rigorous challenge of explaining variations in the personal savings-income ratio. This is the ratio of personal savings to personal disposable income. Personal disposable income represents the incomes and government transfer payments received by households and unincorporated bodies less direct tax deductions (i.e. income tax

CHART 1

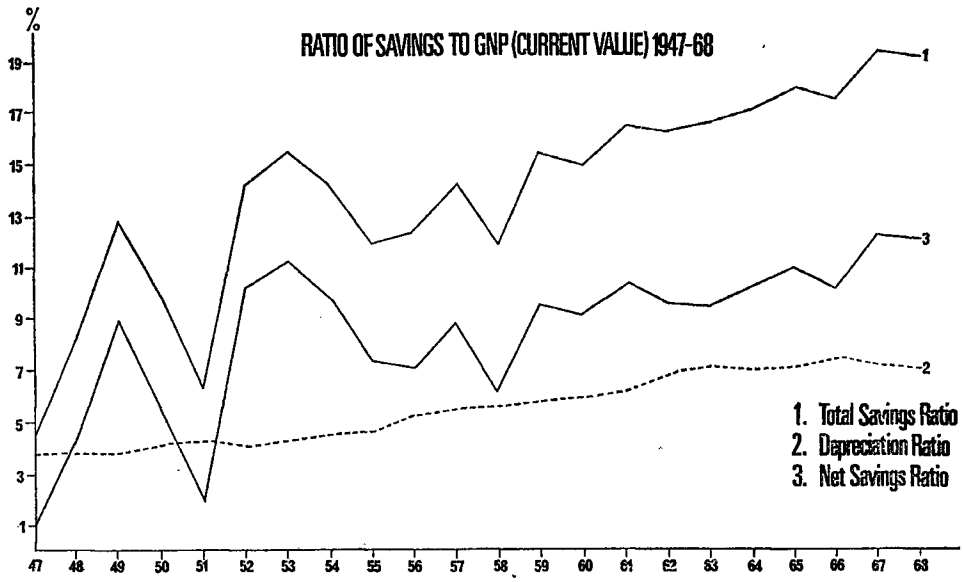
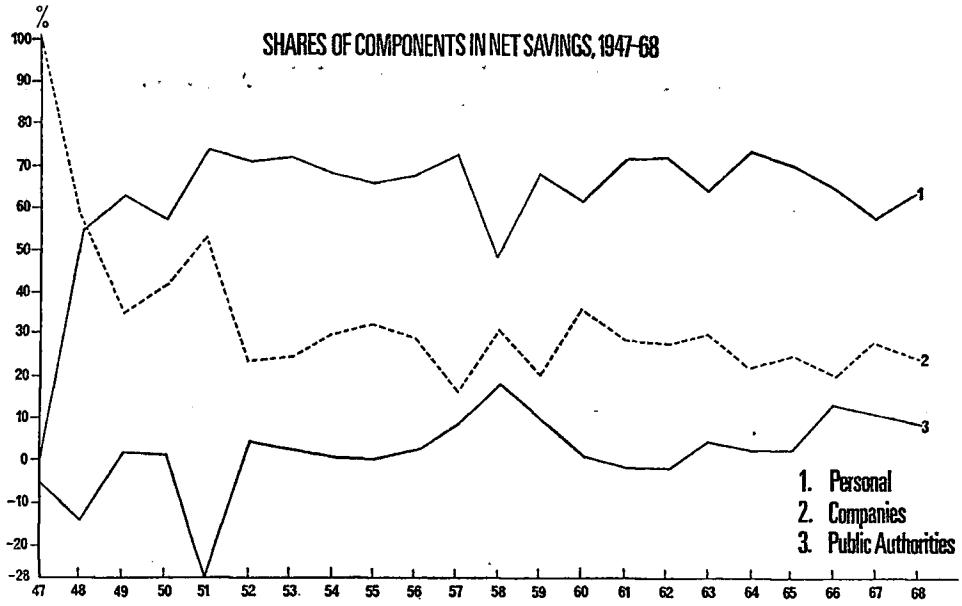


CHART 2



and social insurance contributions). It is, in effect, the income out of which persons are free to make decisions as between personal consumption and personal savings. The personal savings ratio, so defined and denoted by Y, is our dependent variable throughout.

The personal savings ratio is plotted on Chart 3 from 1947–68 and, as may be seen, it exhibits considerable variation. The extremely low levels in 1947 and 1948, probably due to highly exceptional factors associated with the termination of wartime restrictions, might distort analysis: accordingly, we used in our regression analysis only the data for the 20 years 1949–68, inclusive. In 1949 the ratio was 7·1 per cent and during the 1950's it ranged from as high as 9·7 per cent in 1953 to as low as 3·8 per cent in 1958. After 1960 the ratio fell below 9 per cent in only one year (1963) and had risen to 11·4 per cent in 1968. For the 20 observations 1949–68, the mean was 8·4 with a standard deviation of 1.93.

We were interested not merely in getting a good explanatory equation but also in testing whether variables which are commonly thought to influence personal savings do in fact have a significant effect. In all, we tested 40 explanatory variables, many of them being, of course, alternatives for each other. Obviously with only 20 observations there can be little hope of finding more than, at most, about half a dozen significant explanatory variables in one equation. Even still, the number of equations necessary to test all conceivable combinations of the explanatory variables considered is very large. We limited ourselves to testing some 400 equations, run in groups at thirteen different stages. We used our judgement and the results of preceding stages in making the selections. In

CHART 3

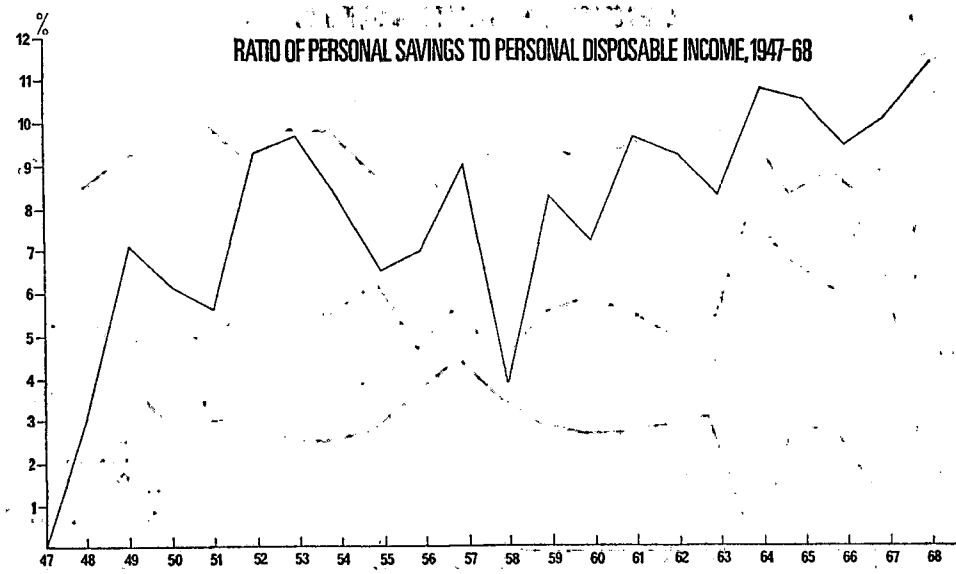


Table 1 we present 32 of the selections for illustrative purposes.[1] These cover 19 explanatory variables, and data for these variables are given in Appendix Table A, where the sources and methods are explained. We comment in the text on the results achieved with the remainder of the explanatory variables tested. All the explanatory variables may conveniently be grouped, for discussion purposes, under the following five heads: income, taxation, demographic, monetary and other.

4. *INCOME VARIABLES*

Total Real Income Per Capita

The first and most obvious factor that might account for a rising personal savings ratio is a rise in the level of real personal disposable income *per capita*. This is the current value of disposable income deflated by an appropriate price index: the price index we used was the implied price of total personal consumption, which, as it embraces total personal consumption, we regard as more appropriate than the more familiar Consumer Price Index. The fact that the real income *per capita* variable showed a strong and unbroken rise from 1958, whereas previously it rose slowly and declined in a few years, in itself suggests that it may be closely related to the behaviour of the savings ratio. The simple correlation between the two variables is 0·71, significant at the 0·1 per cent level.

Farmers' Income

However, one of the very interesting features noted in a preliminary study of the absolute data was the close correspondence between variations in the level of savings and in the level of farmers' income (excluding remuneration of farm employees).[2] Taking the first differences in the annual levels of total personal savings and farmers' income, both measured in current values, the simple correlation for the 19 observations 1949–68 is 0·77. Nor was this correlation peculiar to the early part of our period. Dividing the period at 1961, the correlation for the 12 first differences from 1949–61 was 0·63 and for the 7 first differences from 1961–68, 0·98, both of which are significant at, at least, the five per cent level. These are remarkably high correlations in first difference form. The simple correlation between the first differences of personal savings and non-agricultural personal disposable income[3] for 1949–68 is considerably lower, 0·50. Non-

1. The complete set of selections can be made available at ESRI for inspection by any interested researcher.

2. Although we refer to this, for convenience, as farmers' income, it is strictly farmers' agricultural income. Some farmers have other sources of income (e.g. interest and dividends) but we have no means of including these in farmers' income.

3. This is the difference between total personal disposable income and farmers' income. Although termed non-agricultural income here, it includes income received by farmers from non-agricultural activities. It also includes remuneration of employees engaged in agriculture, but this is a comparatively small component.

