A NOTE ON THE CONSUMPTION FUNCTION AND THE PRICE DEFLATOR OF DISPOSABLE INCOME

By K. P. PRODROMIDIS *

I

In a 1964 paper on the relationship between aggregate consumption and wealth, Ball and Drake argued that "it is not wholly implausible... for the economy as a whole [that] the propensity to save is zero in stationary conditions" [1, p. 68]. To test their theory they considered the zero - intercept consumption function

$$C_t = \alpha Y_t + \beta C_{t-1} + u_t \qquad (1)$$

where C and Y refer to real private consumer expenditure and real personal disposable income, respectively, u is a random disturbance term, and t is the time period index. Moreover, "this type of function" Evans emphasized "is consistent with the long-run stability of the C/Y ratio" [4, p. 24]. The above discussion implies that, under stationary conditions, the marginal propensity to consume tends to unity or, equivalently, the sum of the regression coefficients of equation (1) adds up to unity [1, pp. 67 - 69].

All variables appearing in the consumption function at issue are measured in real terms. Consequently, they are obtained by deflating the corresponding nominal variables by the proper price indices. The usual practice is to deflate both private consumer expenditure and disposable income by the consumption deflator, p_c, although some econometric studies, notably [1] and [5], have deflated the income variable by the GNP deflator, p_g. In criticizing the views presented in [1], Evans concluded that the Ball and Drake theoretical proposition concerning the size of the marginal propensity to consume in the very long-run is nothing

* The author is with the Athens School of Economics and Business Sciences. He is indebted to Miss J. Anastassakou for research assistance.

else but the result of an upward statistical bias attributed to the use of the wrong price deflator [4, p. 57] !

II

In Evans' analysis the variables entering in the consumption function are expressed as deviations from their mean values, so that equation (1) may be re-written as

$$c_t = ay_{jt} + bc_{t-1} \tag{2}$$

where the lower case letters c and y denote the real private consumer expenditure and the real disposable income in deviation form, and the index j indicates that the income variable may be deflated either by the p_g or the p_c deflator [1]. Evans asserts that "the use of the GNP deflator instead of the consumption deflator will l o w e r the estimate of the short-run mpc but will r a i s e the sum of the coefficients [of equation (2) to add up to unity] and hence the estimate of the long-run mpc [a/(1 - b)] " [4, p. 57]. (Our emphasis).

Evans' claim is based on the empirical observation that (in the U.S. economy of the 1929 - 60 period) p_g fluctuated more than p_c [3, p. 338]. Based on this observation, Evans concludes that "if values of the variables around the means are considered...,the $(Y^*/p_g)_t$ will be smaller in absolute value than the corresponding $(Y^*/p_c)_t$ [2]. Thus, as each $(Y^*/p_{gt}]$ becomes smaller, the sizes of the moments $\Sigma c_i y_i$, $\Sigma c_{i-1} y_i$, and Σy_i^2 will all decrease. These changes will have very little effect on the numerator of a/(1 - b)... [but they yield small values in the denominator]. Thus the long-run m.p.c. a/(1 - b) will be larger when the deflator for income is p_g instead of p_c [3, p. 338].

To see Evans' point consider the examples in Tables 1 and 2. Upon comparison of the last columns of Tables 1 and 2 it follows that $|{}_g y_t| < |{}_c y_t|$ for every

TABLE 1

t	Y_t^*	p_{gt}	$y_{gt} = Y_t^* / p_{gt}$	$\bar{y}_g$	${}_g y_t = y_{gt} - \bar{y}_g$
1	300	108	277.8	311.6	—33.8
2	380	110	345.4		33.8

t, which is in agreement with Evans' hypothesis. Consider, however, a counter example in Table 3. By comparing the last columns of Tables 2 and 3, we notice that $|{}_g y_t'| > |{}_c y_t|$ for every t, which is in contrast to Evans' argument. Further-

1. The random disturbance term is omitted for simplicity.
2. Symbol Y * stands for nominal disposable income.

TABLE 2

t	Y^*_t	p_{ct}	$y_{ct} = Y^*_t / p_{ct}$	$\bar{y}_c$	$_c y_t = y_{ct} - \bar{y}_c$
1	300	108	277.8		—37.0
2	380	108	351.8	314.8	37.0

more, by examining the p_g and p_c series of the sample period employed by Evans (cf. [2, p. 180]), we notice that they followed a (cyclical) pattern, which is not in accordance with the spirit of the above mentioned quotation. Consequently, one is not in a position to predict the size of $_gY_t$ or $_gY_t'$ relative to $_cy_t$ (where these

