

# *Estimation of the Short-run Effects of Fiscal Policy in Ireland, 1960—1970<sup>1</sup>*

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*Abstract:* Apart from input-output studies, little effort appears to have been made to construct general-purpose macro-economic models of the Irish economy. A paper by Brendan Walsh is one exception. (See his "Econometric Macro-Model Building in the Irish Context", *ESRI Quarterly Economic Commentary*, June 1970.) The present study is an attempt to move some small distance in filling the significant gap which still remains in the macro-economic analysis of the economy. Apart from their possible academic interest, models of the kind developed here should be of interest to Government as guides in the formation of budgetary policy. The model constructed in this paper may also be of interest to banks and large industrial firms concerned with macro-economic forecasting as a basis for their own short-run planning.

**F**ROM the standpoint of economic policy, among the principal features which highlight the 1960s as compared to the early and mid 1950s in Ireland are:

- (i) Expansionary domestic fiscal policies replacing those of demand deflation.
- (ii) Greater realisation at decision-making levels that economic growth would, to a large extent, be contingent on performance of industrial exports. Industrial development policy accordingly became much more export orientated. Fiscal incentives played a major role in this longer-run development policy.<sup>2</sup>

1. This material draws on Chapter 3 of the author's doctoral dissertation, Norton (1973). Critical guidance and discussion by Bent Hansen and Richard Sutch are greatly appreciated.

2. The industrial grants scheme dates from 1952, but it was not until legislation of 1956 and 1959 that new industrial projects located outside the designated under-developed areas became eligible for such assistance. The tax holiday was introduced by legislation of 1956. It could not have been expected that such measures would have much impact in the short-run, and the Control of Manufactures Acts seem to have adversely influenced their effectiveness. On the latter point, see Whitaker (1958), p. 232. The tax relief and grant schemes had negligible impacts on economic activity until about 1960. See Dermot McAleese, (1974).

- (iii) Changes in official attitudes toward borrowing from abroad, whether in the form of direct investment in Ireland by foreign industrialists, or by way of borrowing in foreign capital markets by the State and its enterprises. Thus, the Control of Manufactures Acts, 1932 and 1934, designed to ensure that Irish industry would be under the control of Irish nationals, were amended in 1958 so as to exempt from the operation of the Acts new export orientated foreign owned industry, and those restrictions were removed entirely in 1964. In the later 1960s, taboos on State borrowing in foreign capital markets were cast aside.

Given the official attitudes concerning the appropriate magnitude of external reserves, and in the absence of early realisation of need for the changes in (ii) and (iii), macro-economic policy in the early and mid 1950s was almost inevitably deflationary, resulting in the highest emigration rates for decades in 1957-58. Despite policies of growth through import substitution in 1926-50, the propensity to import had actually increased between the 1930s and the 1950s (see Kennedy (1971)). Due to the high and increasing import propensity (see McAleese (1973), also Geary (1965)), and in the absence of considerable foreign borrowing (which does not appear to have been officially regarded as a relevant possibility) economic growth in the 1950s had to founder on both current account and capital account balance of payments constraints unless exports of goods and services<sup>3</sup> increased sufficiently fast. Thus, the expansionary domestic fiscal policies of the 1960s, mentioned in (i), could hardly have been maintained but for the changes in (ii) and (iii).

To assess the short-run effects, on real income and on the balance of payments on current account, of fiscal policy changes in 1960-70, we ideally need a macro-model of the economy. Since we are concerned primarily with the short-run, we can regard exports in a given year as exogenously determined in the given year. But in drawing conclusions concerning the longer-run impact of fiscal measures on economic growth, we must recognise that exports—industrial exports in particular—were at least in part endogenously determined by fiscal incentives.

## I

### *Estimation of Short-Run Effects of Fiscal Policy: Methodology*

The methodology to be employed to assess the short-run effects of fiscal policy changes in the eleven years 1960-70 is an extension of that used by Bent Hansen (1968), W. Snyder, and T. Tanaka (1972) in their studies of eight other countries. (The latter is identical to that employed by Hansen).

3. The role of exports of services in relaxing current account balance of payments constraints should not be overlooked. In their forthcoming book, Kieran Kennedy and Brendan Dowling (1975) analyse failures in the development of tourism as among the major deficiencies of policy in the late 1940s and early 1950s.