TABLE 1: *Parameter Estimates for Savings Ratio Regressions, 1949-68 (t-ratios in parentheses)*

Equation	*Intercept*	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	
1.	−31·07	0·118	0·806									
		(5·89)	(3·92)									
2.	−32·16	0·121		0·853	0·730							
		(5·67)		(3·81)	(2·47)							
3.	−22·12	0·099		0·578								
		(4·47)		(2·63)								
4.	−7·15					−0·007	0·118					
						(0·53)	(3·90)					
5.	−31·52		0·788			0·088	0·036					
			(1·29)			(1·17)	(0·51)					
6.	−21·72					0·009	0·130	0·360				
						(0·32)	(3·80)	(0·66)				
7.	−24·17	0·146	0·739							−1·304	0·845	
		(4·65)	(3·72)							(2·01)	(2·42)	
8.	2·05	0·137	0·651							−1·226		0·920
		(4·87)	(3·42)							(2·29)		(3·00)
9.	24·43					0·034	0·109			−1·222		0·914
						(1·41)	(4·00)			(2·23)		(2·81)
10.	22·12						0·114		0·037	−1·224		0·845
							(4·33)		(1·45)	(2·26)		(2·76)
11.	15·34	0·145	0·655							−0·940		0·988
		(5·56)	(3·76)							(1·83)		(3·48)
12.	6·50	0·144	0·628							−1·056		0·905
		(5·65)	(3·69)							(2·09)		(3·21)
13.	2·02	0·089	0·619							−1·053		0·921
		(3·09)	(3·93)							(2·36)		(3·64)
14.	5·21	0·095	0·618							−1·144		0·979
		(3·32)	(3·85)							(2·53)		(3·76)
15.	8.13	0·102	0·626							−0·953		0·952
		(3·10)	(3·93)							(2·04)		(3·68)
16.	23·72					0·051	0·110			−1·462		0·734
						(2·12)	(4·32)			(2·77)		(2·31)
17.	22·80					0·017	0·095			−1·274		0·754
						(0·75)	(4·52)			(2·98)		(2·95)
18.	20·14						0·096			−1·033		0·717
							(4·68)			(3·73)		(2·91)
19.	19·91						0·117		0·052	−1·402		0·638
							(4·70)		(2·03)	(2·70)		(2·03)
20.	20·80						0·097		0·009	−1·142		0·719
							(4·53)		(0·34)	(2·65)		(2·81)
21.	−0·72						0·092			−0·528		
							(4·21)			(2·11)		
22.	28·68						0·126					0·671
							(5·23)					(2·96)
23.	52·05						0·132		0·064	−1·323		1·191
							(6·40)		(2·84)	(2·67)		(4·56)
24.	48·00					0·057	0·122			−1·177		1·037
						(2·88)	(5·75)			(2·56)		(3·55)
25.	48·87						0·131		0·074	−1·457		1·075
							(6·89)		(3·43)	(3·14)		(3·98)
26.	10·60	0·104		0·571						-1·568		1·097
		(3·60)		(4·29)						(3·78)		(4·70)
27.	15·00	0·110		0·556						−1·675		1·166
		(3·71)		(3·96)						(3·86)		(4·73)
28.	9·36	0·129		0·569						−1·816		0·889
		(5·22)		(5·32)						(5·27)		(4·42)
29.	6·54	0·106	0·581							−1·345		0·887
		(3·61)	(3·78)							(2·94)		(3·25)
30.	8·66	0·133		0·655	0·163					−1·817		0·981
		(5·85)		(5·77)	(0·97)					(5·05)		(4·90)
31.	13·55	0·136		0·595						−1·950		1·037
		(5·92)		(6·01)						(6·01)		(5·15)
32.	13·08	0·135		0·600						−1·972		1·024
		(5·98)		6·13)						(6·14)		(5·27)

Terminology
X_1 = Total real personal disposable income *per capita*.
X_2 = Ratio of farmers' income to personal disposable income.
X_3 = Ratio of farmers' money income to personal disposable income.
X_4 = Ratio of farmers' stock income to personal disposable income.
X_5 = Non-agricultural real personal disposable income *per capita*.
X_6 = Farmers' real personal income *per capita*.
X_7 = Ratio of farm population to total population.
X_8 = X_6 lagged by one year.
X_9 = Ratio of direct taxes to non-agricultural personal income.
X_{10} = Ratio of indirect taxes to personal consumption.
X_{11} = Ratio of indirect taxes, less food subsidies, to personal consumption.

X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	R	*s.e.*	F	τ	*Equation.*
								·859	1·042	24·00	12	1.
								·862	1·063	15·49	12	2.
								·804	1·212	15·51	11	3.
								·841	1·101	20·62	11	4.
								·846	1·119	13·43	12	5.
								·858	1·080	14·84	12	6.
−12·401								·903	0·963	12·42	10	7.
(1·94)												
−27·200								·917	0·896	14·79	11	8.
(2·80)												
−30·401								·909	0·936	13·30	11	9.
(3·07)												
−28·809								·910	0·933	13·40	11	10.
(3·13)												
−30·634	−2·296							·936	0·821	15·29	13	11.
(3·37)	(1·92)											
−28·545	−2·455	1·778						·944	0·797	14·16	13	12.
(3·18)	(2·10)	(1·34)										
−21·791			1·701					·948	0·738	19·41	9	13.
(2·64)			(2·76)									
−23·751				1·743				·946	0·753	18·57	9	14.
(2·87)				(2·61)								
−24·346	−1·054		1·393					·951	0·747	16·34	9	15.
(2·73)	(0·83)		(1·92)									
−28·787					−0·077			·928	0·870	13·38	12	16.
(3·11)					(1·80)							
−23·500			1·665		−0·065			·958	0·698	22·80	10	17.
(3·07)			(2·86)		(1·87)							
−20·38			1·893		−0·055			·956	0·686	22·81	10	18.
(3·29)			(3·89)		(1·75)							
−26·081					−0·071			·926	0·879	13·05	11	19.
(2·96)					(1·67)							
−21·487			1·767		−0·059			·956	0·711	18·23	10	20.
(2·94)			(2·81)		(1·70)							
			1·84		−0·090			·918	0·860	20·11	17	21.
			(3·12)		(2·58)							
−22·529	−2·870							·916	0·869	19·58	9	22.
(3·36)	(2·71)											
−45·19	−3·35					0·250		·957	0·707	18·44	9	23.
(5·07)	(3·04)					(2·69)						
−39·893	−3·087				−0·059		−0·146	·960	0·710	16·10	12	24.
(4·49)	(2·78)				(1·64)		(1·72)					
−42·862	−2·874				−0·055		−0·248	·966	0·654	19·24	9	25.
(5·08)	(2·82)				(1·70)		(2·86)					
−27·908			2·035					·953	0·703	21·61	11	26.
(3·71)			(3·47)									
−30·476				−2·024				·948	0·741	19·22	11	27.
(3·92)				(3·08)								
−26·274			1·861		−0·080			·972	0·565	29·86	11	28.
(4·33)			(3·92)		(2·85)							
−24·431			1·657		−0·050	0·072		·961	0·706	16·30	10	29.
(2·86)			(2·77)		(1·37)	(0·92)						
−28·792			1·896		−0·066	0·104		·981	0·511	28·92	12	30.
(4·53)			(4·32)		(2·48)	(1·82)						
−31·113			1·872		−0·075		−0·108	·979	0·517	31·56	12	31.
(5·05)			(4·30)		(2·91)		(1·82)					
−30·875			1·966		−0·073	0·111		·980	0·509	32·60	11	32.
(5·17)			(4·55)		(2·85)	(1·94)						

X_{12} = Employment dependency ratio.
X_{13} = Marriage rate.
X_{14} = X_{13} lagged by one year.
X_{15} = Annual percentage change in population.
X_{16} = Emigration rate.
X_{17} = Annual rate of change in private net credit.
X_{18} = Real interest rate.
X_{19} = Annual percentage change in prices.
R = Multiple correlation coefficient.
s.e. = Standard error of estimate.
F = F-ratio.
τ = Geary's statistic of number of sign changes in residuals.

The explanatory variables are explained more fully in the text and in notes to Appendix Table A.

agricultural personal income is made up of widely different categories and it might be thought that, of these, the income of independent traders combined with interest, dividends and rents should be more closely related to savings: however, the correlation in that case is only 0·40. The correlation with savings for the remainder of non-agricultural income, which is mainly employee remuneration, is 0·45.[4]

Agricultural Stock Changes

A major reason for the high correlation between changes in savings and in farmers' income might be fluctuations in agricultural stockbuilding (i.e. the value of changes in numbers of livestock on farms). In the national accounts, stock-building forms part of farmers' income. It can assume positive or negative values and, as is well known, it is a highly volatile component of farmers' income. In some years the change in total farmers' income is due more to the change in stockbuilding than to the change in the remainder (which, for convenience, we call farmers' money income).[5] It is sometimes argued that farmers automatically save the amount of any rise in stockbuilding and that, therefore, we should subtract from personal savings the amount of agricultural stockbuilding, the balance to be referred to as "monetary" savings. *A priori,* however, there is no justification for this procedure. If a farmer were to automatically increase his savings by the amount of increased stockbuilding, he would do so effectively by restraining his monetary consumption. But a farmer might equally well cut down on savings for some other purposes, e.g. he might defer buying a tractor for which he proposed to pay out of his own savings. Or indeed, a farmer may not vary his current savings at all but may finance the rise in stockbuilding by drawing on past savings or borrowing from a bank. How farmers vary their savings and consumption in response to changes in stocks is essentially an empirical question.

In fact we found that the correlation between the annual first differences in farmers' money income and personal "monetary" savings for the period 1949–68, 0·77, was the same as that between the first differences of total farmers' income and total personal savings. We also found that the correlation between changes in farmers' money income and in total personal savings was 0·59, significant at the 1 per cent level, whereas the correlation between changes in stockbuilding (i.e. the change in the change in agricultural stocks) and total personal savings was only 0·31, not significant at the 5 per cent level.

4. In both these correlations we were forced to use the first differences of personal income rather than personal disposable income, since it is not possible to allocate total direct taxes. No such problem arises with farmers' income, since farmers in effect do not pay income tax on their agricultural income.

5. This term may be slightly misleading unless it is borne in mind that farmers' "money" income includes the estimated value of farm produce and fuel consumed on farms without process of sale. And, as already noted, it does not include money income received by farmers from non-agricultural activities.

It does not seem to us, therefore, that there is any merit in dividing personal savings into monetary and non-monetary components in this way. In explaining variations in total personal savings, however, it may be worthwhile dividing total farmers' income as between money income and stockbuilding. The reason is that a change in total farmers' income that results from a change in stockbuilding may have a different impact on total savings from a change in total income in the form of a change in money income. One might reasonably expect that an extra £1 of stockbuilding is associated with a greater rise in personal savings than an extra £1 in money income, though not necessarily associated with an automatic rise of exactly £1, which is in effect the hypothesis we criticized.