TABLE 3

t	Y^*_t	p'_{gt}	$y'_{gt} = Y^*_t / p'_{gt}$	$\bar{y}'_g$	$_g y'_t = y'_{gt} - \bar{y}'_g$
1	300	108	277.8		40.35
2	380	106	358.5	318.15	—40.35

variables are measured as deviations from their means) from the single observation that p_g has changed more than p_c. This in turn implies that Evans' criticism on the Ball and Drake theoretical consideration is not properly founded. Thus he cannot claim that the argument concerning the long-run tendency of the sum of coefficients $a + b$ to add up to unity is the result of a statistical bias [3]. Furthermore, and perhaps more important, one could argue that, if the correct specification of the equation to be estimated has a zero intercept, there is no reason to measure the variables involved as mean deviations. Note, however, that this is the type of function proposed by Ball and Drake, and that it is consistent with the long-run stability of the propensity to consume.

III

In this section we present some empirical evidence, which does not support Evans' contention. In Table 4 we present the estimated consumption functions

3. Nonetheless, it could be argued that the example reported in Table 3 may not be, economically speaking, correct, due to the nature of the U.S. national income accounts, namely the assumed zero productivity in the public sector. The implication of this assumption may be that, over time, p_g may grow faster than p_c because consumption expenditures include the effects of productivity improvements. Hence, the fluctuations of the two price deflators around their mean values may be greater for p_g than p_c. However, there may be other factors affecting the behavior of the variables at issue, for, as may be seen in Section III of this paper, the behavior of either one of the price deflators was not unique during the period under consideration.

by Ball and Drake [eqs (1) - (3)] and Evans [eqs (4) and (5)] from annual data. All variables are cast in real terms and refer to the 1929 - 1962 U.S. economy. In all cases the sum of the coefficients, a + b, takes values between .97 and .98. From among these values, the sum .97 is associated with one equation employing

TABLE 4

Yearly Estimates of the Consumption Function

$$C_t = aY_t + bC_{t-1}$$

Function	Sample period	Coefficients a	b	a + b	$\bar{R}^2$	DW	Deflators used
1. Ball and Drake	1929 - 41	.58 (.08)	.40 (.08)	.98	.96	n.c.	p_g
2. Ball and Drake	1946 - 60	.66 (.13)	.31 (.15)	.97	.99	n.c.	p_g
3. Ball and Drake	1929 - 41 and 1946 - 60	.57 (.06)	.41 (.07)	.98	.99	n.c.	p_g
4. Evans	1929 - 41 and 1947 - 62	.5834 (.0640)	.3875 (.0706)	.9709	.998	1.73	p_c
5. Evans	1929 - 41 and 1947 - 62	.5600 (.0868)	.4202 (.0947)	.9802	.997	1.11	p_g

Numbers in parentheses underneath the coefficients are standard errors.
$\bar{R}^2$ = coefficient of multiple determination adjusted for degrees of freedom.
DW = Durbin - Watson statistic. n.c. = not computed.
Sources: Ball and Drake [1, 1964, p. 76], Evans [3, 1967, p. 347].

the p_g deflator [eq. (2)] and one equation utilizing the p_c deflator [eq. (5)]. This finding is not in agreement with Evans' hypothesis. Furthermore, for the sake of objectivity, we present in Table 5 estimates of the expression $C_t = aY_t + bC_{t-1}$ for the sample periods mentioned in Table 4 by employing, separately, the p_g and p_c deflators [4]. Moreover, since the data set employed by Ball and Drake, and Evans was not available to us, and upon consideration of the data revisions that took place since their papers appeared in the literature, we made use of two sets of data, namely data published near the time period the Ball and Drake paper appeared (see [6] [5]), and more recently revised data (see [2]).

---

4. The year 1929 was employed for lagged consumption. Years prior to 1929 were not available to us.

5. The 1929 - 55 data were obtained from the July 1958 issue, and the 1956 - 62 data from the July 1965 issue of the Survey of Current Business. See [6].