(a) *Hansen's Methodology*

In order to grasp the essence of the method used, we first outline a simplified version of Hansen's approach. Consider the model:

$$\begin{aligned} \text{(A-1)} \quad Y &= C + I + G \\ C &= \alpha(Y - T) + \beta \\ T &= \gamma + tY \end{aligned}$$

where  $Y$  is national income,  $C$  private consumption,  $I$  private investment,  $G$  government expenditure on goods and services,  $T$  income tax receipts, and  $t$  the marginal tax rate. The three variables on the left hand side are endogenous,  $G$  and  $t$  are policy variables, and we assume that  $I$  is an autonomous exogenous variable. For changes from year to year, (A-1) implies:

$$\text{(A-1')} \quad dY = \frac{I}{1 - \alpha(1 - t)} [dI + dG - \alpha Y dt]$$

The effects on real national income of discretionary budget changes,  $E_{disc}$ , are defined by Hansen as the difference between the actual change in income,  $dY$ , and the change which would have occurred had no discretionary budget changes been made (only automatic tax revenue budget changes would then at most occur). Thus, (A-1') implies:

$$\text{(A-1'')} \quad E_{disc} = dY - \frac{I}{1 - \alpha(1 - t)} dI$$

Any set of annual observations, if it satisfies model (A-1), will also satisfy its truncated version:

$$\begin{aligned} \text{(A-2)} \quad Y &= C + I + G \\ C &= \alpha(Y - T) + \beta \end{aligned}$$

where  $T$  rather than  $t$  is now regarded as a policy variable on the revenue side. For year to year changes, (A-2) implies.

$$\text{(A-2')} \quad dY = \frac{I}{1 - \alpha} [dI + dG - \alpha dT]$$

The effects on real income of total budget changes,  $E_{tot}$ , are defined by Hansen as the difference between the actual change in income and the change which would have occurred had there been no changes at all in the budget, either automatic revenue changes or discretionary changes (this in fact implies a zero marginal rate of taxation). (A-2') then yields:<sup>4</sup>

$$(A-2'') \quad E_{tot} = dY - \frac{I}{1-\alpha} dI$$

(A-1'') and (A-2'') imply that:

$$(A-3) \quad E_{disc} - E_{tot} = dY - \frac{I}{1-\alpha(1-t)} dI - dY + \frac{I}{1-\alpha} dI$$

$$(A-3') \quad = \frac{I}{1-\alpha} dI - \frac{I}{1-\alpha(1-t)} dI$$

which, since  $0 < t < 1$ , will have the same sign as  $dI$ .

The right hand side of (A-3') is the difference between the change in income which would have occurred due to non-budgetary forces had there been no automatic tax revenue responses, and the change in income which would have taken place due to non-budgetary forces with automatic budget responses taken into account. (A-3') is therefore the dampening exerted by automatic budget responses on income fluctuations generated by non-budgetary forces. Hence, the automatic effects of the budget,  $E_{aut}$ , can be defined as:

$$(A-4) \quad E_{aut} = E_{tot} - E_{disc}, \text{ opposite in sign to } dI.$$

The exact equations above are, of course, too simple for empirical use. The actual model (in its non-truncated version) employed by Hansen-Snyder-Tanaka consisted of seven equations. Some features of their approach deserve passing comment. First, marginal rates of direct and indirect taxation,  $t_d$  and  $t_i$ , were assumed constant throughout their sample periods, being estimated by least squares methods. Discretionary  $dt_d$  and  $dt_i$  in any year were then computed as the difference between observed  $t_d$  and  $t_i$ , and  $t_d$  and  $t_i$  as estimated in the regressions. Second, private investment was assumed autonomous. Third, monetary considerations were excluded from the model (see, however, Hansen (1973)). For those reasons, Hansen, in his study of fiscal policy in seven OECD countries,

<sup>4</sup>. The author is grateful to Kieran Kennedy for discussion which led to improvement in the exposition in the following few sentences.

supplemented the conclusions inferred from his model with non-econometric empirical and qualitative analyses. Finally, Hansen's model was static and included no lagged variables. That amounts to assuming that all the effects of budget changes appear in the period in which the changes were made. That procedure can, however, be defended. Several studies have suggested that the lags in the effects of fiscal policy changes are short, relative to monetary measures (see, for example, Fromm and Taubman (1968), Ando and Modigliani (1969), Hamburger (1969), Fisher and Sheppard, (1972)). In testing for the existence of lags in the effects of fiscal policy changes in Europe, Hansen likewise concluded that the lags between changes in the levels of fiscal policy variables and most of their effects were relatively short.