In equation 1 of Table 1, we regress the personal savings ratio (Y) on the level of real personal disposable income *per capita* (X_1) and the share of total farmers' income in total personal disposable income (X_2). Equation 2 takes the same form except that farmers' income is divided as between money income (X_3) and stockbuilding (X_4), both as a share in total personal disposable income. The equations are reproduced, following. The figures in brackets are the t-ratios for the significance of the individual coefficients; the figures underneath the t-ratios are the *beta* coefficients, which illustrate the relative importance of the different explanatory variables in accounting for the variance of the dependent variable;[6] R is the multiple correlation coefficient; s.e. is the standard error of estimate; F is the usual F-value for testing the significance of the equation; and τ is Geary's statistic of the number of sign changes in the residuals for testing for autocorrelation.

$$Y = -31{\cdot}07 + 0{\cdot}118\ X_1 + 0{\cdot}806\ X_2 \qquad (1)$$
$$\qquad\qquad (5{\cdot}89) \qquad (3{\cdot}92)$$
$$\qquad\qquad 1{\cdot}810 \qquad 1{\cdot}209$$

$$R = {\cdot}859 \quad s.e. = 1{\cdot}042 \quad F = 24{\cdot}00 \quad \tau = 12$$

$$Y = -32{\cdot}16 + 0{\cdot}121\ X_1 + 0{\cdot}835\ X_3 + 0{\cdot}730\ X_4 \qquad (2)$$
$$\qquad\qquad (5{\cdot}67) \qquad (3{\cdot}81) \qquad (2{\cdot}47)$$
$$\qquad\qquad 1{\cdot}856 \qquad 1{\cdot}283 \qquad 0{\cdot}356$$

$$R = {\cdot}862 \quad s.e. = 1{\cdot}063 \quad F = 15{\cdot}49 \quad \tau = 12$$

As expected, the level of real disposable income *per capita* has a highly significant positive effect on the savings ratio. So also has the share of farmers' income in total income. These two variables together account for 74 per cent of the variance in the savings ratio.[7] In equation 2, the coefficient of the agricultural

6. The non-statistical reader is warned that, in general, the *beta* coefficients are liable to fluctuate considerably depending on the combination of explanatory variables used.

7. It is clear from the value of the τ statistic that there is no evidence of autocorrelation in equations 1 and 2, and this held true in almost all our results.

stocks variable (X_4), though significant, is much less so than the coefficient of the farmers' money income variable (X_3) in the same equation, and in general equation 2 performs less well than equation 1. When we drop X_4 and use X_3 alone (see equation 3 of Table 1), the result is not as good as in equation 1 using X_2. However, in other equations with additional explanatory variables included, X_3 performs better than X_2. We also found in other equations that the coefficient of X_4 was not significant whereas the coefficient of X_3 was always highly significant (see, for example, equation 30 of Table 1).

Most surprising of all, perhaps, is that in equation 2 the coefficient of the stock variable (X_4) is less than that of the money income variable. This result emerged consistently in every equation we ran for the period as a whole that involved these two variables. On the basis of this evidence we are forced to conclude that insofar as changes in farmers' stockbuilding exercise a different impact on savings from changes in farmers' money income, the latter is more closely related to, and exercises a greater influence on, changes in total personal savings.

An Alternative Formulation of the Income Variables

An alternative way of showing the importance of changes in farmers' income in relation to changes in savings is to separate real income *per capita* into two variables, farmers' income *per capita* and non-agricultural income *per capita*. This requires estimates of the farming and non-farming population for every year, whereas such figures are available only for Census of Population years. We made our own estimates for the intervening years, the methods employed being described in the notes to Appendix Table A, and we are satisfied that they are reasonably good estimates. In equation (4) of Table 1, reproduced following, the explanatory variables are non-agricultural real personal disposable income *per capita* (X_5) and farmers' real personal (disposable) income *per capita* (X_6).[8]

$$Y = -7{\cdot}15 - \underset{(0{\cdot}53)}{0{\cdot}007}\, X_5 + \underset{(3{\cdot}90)}{0{\cdot}118}\, X_6 \qquad (4)$$

$$R = {\cdot}841 \quad s.e. = 1{\cdot}101 \quad F = 20{\cdot}62 \quad \tau = 11$$

The coefficient of farmers' income *per capita* (X_6) comes out highly significant, but the coefficient of non-agricultural income *per capita* (X_5) is non-significant and even has the wrong sign. However, when other explanatory variables are included the cofficient of X_5 does emerge as significant and with the expected positive sign. (See equations 16 and 24.) In all the regression equations we tried when these two variables were significant the coefficient of X_6 was higher than the coefficient of X_5, and considerably so in most cases. This suggests that farmers save a higher proportion of an extra £1 of income *per capita* than does the non-agricultural population.

8. In the light of the earlier results, we did not feel it necessary to distinguish here between farmers' money income and stock income.

Even if equation (4) were satisfactory, it would be desirable to make allowance for the possibility that the secular decline in the share of the farm population in total population would exert a downward pull on the savings ratio. It may be noted that we cannot allow for this, as might appear at first sight, by including in equation (4) the farmers' share in total income (X_2). The reason is that X_2 and X_6 are too closely influenced by the same factors, and the result of adding X_2 to equation (4) is, not unexpectedly, to destroy the significance of both X_2 and X_6 (see equation (5) of Table 1). We tried instead to allow for this factor by using the ratio of the farm population to total population (X_7). However, although the coefficient of X_7 consistently emerged with the expected positive sign, in no case that we tried was it significant, as may be seen, for example, in equation (6) of Table 1. If in fact the secular fall in the share of the agricultural population has not directly affected the savings ratio, as these results suggest, then this might plausibly be explained as follows. Those leaving the farm sector are likely to be among the poorer classes of farmers and their income level in agriculture may have been so low that they were not in a position to save to any significant degree.[9]

Reasons for the High Saving Propensity among Farmers

Why do farmers save a higher proportion of any given rise in real income than the rest of the community? Apart from the innately greater desire of farmers to have a "nest egg" and their conservatism in relation to novel consumer goods—characteristics that are well known but are more appropriate for study by social psychologists—there are also solid economic reasons for such behaviour. One is that farmers do not pay income tax on their agricultural income and we show later that income tax has a strong negative effect on savings. More importan$_t$

9. If this explanation holds it might then be asked why X_2, the farmers' share in total income, exerts such a strong positive influence on the savings ratio, as in equation 1. However it should be noted that X_2 can be shown to be equal to the ratio of farmers' real income *per capita* to total real income *per capita*, weighted by the share of the farm population in total population, i.e.,

$$X_2 = \frac{I_A}{I_T} = \frac{\dfrac{I_A}{N_A P_C}}{\dfrac{I_T}{N_T P_C}} \cdot \frac{N_A}{T}$$

$$= \frac{X_6}{X_1} \cdot X_7$$

where I is personal disposable income in current values, N is population, Pc is the price deflator, subscripts A and T refer to agriculture and the economy as a whole, respectively. Thus, if the decline in X_7 has not significantly influenced savings it is still entirely reasonable to expect, given our other results, that changes in farmers' income *per capita* relative to total income *per capita* (X_6/X_1) will exert a strong and positive influence on the savings ratio. This could account for the satisfactory performance of X_2, especially since variations in X_2 are predominantly determined by variations in the ratio $\dfrac{X_6}{X_1}$ rather than by variations in X_7 which shows a steady secular fall throughout.

perhaps is the fact that farmers know from experience that their income is subject to very considerable fluctuations, both because of fluctuations in volume of output and in price. In such circumstances it is a perfectly rational reaction to regard part of any large increase in income as being transitory and to save a relatively high proportion of it. The counterpart is that a temporary fall in income is met by letting savings bear a greater share of the fall while seeking to maintain consumption.

This behaviour is related in a subtle but important way to changes in the terms of trade. A rise in the price of Irish exports relative to Irish imports is generally due largely to a rise in livestock prices. And when the price of exported livestock rises, the price of livestock consumed at home also rises. Thus an improvement in terms of trade for the economy is generally associated with an improvement in the terms of trade of the agricultural sector *vis-a-vis* the non-agricultural sector. This represents a "windfall" gain to the farmers. It is included in our measure of real farm income since we deflate farmers' income—correctly, we believe—by a general consumption price rather than by the price of agricultural produce. In line with the work on savings in other countries that incorporates the permanent income hypothesis, it is to be expected that a relatively high proportion of a windfall gain will be saved.

Lagged Income Variables

We tried variables X_1, X_2 and X_5 each lagged by one year. Only one of these worked satisfactorily—the lagged value of X_5, non-agricultural income *per capita*, which we term X_8. Generally speaking X_8 worked slightly better than X_5—compare, for instance, equation 24 with equation 25 of Table 1. As might be expected, there is no point in using both X_5 and X_8 in the one equation. These two variables are far too highly correlated ($r=\cdot 988$), with the result that the significance of both variables is completely spoiled.

Rate of Change in Income and Income per Capita

Studies for other countries have found that the rate of growth of real income or real income *per capita* is positively related to the savings ratio.[10] One reason would be that, when the rate of growth of real income (or real income *per capita*) rises, people would tend to adjust their consumption to the newer income level with a lag, and the savings ratio would thus tend to rise. We tried the annual percentage changes in real personal disposable income both in total and *per capita*. The simple correlations with the savings ratio are 0·50 for total and 0·40 for *per capita* income, both of which are significant at the 10 per cent level. However, in no regression equation that we ran did the coefficients of the variables remotely approach significance. We also tried the lagged value of the rate of change in *per*

10. See, for example, Subramanian Swamy, "A Dynamic Personal Savings Function and its Long-run Implications", *The Review of Economics and Statistics*, February 1968, and the references cited therein.

capita real income. This shows an insignificant negative correlation with the savings ratio ($r = -0{\cdot}05$) and in no case, whether used separately or together with the current value, did its regression coefficient emerge as significant.

5. *TAX VARIABLES*

It is generally recognised that different forms of taxation have different effects on savings behaviour. There is, in particular, a commonly held view that an increase in direct taxation (i.e. mainly income tax and social insurance contributions) will tend to discourage savings, whereas an increase in indirect taxation (i.e. taxes on expenditure), at least one applying to the full range of consumption, may even encourage savings. Direct taxes apply with the same force to the part of income that a person would save, if there were no such taxes, as it does to the part he would spend on consumption. Indirect taxes, on the other hand, tend to make saving more attractive relative to consumption, though they might as well, of course, reduce the ability to save by lowering the real value (or spending power) of income. Direct taxes, being in the main progressive, fall relatively more heavily on the richer classes which are likely to do most saving, whereas indirect taxes are generally regressive.