TABLE 5

Yearly Estimates of the Consumption Function $C_t = aY_t + bC_{t-1}$

Equation	Coefficients a	b	a + b	$\bar{R}^2$	DW	Deflators used
A. Sample period, 1930 - 41 :						
A.1 *	.6101 (.1087)	.3515 (.1192)	.9616	.9992	.63	p_g
A.2 *	.5846 (.0859)	.3960 (.0918)	.9806	.9994	.80	p_c
A.3 **	.5621 (.1135)	.3837 (.1282)	.9458	.9990	.63	p_g
A.4 **	.5788 (.0903)	.3935 (.0975)	.9723	.9993	.80	p_c
B. Sample period, 1946 - 60 :						
B.1 *	.5435 (.1015)	.4386 (.1116)	.9821	.9998	1.49	p_g
B.2 *	.6992 (.1026)	.2579 (.1141)	.9571	.9998	1.54	p_c
B.3 **	.4662 (.0990)	.4995 (.1138)	.9657	.9998	1.66	p_g
B.4 **	.7146 (.0952)	.2297 (.1073)	.9443	.9999	1.94	p_c
C. Sample period, 1930 - 41 and 1946 - 60						
C.1 *	.5800 (.0730)	.3959 (.0802)	.9759	.9997	.99	p_g
C.2 *	.5949 (.0608)	.3760 (.0672)	.9709	.9998	1.43	p_c
C.3 **	.5207 (.0702)	.4356 (.0804)	.9563	.9997	1.03	p_g
C.4 **	.5882 (.0596)	.3743 (.0667)	.9625	.9998	1.44	p_c
D. Sample period, 1930 - 41 and 1947 - 62						
D.1 *	.5639 (.0893)	.4162 (.0974)	.9801	.9997	.96	p_g
D.2 *	.5682 (.0643)	.4040 (.0709)	.9722	.9998	1.63	p_c
D.3 **	.5132 (.0858)	.4471 (.0975)	.9603	.9996	.96	p_g
D.4 **	.5813 (.0640)	.3816 (.0715)	.9629	.9998	1.54	p_c

Numbers in parentheses underneath the coefficients are standard errors.
$\bar{R}^2$ = coefficient of multiple determination adjusted for degrees of freedom.
DW = Durbin - Watson statistic.

Sources : * and ** indicate that the equations at issue were estimated with data obtained from [6] and [2], respectively.

Upon inspection of the results reported in Table 5, we notice the following : The numerical values of the regression coefficients associated with the first two equations in parts A - D of this table are not far from those obtained by Ball and Drake, and Evans due to the fact that the data used to estimate these regressions are more or less contemporary to those employed by these authors. On the contrary, the numerical values of the coefficients of the last two equations in parts A - D of Table 5 are not so close to those reported in Table 4 because they are based on more recently revised data. The statistical evidence does not lend support to Evans' contention, namely that the long-run marginal propensity to consume or equivalently the sum of coefficients a + b tends to unity, when p_g rather than p_c is used to deflate personal disposable income. For as may be seen in Table 5, in fifty per cent of the cases, the sum of the coefficients was greater whenever the p_c deflator was used (equations A.2, A.4, C.4, and D.4). The numerical magnitude of the sum a + b ranged between 0.9458 - 0.9821 and 0.9443 - 0.9806 when the p_g and p_c deflators were used, respectively. Consequently, the Ball and Drake theoretical proposition, as far as the numerical magnitude of the long-run marginal propensity to consume is concerned, holds regardless of the price deflator used.

REFERENCES

[1]. Ball, R. J. and Drake, P. S., "The Relationship Between Aggregate Consumption and Wealth", *International Economic Review*, Vol. 5, No. 1 (Jan. 1964), pp. 63 - 81.

[2]. Council of Economic Advisers, *The Economic Report of the President* (Washington : Government Printing Office, 1970).

[3]. Evans, M.K., "The Importance of Wealth in the Consumption Function", *The Journal of Political Economy*, Vol. 75, No. 4 (Aug., 1967), pp. 335 - 351.

[4]. Evans, M. K., *Macroeconomic Activity: Theory, Forecasting and Control* (New York : Harper and Row Publishers, 1969).

[5]. Klein, L. R., "Problems in the Estimation of Independent Systems", in H. Wold, ed., *Model Building in the Human Sciences* (Monaco : Union Européenne d' 'Editions, 1967).

[6]. U. S. Department of Commerce, *Survey of Current Business*, Office of Business Economics, issues of July 1958 and July 1965.