(b) *Ireland: The Basic Model Used*

The model chosen in this paper for short-run fiscal policy analysis of Ireland was:

$$(B-1) \quad Y = C + I_f - M + I_s + G_c + I_g + X + X_f + D_p$$

$$(B-2) \quad P_y Y = P_c C + P_{i_f} I_f - P_m M + P_{i_s} I_s + P_{g_c} G_c + P_{i_g} I_g + P_x X + P_m X_f + D_{c_p}$$

$$(B-3) \quad P_c = P(1 + t_i)$$

$$(B-4) \quad T_i = P C t_i$$

$$(B-5) \quad P_{y_p} Y_p = P_y Y - T_i - PROF - D_c - ADJ - GTIY + ND + OTI$$

$$(B-6) \quad T_d^p = t_d P_{y_p} Y_p$$

$$(B-7) \quad T_d^c = t_d^c PROF_{t-1}$$

$$(B-8) \quad C = \alpha_1 + \beta_1 [(P_{y_p} Y_p - T_d^p)/P_c]_{t-1} + \beta_2 \Delta [(P_{y_p} Y_p - T_d^p)/P_c]$$

$$(B-9) \quad I_f = \alpha_2 + \beta_3 [(PROF - T_d^c)/P_{i_f}] + \beta_4 (CTH/P_{i_c} + CTE/P_{ime}) + \beta_5 (Y_{t-1} - Y_{t-2})$$

$$(B-10) \quad M = \alpha_3 + \beta_6 (I_f + I_g) + \beta_7 (C + X + I_s)$$

$$(B-11) \quad PROF = \alpha_4 + \beta_8 (P_y Y) + \beta_9 [(\Delta P_y Y)/(P_y Y)_{t-1} - \Delta E/E_{t-1}]$$

The variables are defined as follows:

*Endogenous:*

- $Y, P_y Y, P_{yp} Y_p$  : Real GNP, money GNP, nominal personal income.
- $T_i, T_d^p, T_d^c$  : Total revenue from indirect taxation less subsidies, from direct taxes on persons, and from direct taxes on companies.
- $C, P_c$  : Real consumers' expenditure on goods and services, consumer price index.
- $I_r$  : Real private fixed investment, net. Investment by State enterprises is included in this series.
- $M$  : Real imports.
- $PROF$  : Undistributed profits of companies before tax, net.

*Exogenous:*

- $P_{gc} G_c, P_{ig} I_g$  : Value of central and local government current expenditure on goods and services, and on gross fixed investment.
- $P_x X, P_m X_f$  : Value of non-factor exports, and of factor exports.
- $CTH, CTE$  : Capital transfers by government to households, and to enterprises, nominal.
- $P_{is} I_s, ADJ$  : Value of changes in stocks, adjustment for stock appreciation.
- $ND, GTIY, OTI$  : National Debt interest, government trading and investment income, other transfer income.
- $E$  : Average industrial employee earnings, nominal.
- $t_i, t_d^p, t_d^c$  : Marginal rate of indirect taxation less subsidies, of direct taxation on persons, and of direct taxation on companies.
- $P, P_m$  : Index of prices of consumer goods net of indirect taxation, import price index.
- $P_{if}, P_{ic}, P_{ime}$  : Private fixed investment price index, construction price index, machinery and equipment price index.
- $D_c, D_{cp}, D_p$  : Nominal total depreciation, nominal private depreciation, real private depreciation.

*Note:* All variables in real terms are expressed in 1958 prices, and for all price indices, 1958 = 1.

This model is more complete than that of Hansen-Snyder-Tanaka. Some comments concerning some further equations which might have been included are, however, desirable.

#### *Investment in Stocks (Inventories)*

Several attempts were made to specify a stock equation. Forms like the following were considered:

$$I_s = \psi(X_a, W) + \delta(K_{s,t}^d - K_{s,t-1})$$

The function  $\psi(X_a, W)$ , where  $X_a$  denotes agricultural exports, and  $W$  is a dummy variable representing the weather, was specified in the hope of tracking down changes in agricultural stocks. The second group of terms,  $\delta(K_{s,t}^d - K_{s,t-1})$ , is a flexible accelerator for stock changes outside agriculture. It says that changes in such stocks are a function of the difference between the desired level of stocks at the end of the current period ( $K_{s,t}^d$ ), and the actual level at the end of the previous period ( $K_{s,t-1}$ ). The coefficient  $\delta$ ,  $0 < \delta < 1$ , denotes the speed of adjustment. Thus, it was assumed that only some proportion of the gap between the desired and the actual level of inventories was made up in the current period. Assuming  $K_{s,t}^d = \alpha S_t$ , where  $S_t$  represents current sales, we can write (for non-agriculture):

$$I_{s,t} = \delta \alpha S_t - \delta K_{s,t-1}$$

i.e., actual investment in stocks outside agriculture will be higher the larger the current volume of sales, and lower the greater the volume of stocks carried over from the previous time period.