This view about the relative effects of the two forms of taxation on savings has been to the forefront of budgetary policy in Ireland during the post-war. Budget speeches throughout have reiterated "the principle, enunciated both by this Government and the Opposition, that whatever taxation is necessary should in the circumstances of this country, fall more heavily on expenditure than on income".[11] This policy rested in part on the above-mentioned view about the different effects of the two categories of taxation on saving. Typical of the statements defending the policy is the following from the 1968 Budget speech:

> "Reliance will continue to be placed chiefly on indirect rather than on direct taxation on the ground that taxation of expenditure has less of a disincentive effect on economic activity than taxation of income. It discourages excessive spending but not earning or saving. The corresponding moderation in the taxation of income is a stimulus to individual and corporate effort."[12]

It is also of interest to quote Kaldor's view, which runs on similar lines:

> "But taxes on income as such . . . discriminate against savings, and are therefore likely to have a lesser restraining effect on spending than equivalent taxes on expenditure. A given amount of money collected from a particular taxpayer will tend to reduce his spending by a lesser amount if it is collected in the form of an income tax than if it is raised in the form of an expenditure tax. . . .
>
> "An expenditure tax, on the other hand, will leave the incentives to save and spend unaffected for any given level of real income or consumption; indeed . . . it will

11. *Dail Debates*, Vol. 174, 15 April 1959 (1959 Budget Speech), p. 359.
12. *Budget 1968*, p. 21.

tend to discriminate against spending and in favour of saving in so far as risks are assumed in earning the income."[13]

In testing this view, the direct tax variable used (X_9) is the ratio of taxes on income (including social insurance contributions) to non-agricultural personal income. It may be noted that the value of this variable has risen substantially over the period because, apart from changes in tax rates, inflation and rising real incomes tend to raise the ratio due to the progressive nature of income tax and the fact that income tax allowances tend to lag behind inflation. We would have liked to test more directly the effect of changes in income tax *rates*, but to do so without incorporating changes in tax allowances, which we saw no way of doing here, seemed to us meaningless. The indirect tax variable we used first (X_{10}) is the ratio of total taxes on expenditure to total personal consumption. In equation 7, the savings ratio is regressed on X_1, X_2, X_9, X_{10} and X_{12}, the latter being a form of dependency ratio discussed below.[14]

$$Y = -24.17 + \underset{(4\cdot65)\ 2\cdot234}{0\cdot146\ X_1} + \underset{(3\cdot72)\ 1\cdot108}{0\cdot739\ X_2} - \underset{(2\cdot01)\ 1\cdot022}{1\cdot304\ X_9} + \underset{(2\cdot42)\ 1\cdot087}{0\cdot845\ X_{10}} - \underset{(1\cdot94)\ 0\cdot684}{12\cdot401\ X_{12}} \qquad (7)$$

$$R = \cdot 903 \quad s.e. = 0\cdot 963, \quad F = 12\cdot 42 \quad \tau = 10.$$

Both the tax variables emerge as significant and, in accordance with the hypothesis, the direct tax variable has a negative sign while the indirect tax variable has a positive sign.[15] The performance of the direct tax variable is perhaps the more impressive because of the fact that the simple correlation between it and the savings ratio is significantly *positive* ($r = 0\cdot 65$). The size of the regression coefficients seems to be remarkably high, however. Our results suggest that a rise of one percentage point in the ratio of total direct taxes to non-agricultural personal income causes a reduction of more than one percentage point in the savings ratio, implying that people reduce their savings by more than the full amount of any increase in direct tax payments. This may well be so but, if it is so, it is a very remarkable finding. We may say that in the many equations we ran, involving the direct tax variable, the coefficient was scarcely ever below 1 and sometimes substantially above 1 (speaking arithmetically rather than algebraically). The coefficient of the indirect tax variable suggests that a rise of one

13. Nicholas Kaldor, *An Expenditure Tax* (London: Unwin University Books, Fourth Impression, 1965), p. 175.

14. It may be noted that generally the coefficient of X_9, and sometimes the coefficient of X_{10}, did not emerge as significant when X_{12} was absent from the equation.

15. It should be stressed that the effect on savings is only one of a number of criteria that must be considered in deciding on taxation policy, and we are not here expressing any view about the relative merits of direct and indirect taxation from an overall economic and social viewpoint.

percentage point in the ratio of indirect taxes to consumption causes the savings ratio to rise by nearly one percentage point. In all the equations we ran the coefficient of the indirect tax variable was generally in the region of unity.

If the indirect tax variable used above is genuinely a good explanatory variable, then the ratio of indirect taxes less subsidies to total consumption might seem to be a better one, since subsidies are equivalent to a negative indirect tax. We tried this variable but it did not work nearly as well as the first one. This is not surprising since the subsidies, in the main, apply to producers' goods (e.g. fertilizers) or to exports, whereas indirect taxes apply mainly to goods consumed at home. However, there was one important category of subsidy in the early years, namely the food subsidies, which applied to domestic consumer goods and which varied substantially. If, therefore, our indirect tax variable is to be regarded as a sound explanatory variable, then it should work better when we deduct the food subsidies. In equation 8, we test this by substituting for X_{10} in equation 7 the ratio of indirect taxes less the food subsidies to total personal consumption (X_{11}). As expected, equation 8 performs better on all counts than equation 7.

$$Y = 2{\cdot}05 + 0{\cdot}137\,X_1 + 0{\cdot}651\,X_2 - 1{\cdot}226\,X_9 + 0{\cdot}920\,X_{11} - 27{\cdot}200\,X_{12} \qquad (8)$$
$$(4{\cdot}87) \quad (3.42) \quad (2{\cdot}29) \quad (3{\cdot}00) \quad (2{\cdot}80)$$
$$R = {\cdot}917 \quad s.e. = 0{\cdot}896 \quad F = 14{\cdot}79 \quad \tau = 11.$$

6. *DEMOGRAPHIC VARIABLES*

Dependency Ratio

It has been found elsewhere that a high dependency ratio is unfavourable to saving.[16] By dependency ratio is normally meant the ratio of population in the "dependent" age groups (usually taken as 14 years and under and 65 years and over) to the population in the "non-dependent" age groups (i.e. the balance of the population). Ireland has a very high dependency ratio, and one that has risen substantially in the post-war from 62·6 per cent in 1946 to 73·6 per cent in 1966. The rate of increase was greatest from 1951 to 1961 when the ratio rose from 65·5 per cent to 73·3 per cent.

The reasons why a high dependency ratio might adversely affect the savings ratio are summed up in Leff's words as follows:

> "The logic of an inverse relation between dependency ratios and savings rates, in turn, goes as follows. Children constitute a heavy charge for expenditure which, in the standard national income accounting framework, is put under the heading of consumption. Because they contribute to consumption but not to production, a high ratio of dependents to the working age population might be expected to

16. See N. Leff, "Dependency Rates and Savings Ratios", *American Economic Review*, December 1969.

impose a constraint on a society's potential for savings. . . .

> . . . the retired, older population also constitutes a dependency burden by being claimants on consumption without contributing currently to output. . . ."[17]

Unfortunately, we do not have annual data for the dependency ratio so defined: it is available only for Census of Population years. We tried instead two other dependency ratios which we may call the labour force dependency ratio and the employment dependency ratio to distinguish them from the age dependency ratio mentioned above. The first of these is the inverse of the ratio of the labour force to the population not in the labour force (i.e. the rest of the population). On the arguments quoted above for the age dependency ratio, it can indeed be claimed that this is a better measure of the effect of dependency on the savings ratio, since, for instance, married women not in the labour force, the sick, secondary school and university students, etc., "contribute to consumption but not to production" in the national accounts sense. The other dependency ratio we tried is the inverse of the ratio of employment to the non-employed population (i.e. total population minus total employment). This should be an even more relevant dependency measure on the earlier argument, since the unemployed also "contribute to consumption but not to production"; and when a person is temporarily unemployed, he probably does not reduce his consumption proportionately with the reduction in his personal income. In fact, the labour force and employment dependency ratios have moved very closely in line with each other over our period (r=0·982), and both moved roughly in line over the longer term with the age dependency ratio, as may be seen from the following figures for census years:

Dependency Ratio:	*1946*	*1951*	*1961*	*1966*
Age	0·626	0·655	0·733	0·736
Labour force	1·29	1·35	1·54	1·58
Employment	1·41	1·43	1·68	1·71

In our regression results, we found that both the labour force and employment dependency ratios worked very well, the regression coefficients being generally highly significant and having in all cases the expected negative sign (see equation 7 and subsequent equations in Table 20 which include X_{12}, the employment dependency ratio). We also found, as the underlying argument would suggest, that the employment dependency ratio (X_{12}) performed consistently better than the labour force dependency ratio (not shown here). The regression coefficient of X_{12} is generally in the region of 20 and upwards, suggesting that a rise of 0·1 in the employment dependency ratio causes a fall of upwards of 2 percentage points in the savings ratio. Given that the employment dependency ratio rose by 0·25 from 1951–61, it would appear that this factor exercised a substantial drag on the savings ratio in Ireland in the 1950's. In contrast, the employment dependency ratio rose by only 0·05 from 1961–68.

17. *Ibid.*

Marriage Rates

Persons generally save in anticipation of marriage, and the question arises whether variations in the marriage rate will affect savings. However, we must be careful here about what is meant by saving. Suppose an individual sets aside £100 in any year out of current income, he might with justification regard himself as saving. But if during the course of the year he uses this money as a deposit on a new car, the balance of which is financed by hire-purchase, then in our terms his position in that year is one of net dissaving. In the following year when he is engaged in repaying his hire-purchase debt out of current income, he may or may not regard this as saving, but, *ceteris paribus,* it would be regarded for our purposes as saving *in that year.*

We tried three marriage rates as explanatory variables, the current year's marriage rate, the previous year's marriage rate and the following year's marriage rate. Of these, the first (X_{13}) worked best and emerged as significant in many of the equations run (see, for example, equations 22, 23, 24 and 25 of Table 1). In all cases, however, the coefficient was negative, and the results suggested that a rise of 0·1 percentage points in the current marriage rate would involve a fall of 0·2—0·3 percentage points in the savings ratio. At first sight this is a surprising result but, on reflection, it seems entirely reasonable, given that the year of marriage is a year of high expenditure on current goods and services for the parties involved. Exceptionally large expenditures are incurred in respect of the wedding reception, bride's trousseau, honeymoon, etc., and in most cases these far exceed the current savings undertaken by the parties in that year.

This ties in very well with our results for the lagged marriage rate (X_{14}) which was found to have a positive effect on the savings ratio, though in the equations we ran the coefficient was generally significant only at the 10 per cent or 20 per cent level. (See equation 12 of Table 1.) It seems plausible that after substantial net dissaving in the year of marriage, the following year should be one of comparative retrenchment in consumption as hire-purchase debts are paid off, savings refurbished and responsibility undertaken in many cases for repayment of mortgage debt.

The logic of the following year's marriage rate as an explanatory variable for current savings, is that people tend to save in anticipation of marriage and the variable may be regarded as an expectational one. It did not work very well, however, the regression coefficient never achieving significance at more than about the 20 per cent level, and having consistently a negative sign instead of the anticipated positive one.