No regressions, however, were run for the stock equation: one could infer by inspection that *a priori* plausible stock equations would not fit the Irish data. That indeed, is common experience: economists attempting to make stock changes endogenous to short-run models normally report poor fits (see, for example, Evans (1970)). That is largely because the determinants of even the desired level of stocks differ between economic activities (for a useful discussion, see Darling and Lovell (1965)), and besides, as we know from elementary Keynesian theory, part of investment in stocks is planned, part unplanned, or unanticipated. For the above reasons, it was decided to regard investment in stocks as exogenous in the model.

#### *Private Fixed Investment, Net*

An attempt was initially made to specify two private fixed investment functions—one for machinery and equipment, one for construction. Published Irish data are not, however, adequate to infer such series: the only private net investment series that could be inferred was that for total private fixed investment, net.

### *The Monetary Sector*

The absence of monetary variables from the model has probably been noticed. Although an attempt was made to model the monetary sector and its interaction with the expenditure sector, this effort was ultimately abandoned due to data limitations. The exclusion from the model of the monetary sector can also be defended on the grounds that in Ireland, with a very liquid banking system during much of the period, and where credit advice by the Central Bank (the main "instrument" of monetary policy in the 1960s) had only limited success, money supply variables tended to react passively to demand,<sup>5</sup> so that the money supply acted as a permissive rather than as a causal factor in income growth.

### *Exogenous Prices*

Apart from the impact of indirect taxes on the consumer and GNP price indices, all prices were regarded as exogenous. Although it is a simplification, such a procedure appears reasonable in the context. Thus, the Central Bank has remarked that "to the extent that excessive demand is satisfied through imports or through diversion to internal use of exportable products, it reflects itself in a balance-of-payments deficit rather than in increased prices. This tends to be the position in a small highly open economy such as that of Ireland" (Central Bank (1964)).

### *Some Remarks on the Included Equations*

The high degree of aggregation in the model reflects the degree to which data were available. The model is an "honest" one in the sense that the specification in a given equation is the outcome of *a priori* economic reasoning given the constraints of the available data. No attempt was made to "play with the machine" by running regressions for a large number of alternative specifications of a given equation, and then choosing the specified equations by the criteria of "nice"  $R^2$  and  $t$  statistics; contrary to what is often assumed, such a procedure might have little economic or statistical meaning.

The consumption function, Equation (B-8), permits the relation between consumption and annual disposable income to shift upwards over time, and in doing so, allows for a possible ratchet in the short run. This is consistent with several modern theories of the consumption function.

Because of their magnitudes in Ireland, it was expected that investment subsidies would be important determinants of fixed investment. CTH in the investment function, (B-9), consists of grants by the State to households and

5. J. Oslizlok, (1964, pp. 128-9), economist at the Central Bank, noted in May 1963 that "the most likely explanation of the remarkable stability of income velocity in Ireland is precisely the absence of an active monetary policy". Apart from the openness of the economy, the inability of the Bank to control the money supply was largely due to the fact that the Bank did not have legal power to impose minimum reserve ratios on the commercial banks, because the commercial banks did not feel that they ought decline government requests for credit, and because of the particular system of overdraft borrowing then prevailing in Ireland.

non-profit making bodies. A large part of these grants financed the improvement and construction of housing, universities and schools. CTE, capital transfers to enterprises, are defined (CSO, 1972) as "unrequited payments regarded as being paid into the capital accounts of enterprises which will result in expenditure on capital formation". They have increased very substantially since the late 1950s. They include not only the important class of grants made by An Foras Tionscal (the Grants Board) and the Industrial Development Authority, but also a variety of other grants, such as those for farm buildings, those to Bord Iascaigh Mhara (the Sea Fisheries Board), to Bord Fáilte (the Irish Tourist Board), and a large range of other capital transfers to enterprises. On the basis of contacts with the Department of Finance, no lag was specified for those variables. The expression for profits in the investment function is an internal liquidity variable. It was, however, recognised that a large part of investment plans are formulated about one year ahead (see Evans (1969) for a survey of the evidence on this point in the USA). Thus,  $Y_{t-1} - Y_{t-2}$ , the change in real income in the previous year, can be interpreted as an expectations phenomenon determining plans in year  $t-1$  to invest in year  $t$ .

The import function, (B-10), is of a simple Keynesian variety. In the light of available evidence, the exclusion of price or international exchange rate variables does not appear too serious an omission (McAleese (1973)). Had more observations over time been available, separate import coefficients would have been estimated for each of the components of aggregate demand. The simple specification reflects the problem of degrees of freedom when the number of observations over time is small.<sup>6</sup>

The final equation, (B-11), relates the undistributed profits of companies to national income. The specification does, however, recognise that profits are likely to be higher the greater the rate of growth of nominal GNP relative to employee remuneration.

### *The Data*

The objective was to measure the effects on real GNP, and on the balance of international payments on current account, of changes in fiscal policy variables in each *calendar* year, 1960-70. The Irish National Accounts, however, classify government sector variables on the basis of the *fiscal* year (three quarters of the current calendar year, one quarter of the next calendar year). Thus, in years when real government expenditure is rising (and it was rising in the period under review), reported real GNP is actually an overestimate of "true" real GNP. Almost all of the National Accounts data had to be adjusted to take account of that procedure. The method adopted was as follows: Government current expenditure on goods and services at market prices in year  $t$  was estimated as  $P_{gc}G_c(t) = .25(P_{gc}G_c(t-1))^* + .75(P_{gc}G_c(t))^*$ , where  $(P_{gc}G_c(\cdot))^*$  is government expenditure at market prices as reported in the Irish National Accounts. All

6. For estimates, derived by input-output methods, of the direct and indirect import content of different categories of final demand in Ireland, see Henry (1972).

government sector variables were transformed in a similar manner. The data used, along with a detailed description of the method of derivation, will be sent to the reader upon request to the author.

### Estimation of Parameters

Equations (B-1), (B-2) and (B-5) are standard national income identities: no estimation of parameters was required here. Those for taxes and the consumer price index, equations (B-3), (B-4), (B-6) and (B-7), constitute four equations in four unknowns,  $P$ ,  $t_1$ ,  $t_2^p$ , and  $t_2^c$ , and can therefore be solved for those unknowns in each year under consideration.<sup>7</sup> The four remaining equations, (B-8), (B-9), (B-10) and (B-11), are stochastic. Because of lack of further data,<sup>8</sup> their parameters had to be estimated using observations from only the thirteen years 1958-70. A question arises: should the coefficients be estimated by ordinary least squares (OLS) or by some simultaneous equations method, such as instrumental variables estimation (INST)?<sup>9</sup>

The OLS estimator in a simultaneous system is biased, and is not even statistically consistent. The INST estimator is, if appropriate instrumental variables can be found, consistent; it is asymptotically unbiased, or expressed otherwise, it is unbiased in very large samples. In reality the economist must normally work with small samples, but *a priori* theorising does not tell us whether INST is preferable to OLS in such circumstances. Equations (B-8) to (B-11) were, accordingly, estimated by both OLS and INST.<sup>10</sup> The coefficient estimates were (standard errors in parentheses):

#### Equation (B-8)

OLS	$\alpha_1 = 52.8300$ (10.1448),	$\beta_1 = .8242$ (.0175)
	$\beta_2 = .6588$ (.0952),	$R^2 = .9965$ , $d = 1.8101$
INST	$\alpha_1 = 54.0687$ (10.6630),	$\beta_1 = .8182$ (.0198)
	$\beta_2 = .7365$ (.1584),	$R^2 = .9962$ , $d = 1.8100$

7. This method of estimation constrains the tax functions to be homogeneous of degree one. An alternative procedure, namely, estimating the tax functions by regression (as in the studies of Hansen-Snyder-Tanaka) seems to be more objectionable than that adopted by the author. (Recall the discussion of Hansen's procedure at the end of Section 1-A, above.)

8. As stated, the official National Accounts data had to be re-estimated by the author, and for that purpose, sufficiently complete data were not available for before 1958. 1970 was the latest year for which data were available at the time this study was in progress.

9. Due to the small number of observations and the resulting degrees of freedom problem, it is not here possible to use the pure two stage least squares estimation procedure (which employs all exogenous variables in the model as instrumental variables). Discussion of the appropriate choice of instrumental variables (when, as here, the number of observations is small), and of pure two stage least squares (when the number of observations is sufficiently large) can be found in, for example, A. Goldberger, *Econometric Theory*, Wiley, (1964), pp. 284-287 and Chapter 7, and (for simple geometric interpretations) in R. Wonnacott and T. Wonnacott, *Econometrics*, Wiley, (1970), Chapters 17-20.

10. The following were employed as instrumental variables in the estimation procedure: For (B-8),  $I_t$ ,  $X_t$ ; for (B-9),  $I_t$ ,  $X_t$ ; for (B-10),  $I_t$ ,  $X_t$ ; for (B-11),  $P_t X_t$ ,  $\Delta E/E_{t-1}$ .