It may well be that the marriage rate is only a form of proxy for other more powerful influences affecting the savings ratio. One such variable is the rate of change in population, discussed next. Before leaving the marriage rate, however, it may be noted that the significance of the coefficient of X_{13} did not in any case survive the introduction of the rate of change in population as an explanatory variable. See, for example, equation 15 of Table 1.

Rate of Change in Population

It has been suggested that in some circumstances a high rate of change in population will be beneficial to savings. Thus, Colin Clark argues:

> "Population growth, other things being equal, is found to have a positive effect upon savings. This indeed is to be expected, on the grounds, amongst others, that a slow growing population will have a higher proportion of old people, who tend to consume rather than save capital; that parents of larger families may make more effort to save for them; and, perhaps most important, that with larger families younger men expect less inheritance, and therefore have to make greater efforts to accumulate for themselves."[18]

And in a cross country regression analysis he found that

> ". . . a 20 per cent rise in real income per head . . . raises the percentage of national income saved by 0·38. A 20 per cent per decade population growth raises the percentage saved by 2."[19]

Not everyone would agree that population growth is favourable to saving, and there are undoubtedly circumstances where, at very low income levels, rapid population gowth has an adverse impact on saving. It should also be noted that Clark was mainly concerned with longer-term changes over decadal periods. Thus the failure to obtain significant results using annual time series would not necessarily disprove his hypothesis. Moreover, the reasons he gives for the effect of population growth on savings are partly related to dependency considerations, which we have already tried to take into account with X_{12}. Hence it is all the more interesting that the current annual percentage change in population (X_{15})[20] consistently emerged as having a highly significant positive effect on the savings ratio, and that it did not detract from the significance of the dependency ratio.[21] This may be seen from equation 13 reproduced below, and other equations in Table 1.

$$Y = 2{\cdot}02 + \underset{(3{\cdot}09)}{0{\cdot}089\,X_1} + \underset{(3{\cdot}93)}{0{\cdot}619\,X_2} - \underset{(2{\cdot}36)}{1{\cdot}053\,X_9} + \underset{(3{\cdot}64)}{0{\cdot}921\,X_{11}} - \underset{(2{\cdot}64)}{21{\cdot}791\,X_{12}} + \underset{(2{\cdot}76)}{1{\cdot}701\,X_{15}} \quad (13)$$

$$R = {\cdot}948 \quad s.e. = 0{\cdot}738 \quad F = 19{\cdot}41 \quad \tau = 9$$

18. Colin Clark, *Population Growth and Land Use* (London: Macmillan, 1967), p. 267.
19. *Ibid.*, p. 268.
20. We used the April population figures (generally called "mid-year"), so that strictly it might be said that there is a lag of over half a year in this variable.
21. We also tried the level of population, but this gave totally non-significant results.

It must be emphasised that the population change variable in Ireland during our period differs from most other countries in two important respects. First, variations in the rate have probably been far greater, the years 1949–61 being characterised by falls in population, the size of which varied considerably, and the years 1962–68 by population increases which also varied somewhat. A second, but related, difference is that variations in the rate of change in population have been overwhelmingly due to variations in emigration. In lieu of population change, we tried the emigration rate (i.e. current emigration as a percentage of last year's population). The simple correlation between this variable, X_{16}, and the population change variable, X_{15}, is -0.992, and the standard deviation of X_{16}, 0·449, is close to the standard deviation of X_{15}, 0·499. Not surprisingly, therefore, X_{16} performs in much the same way as X_{15}, with of course the opposite sign. Sometimes one and sometimes the other gives fractionally better results, but on balance X_{15} seemed to be marginally the better variable. The performance of X_{15} and X_{16} may be seen by comparing, for instance, equation 14 and equation 13.

$$Y = \underset{}{5{\cdot}21} + \underset{(3{\cdot}32)}{0{\cdot}095\,X_1} + \underset{(3{\cdot}85)}{0{\cdot}618\,X_2} - \underset{(2{\cdot}53)}{1{\cdot}144\,X_9} + \underset{(3{\cdot}76)}{0{\cdot}979\,X_{11}} - \underset{(2{\cdot}87)}{23{\cdot}751\,X_{12}}$$

$$- \underset{(2{\cdot}61)}{1{\cdot}743\,X_{16}} \qquad (14)$$

$$R = {\cdot}946 \quad s.e. = 0{\cdot}753 \quad F = 18{\cdot}57 \quad \tau = 9$$

It is generally thought that the high age dependency ratio in Ireland has been caused mainly by emigration. Hence it is perhaps surprising that X_{15} (or X_{16}) performs so well with X_{12}, our employment dependency ratio. However, the simple correlation between the emigration rate and the employment dependency variable is negative, $-0{\cdot}34$, though not significant at the 5 per cent level. This negative correlation might by thought to arise from the fact that X_{12} is influenced by variations in unemployment. However, the correlation between the emigration rate and the labour force dependency ratio, which is not affected by variations in unemployment and almost certainly mirrors closely the variations in the age dependency ratio, is also negative ($r = -0{\cdot}44$). While not denying that the long-term rise in the dependency ratio may be caused by emigration, it does seem that population change (or the emigration rate) exerts an influence on savings other than by its effect on dependency. What factors underlie this influence?

One important factor not often mentioned by economists in connection with savings, might be national morale or confidence about the future. It is probably true to say that no factor gave rise to so much gloom and despondency in the 1950's as the high and rising level of emigration; and no factor was more influential in restoring national self-confidence than the reduction in emigration, which fell to some extent after 1958 but more especially after 1962. It is plausible to argue that people may be less willing to save when confidence about the economic future of the country is weak, and when they know that, no matter what savings

they make to provide for the education and welfare of their children, a large proportion of the family is going to have to emigrate anyway. Admittedly this is a somewhat longer-term influence and it is rather surprising that it would show up in an annual time series analysis.

Further light is thrown on the behaviour of the population growth variable (or the emigration variable) on savings by reason of the fact that, when used with the alternative formulation of the income variables, it consistently destroys the significance of the non-agricultural income *per capita* variable while retaining its own significance.[22] This was so whether we used the current or lagged value of non-agricultural income *per capita* (X_5 or X_8), as may be seen, for example, by comparing equations 16 and 17, or 19 and 20 in Table 1. It would appear, therefore, that population growth may be partly a proxy for X_5 (or X_8), but that it also gives representation to forces affecting savings that cannot be caught by X_5 itself. Two reasons may be suggested why this is so.

One is that when emigration falls, this means that a lot more of the outflow from agriculture find jobs in the non-agricultural sector in Ireland. In fact, reduced emigration almost certainly means a rise in the proportion of the non-agricultural population of those coming directly from a farm background. Although, as we suggested earlier, those leaving agriculture may not have done much saving there because they were probably at the lowest levels in the range of agricultural income *per capita*, when they move to a higher level of income *per capita* in the non-agricultural sector they may carry with them the higher savings propensity of the farming community. If our argument so far holds, reduced emigration therefore implies an upward shift in the savings propensity of the non-agricultural community which cannot be measured by using non-agricultural income *per capita* without distinction of income recipient.

Another reason is that the level of consumption in the non-farming sector in Ireland may be influenced by the level of consumption in the UK. In that case, the savings ratio would tend to vary not just with the level of non-agricultural income *per capita* in Ireland but with its level relative to income *per capita* in the UK. When income *per capita* is relatively high in the UK (and the level of consumption is, therefore, likely to be relatively high even if the savings ratio there rises) at the same time as income *per capita* is relatively low here, then if Irish consumption in the non-agricultural sector is influenced by the UK level of consumption, the ratio of non-agricultural savings to non-agricultural income would be lower than would otherwise be expected.[23] Now it is precisely when non-agricultural income *per capita* is relatively low in Ireland and relatively high in the UK that one would expect emigration to be greatest. This is so

22. The population growth variable does not, however, detract from the significance of X_6, farmers' income *per capita*, or X_1, total income *per capita*.

23. It may be asked why should the UK level of consumption influence the level of consumption in the non-agricultural sector but not in the agricultural sector in Ireland? One obvious answer is that the influence of British communications media is far less in rural Ireland than in urban Ireland, particularly the large urban areas of the east coast.

not only due to the "pull" of relative incomes but also because years of relatively low non-agricultural income *per capita* in Ireland were also years of depression when job opportunities were scarce so that the "push" factors in emigration were most strongly operative.[24]

To sum up, the influence of non-agricultural income *per capita* on the savings ratio may be complicated by (*a*) the composition of persons in receipt of such income, and (*b*) the level of such income relative to income *per capita* in the UK. For the reasons given above, population growth (or the emigration rate) may encompass these influences. It may, also, exercise an influence on savings by affecting confidence, and probably in other ways that have not occurred to us.

7. *MONETARY VARIABLES*

Credit

We tested the effect on the savings ratio of the following credit variables, all in the form of the percentage change during the year: total gross credit, total net credit, private gross credit and private net credit. We also tried the rate of change in total net credit lagged by one year. Moreover, since in two of the years (1951 and 1955) in which the savings ratio was relatively low, there were large increases in total net credit in the current *and* preceding year, we tried also a two-year rate of change in total net credit as an alternative to using the current and lagged values.

A few words of explanation are in order in regard to these variables. Total gross credit is the amount of bills, loans, advances and investments of the Associated Banks. Total net credit is the difference between gross credit and interest-bearing deposits. By private credit is meant here the difference between total credit and the amount extended to the Government. In all cases the change during the year was based on the difference between the end-December figures of the current and previous year. There is a difficulty in calculating a rate of change in net credit, since in the early years the *level* of net credit was negative. We related, in this case, the absolute change in the level of net credit to the level of gross credit.

There is a danger in using the change in net credit to explain savings behaviour that we may be explaining a change in savings partly in terms of a change in savings! Since interest-bearing deposits is a savings medium, a rise in net credit that results from a fall in such deposits may directly represent a fall in savings. This is not necessarily so, however, since interest-bearing deposits may fall also because people are transferring savings from this medium to another medium.

24. The correlation between the emigration rate and non-agricultural real income *per capita* is strongly negative, −0·71, despite the fact that a rise in emigration, insofar as it represents emigration from the non-agricultural sector, has the statistical effect of raising real income *per capita*, which makes for a positive correlation. The correlation between the emigration rate and farmers' real income *per capita* is rather lower (−0·63).