## Equation (B-9)

$$\begin{array}{ll} \text{OLS} & \alpha_2 = 21.2747 \quad (7.2615), \quad \beta_3 = -.0387 \quad (.0175) \\ & \beta_4 = 3.2797 \quad (.5709), \quad \beta_5 = .2898 \quad (.1696) \\ & & R^2 = .9418, \quad d = .7911 \end{array}$$

$$\begin{array}{ll} \text{INST} & \alpha_2 = 18.1381 \quad (11.4753), \quad \beta_3 = .2724 \quad (.0395) \\ & \beta_4 = 3.0422 \quad (.8828), \quad \beta_5 = .2339 \quad (.2329) \\ & & R^2 = .9398, \quad d = .7829 \end{array}$$

## Equation (B-10)

$$\begin{array}{ll} \text{OLS} & \alpha_3 = -168.4369 \quad (29.4197), \quad \beta_6 = 1.0228 \quad (.3642) \\ & \beta_7 = .4921 \quad (.0756), \quad R^2 = .9969, \quad d = .7223 \end{array}$$

$$\begin{array}{ll} \text{INST} & \alpha_3 = -191.5916 \quad (42.5256), \quad \beta_6 = .7831 \quad (.5347) \\ & \beta_7 = .5513 \quad (.1081), \quad R^2 = .9967, \quad d = .8620 \end{array}$$

## Equation (B-11)

$$\begin{array}{ll} \text{OLS} & \alpha_4 = -16.0656 \quad (3.3100), \quad \beta_8 = .0594 \quad (.0035) \\ & \beta_9 = 135.8933 \quad (45.6339), \quad R^2 = .9772, \quad d = 2.1465 \end{array}$$

$$\begin{array}{ll} \text{INST} & \alpha_4 = -16.4472 \quad (3.4826), \quad \beta_8 = .0591 \quad (.0044) \\ & \beta_9 = 151.6035 \quad (92.9484), \quad R^2 = .9769, \quad d = 2.2083 \end{array}$$

The INST coefficient estimates conform to expectations. In OLS, on the other hand,  $\beta_3$  has the wrong sign and  $\beta_6$  appears too large. For those reasons, it was the INST estimates that were used in further calculations. Also, since the Basic Model above, and its Truncated Version (below), are non-linear, most of the remaining computations on the model used the Berkeley C4 *Cal Simex* programme for solving systems of non-linear equations (Baer, 1971).

*Cal Simex* was used to solve the system for real income as predicted by the model in each year, 1960-70.<sup>11</sup> Table I shows that the Basic Model fits the data quite well.

TABLE I: Actual versus predicted real GNP, £ million, 1958 prices

Year	1960	1961	1962	1963	1964	1965
Actual	657.6	689.5	711.3	740.2	764.6	786.6
Predicted	656.3	688.1	701.8	724.6	753.3	791.5
Year	1966	1967	1968	1969	1970	
Actual	799.0	842.3	913.6	941.5	963.3	
Predicted	807.4	839.6	904.5	945.4	968.1	

Note: It is predicted, rather than actual, real GNP that is used in subsequent calculations.

11. Recall note 8. Note also that because much of the analysis which follows deals with the effects of changes in the values of policy variables, and because of lags in some of the equations, the years 1958-9 could not be incorporated into the main body of analysis.

## II

*The Short-run Effects on Real GNP of Fiscal Policy Changes*

The following variables were regarded as controls in assessing the effect of discretionary budget measures:  $P_{gc}G_c$ ,  $P_{ig}I_g$ ,  $CTE$ ,  $CTH$ ,  $t_i$ ,  $t_d^p$ , and  $OTI$ . The procedure adopted was to set, in the reduced form real income equation,<sup>12</sup> the control variables at the following levels: Government expenditure on goods and services at current market prices in year  $t$  was set at the level which prevailed in year  $t-1$  (no change in the value of government expenditure). Real government current expenditure and real government gross investment were then computed by multiplying the figures resulting from the last-mentioned operation by their implicit price deflators. The figures for  $CTE$  and  $CTH$  were handled in like manner, while  $OTI$  in year  $t$  was replaced by the value the same variable had in year  $t-1$  (no change in capital transfers to enterprises, or to households, or in "other transfer income"). The marginal tax rates,  $t_i$  and  $t_d^p$ , in year  $t$  were set at the levels which prevailed in  $t-1$ . (The latter procedure may appear objectionable; some comments on it are made below.)

On the assumption of no change in discretionary budget policy, the above values of the government control variables were plugged into the reduced form real income equation to give an estimate of the level of real GNP which would have prevailed had no change in discretionary budget policy, from the previous year's action, been made. (See Table 2.)

TABLE 2: *Level of income that would have prevailed had no change in discretionary budget policy taken place, £ million, 1958 prices*

Year	1960	1961	1962	1963	1964	1965
Y	648.3	677.1	689.9	714.3	733.4	777.2
Year	1966	1967	1968	1969	1970	
Y	803.6	829.0	881.6	919.4	940.8	

12. Because the reduced form real income equation is quite complicated, it is not presented here. It will, however, be sent to the reader on request. Note that, because it is non-linear, its coefficients are not, in general, multipliers for a single exogenous variable. Rather, the multiplier for a given exogenous variable in a given year in general depends on the values of other exogenous variables in that year. Therefore, the multiplier for a given variable in fact varies from year to year. That is quite consistent with stable functional forms. The author made no attempt to derive these variable multipliers arithmetically. That would be a tedious task, but it can be performed directly using the reduced form real income equation. Contingent on financial support for the hire of a research assistant, it is planned to expand and disaggregate the present model considerably, and to compute more operationally meaningful, less aggregative, multipliers. It is not expected to have those results until about two years from now.