In any event, we feel justified in using net credit as an independent explanatory variable in view of the importance attached by the Central Bank to its effect on spending. Thus the Governor of the Central Bank argues:

> "Net credit creation increases the flow of expenditure and, in a situation in which prices are already rising, such an increase makes a positive contribution to inflation. It makes it possible to spend more than we can afford on consumption purposes and to have cost increases passed on as price increases, to mention just two of the undesirable effects".[25]

The results of our tests may be summarised briefly as follows. Net credit worked better than gross credit, the current rate of change worked better than the lagged rate of change or the two-year rate of change, and private net credit worked better than total net credit. Though in all cases the coefficient of the rate of change in private net credit (X_{17}) had the expected negative sign (i.e. the higher the rate of change in credit the lower the savings ratio), the coefficient did not emerge as fully significant in many of the equations. However, in a number of the equations quoted in Table 1 the coefficient of X_{17} can be seen to be fully significant. (See equations 21, 28, 30, 31, and 32.) The effect on the savings ratio is, however, comparatively small. The results generally suggest that a rise of 1 percentage point in the rate of change of private net credit causes a fall of rather less than 0·1 percentage points in the savings ratio; and, judging from the *beta* coefficients we calculated (not shown here), the relative importance of credit in explaining the increase in the savings ratio is small. It should be added, however, that in some individual years the effect would be large because the rate of change in net credit can sometimes alter very considerably.

We might have achieved more powerful results had we used the rate of change in the averages of the twelve months' figures, though we hardly think this would make an enormous difference. We might also have done better if we had used some measure of personal credit rather than private credit (i.e. by omitting, as well as Government credit, credit for business, church building, etc.), though there is an authoritative body of opinion in favour of the more aggregate credit variable. There are also problems in getting a continuous series for personal credit that would be relevant here.

Hire-Purchase

We tried two hire-purchase variables. One was the ratio of hire-purchase debt outstanding at the end of the year to total personal consumption. The argument here would be that when hire-purchase credit was freely available, though consumption would rise as well as hire-purchase debt, the latter would rise more than the former. Thus the ratio would rise and might be expected to be negatively related to the savings ratio. This variable did not work very well,

25. T. K. Whitaker, "The Role of the Central Bank", Central Bank of Ireland, *Quarterly Bulletin*, Spring 1970, p. 73.

the regression coefficient being generally positive and non-significant. As an alternative we tried the rate of change in hire-purchase debt outstanding. This worked rather better, but its regression coefficient only emerged significantly negative when the rate of change in credit (X_{17}) was absent, and our tests generally suggested that X_{17} was the better variable.

Money Supply

The rate of change in money supply might *a priori* be expected to work better than the rate of change in net credit. The Central Bank regard credit control as operating on expenditure by influencing the supply of money:

> "Monetary policy in 1970/71 will continue to be implemented primarily through control of Associated Bank lending. Since its proximate objective is to fix the amount of money in the economy, policy will be directed to influencing net lending by the Associated Banks, that is to say, the excess of their gross lending over the increase in their deposit accounts."[26]

In fact, whereas there is a significant negative correlation ($r = -0{\cdot}49$) between the savings ratio and the rate of change in net private credit, there is a *positive* correlation between the savings ratio and the rate of change in money supply[27] that is almost significant at the 5 per cent level (0·42). This is despite the fact that the money supply figures have the advantage that they are an average of the year as a whole, whereas the credit figures used here are based only on the end-December figures. There was no correlation between the rate of change in money supply and the rate of change in private net credit ($r = 0{\cdot}06$). In no case that we tried did the regression coefficient of the money supply variable emerge as significant.

Interest Rates

Interest rates are often thought to affect savings, though there is some controversy over whether the effect will be positive or negative. On the one hand, a rise in interest rates may encourage people to save more because the reward is greater, suggesting a positive relation. Moreover, a rise in interest rates tends to lower capital values, and if the "real balance" effect is operative, people will react by replenishing their reduced real capital, again suggesting a positive effect. On the other hand, insofar as people save for a given monetary return, a rise in interest rates may discourage savings because it is possible to provide for the given income by a smaller amount of savings. It is fair to say, however, that the majority opinion is in favour of the predominance of the positive effect.

One difficulty in testing this hypothesis is which interest rate to use. The simplest one available is the bank overdraft rate, and though this is a rate at which

26. Central Bank of Ireland, *Quarterly Bulletin*, Spring 1970, p. 12.

27. The money supply was taken on the basis adopted by the Central Bank, using the adjusted figures as given in Appendix Table 3 of the *Quarterly Bulletin*, Spring 1970.

persons borrow rather than lend or invest, it may reasonably be assumed to move in line with nominal interest rates generally. We got no significant results, however. The regression coefficient was usually negative rather than the more generally expected positive value, but not much importance can be attached to this since the regression coefficients were in all cases non-significant. It may be noted that the simple correlation between the savings ratio and the nominal interest rate was significantly positive (0·60).

At this stage of our inquiry, Finola Kennedy reminded us of something that we ought to have recalled ourselves, namely, that insofar as savings vary in response to changes in interest rates, they are likely to do so in relation to some kind of real interest rate rather than a monetary or nominal interest rate. Her suggestion was to try an interest rate corrected for changes in the general price level and allowing for the appropriate tax deduction. We found no way of allowing for variations in the amount of tax deducted from interest receipts, though our findings on income tax would seem to bear out her point generally. We did try, however, the interest rate minus the rate of change in consumption prices, which may be looked on as a form of real interest rate (X_{18}). This variable worked quite well, emerging as significant in many of the equations tried and always with the expected positive sign. (See, for example, equation 23 of Table 1.) The results generally suggested that a one percentage point rise in the real interest rate leads to a rise of almost 0·2 percentage points in the savings ratio. The relative importance of the variable as judged by the *beta* coefficients was not great, however.

Rate of Change in Prices

Rising prices themselves are thought to have an adverse impact on savings. Thus, in the 1966 Budget speech the Minister for Finance stated, "I am convinced that nothing could be more conducive to a renewed interest in saving than a slower rate of increase in prices".[28] However, this effect may be a long-term one and may not show up in annual time series. In other words, a high price rise in one year may have no measurable effect on savings, but a succession of large price increases may eventually cause a shift in saving behaviour. It is also possible that prices may affect more the disposition of savings than the amount of savings: rising prices may, for example, shift savings away from fixed-interest investments toward assets that provide protection against inflation, without appreciably lowering the overall savings ratio.

The simple correlation between the savings ratio and our price variable (X_{19})—the annual percentage change in the price of total personal consumption—was positive (0·18) but non-significant. In a number of equations, the regression coefficient of X_{19} was non-significant but it did emerge in others as fully significant and with the expected negative sign. (See, for instance, equation 25 of Table 1.) It should be noted that this variable performs almost the same as the real interest

28. *Budget 1966*, p. 24.

rate (X_{18}). The reason is that the variance of the price change variable is far greater than the variance of the nominal interest rate. Thus fluctuations in the real interest rate (X_{18}), which is equal to the money interest rate less the price change, are dominated by fluctuations in X_{19}. The standard deviations of X_{18} and X_{19} are almost identical—2·43 and 2·33, respectively—and the variables are very highly correlated. Not surprisingly they will not work in the same equation, so that a choice must be made between them. Generally, though not always, the real interest rate worked slightly better—compare equations 31 and 32 of Table 1, for example. However, we can reconcile the two variables, and the somewhat better performance of the real interest rate, by recognising that prices affect savings mainly through their effect on the real interest rate. In other words, high price increases discourage those savings which, if they are to be made at all, will tend to be invested mainly in fixed-interest assets and are therefore most liable to be influenced by the relation between nominal interest rates and the rate of change in prices.

8. *OTHER EXPLANATORY VARIABLES*

Unemployment Rate

The unemployment rate was tested as an explanatory variable.[29] Our expectation was that if this were significant, the effect on the savings ratio would be negative. A rise in the unemployment rate means that a higher proportion of the work force is in receipt of a lower than normal income. Since the unemployed would tend to reduce consumption less than proportionately with income, the savings ratio would tend to fall. Of course, it may well be that those liable to be unemployed would not tend to save even when employed, so that there might be no effect on the savings ratio. The simple correlation between the savings ratio and the unemployment rate was negative (− 0·35), though not significant at the 5 per cent level. No significant regression coefficient emerged in the few equations we ran with this variable. We did not test it extensively since we believe we have already taken it into account in our dependency ratio (X_{12}).

Housing

For a variety of reasons some housing variable might plausibly influence savings. Abrams argues, for instance, that "a housing program can also play an important part in developing savings and in releasing unproductive capital into the economy. People will save for housing even when they might not save for anything else".[30] Persons purchasing a house on a mortgage must usually make a deposit, and this forces many to save who might not otherwise do so. In subsequent years, mortgage repayments may also generate new savings.

29. The variable used was the non-agricultural unemployment rate from Table 5 of R. C. Geary and J. G. Hughes, "Certain Aspects of Non-Agricultural Unemployment in Ireland" (Dublin: ESRI, Paper No. 52, February 1970).

30. Charles Abrams, *Housing in the Modern World* (London: Faber and Faber, 1964), p. 110.

It is not clear which housing variable would be most appropriate. One possibility would be the stock of owner-occupied houses, or the ratio of owner-occupied houses to the total housing stock. Unfortunately no such data are available except for Census of Population years. The variable we tried was the volume of non-Local Authority housebuilding each year (i.e. the volume of gross investment in housing less investment in Local Authority housing). This variable is highly and positively correlated with the savings ratio ($r = 0{\cdot}71$). It could be argued, however, that this correlation reflects no more than the fact that gross investment in housing mirrors the ups and downs in the economy and is very highly correlated with other variables that more immediately influence the savings ratio: for example, the correlation between the housing variable and the level of real income *per capita* (X_1) is 0·90.[31] In any event, the regression coefficient of the housing variable was non-significant in our tests. This may be because the effect of housing on savings is already taken into account in other variables such as real income *per capita* or the lagged marriage rate. The correlation between the housing variable and the lagged marriage rate is 0·74.