Some readers may, as remarked above, object to the treatment of  $t_i$  and  $t_d^p$  as control variables. They are, in fact, only imperfectly so, being partly endogenous. Appropriate variations in the estimated  $t_i$  and  $t_d^p$  were therefore made. The levels of income predicted, however, did not alter significantly from those shown in Table 2. The objection does not, accordingly, invalidate the procedure adopted.

In order to assess the effects of total budget changes, resort has to be made to the Truncated Version of the Basic Model. The Truncated Version consists of eight equations in eight unknowns,  $Y$ ,  $P_y Y$ ,  $P_c$ ,  $P_{yp} Y_p$ ,  $C$ ,  $I_t$ ,  $M$ , and  $PROF$  :

$$(C-1) \quad Y = C + I_t - M + I_s + G_c + I_g + X + X_f + D_p$$

$$(C-2) \quad P_y Y = P_c C + P_{it} I_t - P_m M + P_{is} I_s + P_{gc} G_c + P_{ig} I_g + P_x X + P_m X_f + D_{cp}$$

$$(C-3) \quad P_c = P + (T_i/C)$$

$$(C-4) \quad P_{yp} Y_p = P_y Y - T_i - PROF - D_c - ADJ - GTIY + ND + OTI$$

$$(C-5) \quad C = \alpha_1 + \beta_1 [(P_{yp} Y_p - T_d^p)/P_c]_{t-1} + \beta_2 \Delta [(P_{yp} Y_p - T_d^p)/P_c]$$

$$(C-6) \quad I_t = \alpha_2 + \beta_3 [(PROF - T_d^p)/P_{it}] + \beta_4 (CTE/P_{ic} + CTH/P_{ime}) + \beta_5 (Y_{t-1} - Y_{t-2})$$

$$(C-7) \quad M = \alpha_3 + \beta_6 I_t + \beta_6 I_g + \beta_7 C + \beta_7 (X + I_s)$$

$$(C-8) \quad PROF = \alpha_4 + \beta_8 P_y Y + \beta_9 [\Delta P_y Y / (P_y Y)_{t-1} - \Delta E/E_{t-1}]$$

The data employed for the Truncated Version was the same as that used in computing the level of income that would have prevailed had no discretionary budget changes taken place, except that  $T_d^p$  and  $T_i$  in year  $t$  were allotted the values they actually had in year  $t-1$ . The *C4 Cal Simex* programme was used to solve the Truncated Version for each of the endogenous variables in each year under review. That procedure led to the following estimates of the level of income which would have prevailed had no changes at all (automatic or discretionary) occurred in the budget:

TABLE 3: *Real GNP on assumption of no changes at all in budget, £ million, 1958 prices*

Year	1960	1961	1962	1963	1964	1965
Y	651.5	681.0	694.1	716.6	741.0	782.9
Year	1966	1967	1968	1969	1970	
Y	810.4	834.8	890.9	927.3	950.4	

Drawing on the definitions of  $E_{disc}$ ,  $E_{tot}$ , and  $E_{aut}$  in Section I above, the effects on real income of changes in the budget, and  $E_{aut}$ , can now be calculated from Tables 1 to 3, giving:

TABLE 4: *Effects of budget changes, £ million, 1958 prices*

Year	$E_{disc}$	$E_{tot}$	$E_{aut} = E_{tot} - E_{disc}$
1960	8.0	4.8	-3.2
1961	11.0	7.1	-3.9
1962	11.9	7.7	-4.2
1963	10.3	8.0	-2.3
1964	19.9	12.3	-7.6
1965	14.3	8.6	-5.7
1966	3.8	-3.0	-6.8
1967	10.6	4.8	-5.8
1968	22.9	13.6	-9.3
1969	26.0	18.1	-7.9
1970	27.3	17.7	-9.6

In order to facilitate comparisons over time and across countries, the above figures will be normalised by dividing them by real GNP of the previous year and multiplying by a hundred. They then express the effects as percentage changes of real GNP:  $e_{disc} = 100E_{disc}/GNP_{t-1}$ ,  $e_{tot} = 100E_{tot}/GNP_{t-1}$ ,  $e_{aut} = e_{tot} - e_{disc}$ .