9. *CHOICE OF BEST EQUATION*

As pointed out earlier, we were as much concerned with testing a variety of explanatory variables as with finding one best equation. However, of the equations we ran, the one that seemed best to us is No. 32 of Table 1, reproduced below.[32]

$$\begin{array}{lllll} Y = 13{\cdot}08 + 0{\cdot}135\,X_1 + 0{\cdot}600\,X_3 - 1{\cdot}972\,X_9 + 1{\cdot}024\,X_{11} \\ \qquad\quad (5{\cdot}98) \qquad (6{\cdot}13) \qquad (6{\cdot}14) \qquad (5{\cdot}27) \\ \qquad\quad 2{\cdot}071 \qquad 0{\cdot}922 \qquad 1{\cdot}546 \qquad 1{\cdot}343 \end{array}$$

$$\begin{array}{llll} - 30{\cdot}857\,X_{12} + 1{\cdot}966\,X_{15} - 0{\cdot}073\,X_{17} + 0{\cdot}111\,X_{18} \\ (5{\cdot}17) \qquad (4{\cdot}55) \qquad (2{\cdot}85) \qquad (1{\cdot}94) \\ 1{\cdot}702 \qquad 0{\cdot}525 \qquad 0{\cdot}252 \qquad 0{\cdot}140 \end{array} \qquad (32)$$

$$R = {\cdot}980 \qquad s.e. = 0{\cdot}509 \qquad F = 32{\cdot}60 \qquad \tau = 11$$

31. We feel, however, that a complex set of dynamic interrelationships underlie these correlations. If real income is depressed this will tend to depress savings and, therefore, housing activity. But, more important perhaps, when housing is depressed, whether due to a fall in real income, or population decline, or lack of credit, this has tended to depress demand and real income. We explore these interactions further in a forthcoming ESRI paper, "Domestic Demand, Exports and Economic Growth in Ireland in the Post-War".

32. Our criterion of selection is primarily s.e. We recognise, of course, that in picking a "best" equation out of some 400 trials, classical probabilities associated with t, F and τ are not applicable, but we have given these statistics in a comparative empirical spirit.

The first six explanatory variables are significant at the 0·1 per cent level, X_{17} is significant at the 2 per cent level, and X_{18} at the 10 per cent level. X_{18} may be dropped if desired leaving all coefficients significant at, at least, the 2 per cent level—see equation 28 of Table 1. However, as X_{18} is fully significant in other equations, and as its inclusion increases the significance of all of the other coefficients and reduces the standard error of estimate, we prefer equation 32 to equation 28. The *beta* coefficients are shown underneath the t-ratios. It may be noted that X_3, the farmers' money income share, performs here much better than X_2, the farmers' total income share—compare equations 32 and 29. If the stock income share (X_4) is added to equation 32, it disimproves the equation, and the coefficient of X_4 itself is non-significant, as may be seen in equation 30.

Purists may object to including as many as eight explanatory variables with only 20 observations. Our eminent colleague, Dr Geary, advises research workers to be suspicious of equations that have more than three or four explanatory variables. On this view, equations 1, 8, 21 or 22 might seem more desirable. However, savings behaviour is clearly a complex phenomenon influenced by a great variety of factors. We feel that all of the variables included in equation 32 can plausibly be said to represent forces operating on the savings ratio and we are rather pleased to have established their significance in the one equation. Indeed our regret would be that in the absence of a still greater variety of experience that would be given by a larger number of observations we are unable to establish the significance in the one equation of other variables that may have some impact on the savings ratio. We think, however, we have established the major ones.

10. *FIRST-DIFFERENCE RESULTS*

With one exception we did not experiment with alternative specifications of the savings variable or alternative forms of regression equation (e.g. log-linear etc.). The exception was that we carried out a limited number of tests using first differences of the data used above. The results confirmed the foregoing analysis. In equation 33 we show the result of regressing the annual first differences of the savings ratio on the first differences of all variables given in our "best" equation (No. 32) for the 19 observations 1949/50—1967/68. The symbols are the same as heretofore except that lower case letters are used to indicate the first difference form.

$$\begin{array}{l} y = -0{\cdot}36 + \underset{(4{\cdot}02)}{0{\cdot}156}\, x_1 + \underset{(2{\cdot}92)}{0{\cdot}618}\, x_3 - \underset{(2{\cdot}97)}{1{\cdot}950}\, x_9 + \underset{(6{\cdot}27)}{1{\cdot}268}\, x_{11} \\ \qquad - \underset{(1{\cdot}61)}{21{\cdot}657}\, x_{12} + \underset{(4{\cdot}50)}{2{\cdot}260}\, x_{15} - \underset{(1{\cdot}19)}{0{\cdot}035}\, x_{17} + \underset{(0{\cdot}90)}{0{\cdot}074}\, x_{18} \qquad (33) \\ R = {\cdot}962 \quad s.e. = 0{\cdot}803 \quad F = 15{\cdot}64 \quad \tau = 11 \end{array}$$

Since the explanation of the *first differences* of the savings *ratio* provides a very stringent test, this result must be regarded as giving remarkable support to our earlier findings. Five of the six most significant explanatory variables in equation 32 came out as significant here, at least, the 5 per cent level, and the sixth is significant at the 20 per cent level. All eight variables have the correct sign and the size of the coefficients is reasonable in all cases in the light of equation 32. If we drop from equation 33 the three variables (x_{12}, x_{17} and x_{18}) that are not fully significant, we get the following, highly satisfactory, equation.

$$y = -1{\cdot}01 + 0{\cdot}179\,x_1 + 0{\cdot}385\,x_2 - 1{\cdot}294\,x_9 + 1{\cdot}113\,x_{11} + 2{\cdot}215\,x_{15} \quad (34)$$
$$(5{\cdot}07) \qquad (2{\cdot}40) \qquad (2{\cdot}49) \qquad (6{\cdot}47) \qquad (4{\cdot}46)$$
$$R = {\cdot}951 \qquad s.e. = 0{\cdot}800 \qquad F = 24{\cdot}58 \qquad \tau = 7$$

However, the variables dropped here emerge as quite significant in other equations as may be seen from equation 35, following.

$$y = 0{\cdot}51 + 0{\cdot}120\,x_6 - 1{\cdot}512\,x_9 + 1{\cdot}352\,x_{11} - 56{\cdot}298\,x_{12} \quad (35)$$
$$(6{\cdot}04) \qquad (2{\cdot}80) \qquad (6{\cdot}67) \qquad (3{\cdot}85)$$
$$- 2{\cdot}947\,x_{13} + 1{\cdot}549\,x_{15} - 0{\cdot}065\,x_{17} - 0{\cdot}187\,x_{18}$$
$$(2{\cdot}48) \qquad (2{\cdot}85) \qquad (2{\cdot}21) \qquad (2{\cdot}13)$$
$$R = {\cdot}963 \qquad s.e. = 0{\cdot}795 \qquad F = 15{\cdot}95 \qquad \tau = 7$$

In equation 35 we are using the alternative formulation of the income variables, but have dropped non-agricultural income *per capita* (x_5) because, as mentioned before, it does not work with the population growth variable (x_{15}). Indeed, in first difference form, x_5 does not work well with or without x_{15}. It may also be noted that the current marriage rate (x_{13}) performs well here with x_{15} whereas with the earlier data its significance was invariably destroyed by x_{15}.

II. *SUB-PERIOD RESULTS*

It is sometimes said that the structure of the Irish economy has changed so markedly in the last ten years or so compared with earlier that it is misleading to use the whole of the post-war period to estimate the parameters of economic relationships. To say that the economy has changed markedly in the past ten years is manifestly true, but to say that the basic structural responses are completely different seems to us an unproved assertion of which research workers would be well advised to beware. Whether or not the structural responses have altered is an empirical question, though admittedly one that is difficult to determine. We carried out a number of tests with the original data (i.e. not in first difference

form) splitting our total period into two ten-year sub-periods, 1949–58 and 1959–68. The best equation we got for each sub-period from a very limited number of tests is given here.

1949–58

$$Y = \underset{}{29{\cdot}22} + \underset{(3{\cdot}53)}{0{\cdot}080\,X_6} - \underset{(2{\cdot}34)}{2{\cdot}388\,X_9} + \underset{(5{\cdot}04)}{1{\cdot}003\,X_{11}} - \underset{(3{\cdot}26)}{22{\cdot}428\,X_{12}} + \underset{(4{\cdot}61)}{4{\cdot}013\,X_{15}}$$

$$R = {\cdot}987 \quad \text{s.e.} = 0{\cdot}451 \quad F = 29{\cdot}16 \quad \tau = 6 \qquad (36)$$

1959–68

$$Y = \underset{}{97{\cdot}47} + \underset{(3{\cdot}67)}{0{\cdot}069\,X_6} + \underset{(2{\cdot}40)}{0{\cdot}626\,X_{11}} - \underset{(2{\cdot}40)}{66{\cdot}970\,X_{12}} - \underset{(2{\cdot}10)}{0{\cdot}084\,X_{17}} \qquad (37)$$

$$R = {\cdot}965 \quad \text{s.e.} = 0{\cdot}437 \quad F = 17{\cdot}14 \quad \tau = 7$$

The trouble about this approach is that it is virtually impossible to establish structural relationships with only ten observations. Yet the results, such as they are, do not give much support to the view that relationships that work in one period will not work in the other. Three of the variables that appear as reasonably significant in equation 36 (i.e. X_6, X_{11}, X_{12}) also emerge as reasonably significant in equation 37. *A priori* we would have thought that X_6, farmers' real income *per capita*, would be more highly correlated with the savings ratio in the first decade than in the second, in view of the greater importance of agriculture in the early period. In fact the reverse is true, the correlation for 1959–68 being 0·90 as against 0·64 for 1949–58.

The sub-period results served to impress upon us, what every research worker knows, that one set of twenty observations is far better than two sets of ten. The danger that the parameters may have shifted can to some extent be guarded against by careful study of goodness-of-fit and any patterns, or other striking features, in the residuals.

12. *SUMMARY*

The dominant variable in explaining variations in the personal savings ratio in Ireland is the level of real income *per capita*, but significantly better results are got by distinguishing farmers' income from non-agricultural income. The evidence is that variations in farmers' real income *per capita* exert a strong influence on the savings ratio and this is not simply, or even mainly, due to variations in agricultural stock changes. Our results also suggest that farmers have a much higher propensity to save than the non-agricultural community.

Taxation variables also strongly influence saving behaviour. Our results confirm widely-held views that increased direct taxes are unfavourable to savings while increased indirect taxes tend to raise the savings ratio.

Several demographic variables also significantly affect personal savings, in particular the degree of dependency and the rate of change in population. A rise in dependency is adverse to savings while a higher rate of growth of population (or, what comes to much the same thing in Ireland, a reduction in the emigration rate) is favourable to savings. Variations in the marriage rate also appear to affect the savings ratio, which responds negatively to changes in the current marriage rate but positively to changes in last year's marriage rate.

A rise in the rate of increase in credit tends to lower the savings ratio, though the effect is not large unless there are substantial variations in the rate of change in credit. The money interest rate appears to have no effect on the savings ratio, but when combined with the rate of change in prices the resulting real interest rate has a significant, though comparatively small, positive impact on the savings ratio.

Following on our inquiry, the "next necessary thing" would appear to us to be a study of the media through which personal savings are made. It is probable that interest rates and price changes would play a more important role in influencing variations in the disposition of savings among the various savings media.

APPENDIX TABLE A: *Data for Regression Equations in Table 1*[1]

	Y	X_1	X_2	X_3	X_4	X_5[2] X_8	X_6	X_7	X_9	X_{10}	X_{11}	X_{12}	X_{13}[2] X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
	%	£	%	%	%	£	£	%	%	%	%		*per 000*	%	%	%	%	%
1948						157·0							5·4					
1949	7·10	155·4	25·1	22·98	2·14	167·2	128·5	30·4	5·92	18·5	14·3	1·43	5·4	−0·134	1·1	−1·18	5·77	−0·77
1950	6·16	158·3	22·8	22·36	0·48	175·1	119·5	30·3	5·77	18·5	14·5	1·42	5·4	−0·403	1·3	14·06	3·76	2·24
1951	5·62	158·0	23·2	23·48	−0·31	173·2	122·2	30·0	6·12	18·3	14·6	1·43	5·4	−0·283	1·1	12·80	−3·04	8·04
1952	9·31	158·4	25·3	24·51	0·82	168·0	135·6	29·6	6·38	20·5	18·3	1·47	5·4	−0·257	1·2	−4·52	−2·41	8·16
1953	9·70	164·5	25·6	24·19	1·42	171·9	146·4	28·8	6·15	20·5	18·8	1·53	5·4	−0·135	1·1	−5·01	1·18	4·76
1954	8·20	164·7	23·3	24·11	−0·78	177·0	134·3	28·7	6·25	20·4	18·0	1·53	5·4	−0·271	1·2	5·70	5·01	0·59
1955	6·54	171·2	24·7	23·48	1·20	180·5	148·0	28·6	6·21	19·7	17·6	1·55	5·6	−0·680	1·5	12·46	2·95	2·55
1956	7·02	168·9	21·8	21·87	−0·09	184·6	129·7	28·4	5·87	21·7	19·7	1·58	5·8	−0·777	1·7	1·05	3·30	2·95
1957	9·04	170·2	23·5	23·50	−0·02	180·9	142·7	28·0	6·02	22·1	21·6	1·66	5·1	−0·459	1·4	0·23	2·30	4·20
1958	3·83	167·3	21·1	20·42	0·67	183·7	125·5	28·1	6·11	21·3	21·3	1·67	5·3	−1·109	2·0	−1·17	2·75	3·77
1959	8·34	177·9	21·8	19·65	2·16	192·8	139·3	27·9	5·80	22·2	22·2	1·68	5·4	−0·245	1·1	7·24	5·32	0·43
1960	7·31	186·7	21·2	20·85	0·32	203·4	142·9	27·7	6·31	21·3	21·3	1·68	5·5	−0·492	1·4	3·72	5·61	0·79
1961	9·66	198·2	20·7	21·20	−0·54	216·4	150·0	27·3	6·80	22·0	22·0	1·68	5·4	−0·484	1·4	−2·29	4·23	2·33
1962	9·33	204·2	19·9	19·22	0·66	223·6	151·1	26·9	7·05	21·0	21·0	1·67	5·5	0·415	0·5	2·18	2·32	3·88
1963	8·37	208·1	18·6	18·03	0·55	230·4	146·1	26·5	7·37	21·7	21·7	1·67	5·5	0·707	0·3	7·24	3·17	2·58
1964	10·74	222·5	19·2	17·88	1·30	242·6	164·6	25·9	7·73	23·1	23·1	1·67	5·6	0·491	0·6	9·46	−0·22	6·47
1965	10·55	223·6	18·2	15·62	2·55	244·5	161·4	25·2	8·33	23·9	23·9	1·69	5·9	0·419	0·7	−4·67	2·93	4·32
1966	9·50	225·9	16·4	15·61	0·78	251·5	148·8	24·9	9·31	25·5	25·5	1·71	5·8	0·278	0·7	−5·11	4·17	3·36
1967	10·15	231·8	16·9	17·56	−0·66	254·6	161·1	24·3	10·46	26·6	26·6	1·73	6·1	0·520	0·5	−7·06	4·73	2·98
1968	11·38	248·9	17·3	16·77	0·51	270·6	180·1	23·9	10·65	27·2	27·2	1·73	6·5	0·379	0·6	−3·56	4·33	4·09

[1]See Notes on Sources and Methods following, which explain these variables and their derivation.

[2]X_8 is the lagged value of X_5, and X_{14} and lagged value of X_{13}. Here the data are given currently. Thus X_5 is given by the figures for 1949–68 and X_8 by the figures for 1948–67 and correspondingly for X_{13} and X_{14}.

NOTES ON SOURCES AND METHODS

Y: Personal Savings Ratio

Defined as the ratio of total personal savings to total personal disposable income, both at current values.

Source: National Income and Expenditure, 1968 (NIE 1968).

X_1: Real Personal Disposable Income per Capita

Personal disposable income per head of population deflated by the implicit price of personal consumption.

Source: NIE 1968 for income and price figures. Population figures are April estimates (commonly referred to as mid-year) from *Report on Vital Statistics* up to 1967 and Department of Finance, *Review of 1969 and Outlook for 1970* for 1968.

X_2: Ratio of Farmers' Income to Personal Disposable Income

Income from agriculture less payments to farm employees and contributions to social insurance as a percentage of total personal disposable income.

Source: NIE 1968.

X_3: Ratio of Farmers' Money Income to Personal Disposable Income

Income of farmers, as defined for X_2, less the value of changes in livestock on farms, as a percentage of total personal disposable income.

Source: NIE 1968.

X_4: Ratio of Farmers' Stock Income to Personal Disposable Income

Value of changes in livestock on farms as a percentage of total personal disposable income.

Source: NIE 1968 and figures supplied by CSO.

X_5: Real Non-Agricultural Disposable Income per Capita

Non-agricultural income (defined as total personal disposable income less farmers' income) deflated by the implicit price of personal consumption and divided by the estimated non-agricultural population.

Source: NIE 1968 for income and price figures. See X_7 for source and derivation of population data.

X_6: Real Farmers' Income per Capita

Farmers' income, as defined for X_2, deflated by the price of personal consumption and divided by the estimated farm population.

Source: NIE 1968 for income and price figures. See X_7 for source and derivation of population data.

X_7: Ratio of Farm Population to Total Population

Estimated farm population divided by total population. The farm population refers to the family farm population figures as given in the Census of Population. The problem of estimating farm population for intercensal years was dealt with as follows. Estimates of the number of family farm workers for each year were obtained from the CSO. The average annual rates of change in the population and employment figures between Census years were calculated and compared.

Population fell less rapidly than employment but the ratio between the two rates of change was roughly similar between intercensal periods. The ratio of the average annual rate of change in farm population to the rate of change in employment for the periods 1951–61 and 1961–66 was 0·58 and 0·61, respectively.

Thus, in estimating the farm population figure for 1952, for example, the percentage change in employment in 1952 compared with 1951 was first calculated. This figure was then multiplied by 0·58, and the resulting figure was taken as the percentage change in population. Likewise for other years except that allowance was made for the slight upward shift in the ratio of the rate of change in population to the rate of change in employment. Using the derived annual percentage changes in population, we were able to calculate population levels for each year starting from the population figures available for the Census years.

The results were cross-checked by using different methods of estimation and remarkably similar results were obtained. The size of the farm population/farm employment dependency ratio was inspected and the results appeared quite acceptable in the light of movements in the overall dependency ratio.

Non-agricultural population was then defined as the total population less the estimated farm population.

Sources: Census of Population, Report on Vital Statistics, and *Review of 1969 and Outlook for 1970.*

X_8: Real Per Capita Non-Agricultural Income (X_5) lagged by 1 year.

X_9: Ratio of Direct Taxes to Non-Agricultural Income

Taxes on personal income (including social insurance contributions) as a percentage of non-agricultural personal income.

Source: NIE 1968.

X_{10}: *Ratio of Indirect Taxes to Personal Consumption*
Total taxes on expenditure as a proportion of total personal consumption.
Source: NIE 1968.

X_{11}: *Ratio of Indirect Taxes less Food Subsidies to Personal Consumption*
Total taxes on expenditure minus total food subsidies as a proportion of total personal consumption.
Source: NIE 1968 and earlier issues.

X_{12}: *Employment Dependency Ratio*
Total population less the employed labour force divided by the employed labour force.
Source: Report on Vital Statistics, Review of 1969 and Outlook for 1970, Budget 1964.

X_{13}: *Marriage Rate per thousand of population*
Annual number of marriages expressed per thousand of total population.
Source: Report on Vital Statistics for data to 1967, and Department of Health, *Quarterly Report on Births, Deaths and Marriages* for 1968.

X_{14}: *Marriage Rate (X_{13}) lagged by one year*

X_{15}: *Rate of Change of Population*
Annual percentage change in total population.
Source: Report on Vital Statistics for data to 1967 and *Review of 1969 and Outlook for 1970* for 1968 data.

X_{16}: *Rate of Net Emigration*
Annual net emigration, mid-year to mid-year, as a percentage of the mid-year population in the previous year. Emigration estimates derived from mid-year population and the average of adjacent natural increase figures. Estimation method as in B. M. Walsh, "Some Irish Population Problems Reconsidered" (Dublin: ESRI Paper No. 42, 1968). Data sources as for X_{13}.

X_{17}: *Rate of Change of Net Private Credit*
Total net credit is defined as the difference between total gross credit (bills, loans, investments and advances of the Associated Banks) and interest-bearing deposits. Private net credit is total net credit less credit extended to the Government sector. Figures used were December to December. The absolute change in net private credit, positive or negative, is expressed as a percentage of total credit. This is because in the early years net private credit was negative, i.e. interest-bearing deposits exceeded total gross credit extended by the banks.
Sources: Central Bank, *Quarterly Bulletin* and *Annual Report.* For earlier years adjusted figures were supplied by the Central Bank.

X_{18}: *Real Rate of Interest*
Defined as the commercial banks' overdraft rate minus the change in the implicit price of personal consumption. An average interest rate for each year was derived on the basis of the number of months for which the rate applied.
Source: Interest data from *Central Bank, ibid.* Price data from *NIE 1968.*

X_{19}: *Rate of Change of Prices*
Annual percentage changes in the implicit price of personal consumption.
Source: NIE 1968.