TABLE 5: *The normalised effects*

Year	$e_{disc}$	$e_{tot}$	$e_{aut}$
1960	1.27	.77	-.50
1961	1.67	1.08	-.59
1962	1.72	1.12	-.60
1963	1.46	1.13	-.33
1964	2.74	1.69	-1.05
1965	1.89	1.14	-.75
1966	.48	-.38	-.86
1967	1.32	.60	-.72
1968	2.72	1.61	-1.11
1969	2.87	2.00	-.87
1970	2.89	1.88	-1.01
Average, 1960-70	1.91	1.15	-.76

Largely because of the differences in the model used, and in the time period considered, the results derived above for Ireland, 1960-70, are not strictly comparable to those derived by Hansen (1968) for seven other countries in the period 1955-65. Making such comparisons, the following conclusions nevertheless appear to be valid.

First, the average automatic budgetary effect in Ireland ( $\cdot76$ ) was less than the average for the seven OECD countries studied by Hansen ( $\cdot87$ ); it was considerably smaller in the early part of the 1960s, and was substantially smaller than the average for France, Germany, and Italy. An important reason why the average automatic budgetary effect in Ireland was considerably below the average for those countries is the fact that, in the early part of the period, the Irish government relied on a very narrow income tax base and on indirect taxation of commodities low in income elasticity of demand. Throughout the whole period, furthermore, the Irish government sacrificed a short-term policy instrument because of the lag in receipts from taxes on undistributed profits of companies. The broadening of the Irish tax base since 1964 (in so far as both direct and indirect taxes are concerned) is reflected in the rise in the Irish  $e_{aut}$  figures for more recent years.

Second, the average effect of discretionary budget changes in Ireland was substantially greater than in most of the countries studied by Hansen. This is explained by the fact that expansionary fiscal measures were overwhelmingly the dominant macro-economic policy instruments in the 1960s. Indeed, the main constraint on public capital expenditure (including subsidisation of investment in the private sector) in 1960-70 appears to have been the volume of funds the State felt it could raise.

### III

#### *The Short-run Effect of Discretionary Budget Changes on the Balance of Payments on Current Account*

Successive Irish Ministers for Finance have indicated that paramount among the objectives of short-term budget policy have been:

- (1) A high level of real aggregate demand.
- (2) A satisfactory level of external reserves. In the case of Ireland, with large net "autonomous" capital inflows since 1958, this has meant moderate deficits in the balance of payments on current account.
- (3) Equity, and the avoidance, if possible, of inflation.

The question of using the Basic Model for purposes of optimisation was considered at this stage. A common optimisation procedure applied to models of the kind under consideration is to assume that the policy makers' criterion function is quadratic, and to minimise the deviations over time between desired

levels of target variables and the actual levels of those variables, subject to the constraints imposed by the structural equations.<sup>13</sup> Thus, it could be assumed that the objective of policy was to minimise the deviations between target real income and target current account international payments deficit, and actual real income and the actual payments deficit. Although such an exercise would be interesting from a computational standpoint, it could hardly be regarded as good *applied* economics for the problem at hand. That is because, given the proposed arguments of the criterion function, the assumption that it is quadratic is not plausible; governments do generally prefer real income, for example, to be  $x$  per cent above target to a situation in which it is  $x$  per cent below target.

As we do not know the policy makers' criterion function, the best one can do, it appears, is to let the policy makers decide for themselves on the wisdom of their actions, by presenting trade-offs between two of the key target variables—real income and the international current account payments deficit.

The levels of predicted real imports, as given by the solution of the Basic Model for the endogenous variables in each year, along with the levels of real imports which actually prevailed, are given in Table 6.

TABLE 6: *Actual versus predicted real imports, £ million, 1958 prices*

Year	1960	1961	1962	1963	1964	1965
Actual <i>M</i>	236.5	269.2	283.9	314.2	354.9	394.4
Predicted <i>M</i>	243.3	277.9	289.3	313.5	354.0	382.7
Year	1966	1967	1968	1969	1970	
Actual <i>M</i>	407.9	425.9	491.2	553.7	573.0	
Predicted <i>M</i>	401.2	431.0	498.4	552.6	567.4	

The Basic Model can also be used to compute the levels of real imports which would have prevailed had no change at all been made in discretionary budget policy. (The procedure adopted was similar to that followed in computing the level of real income which would have prevailed had no discretionary budget changes been made). Thus:

TABLE 7: *Level of real imports which would have prevailed had no change in discretionary budget policy occurred, £ million, 1958 prices*

Year	1960	1961	1962	1963	1964	1965
<i>M</i>	238.9	266.4	278.2	303.3	339.1	375.0
Year	1966	1967	1968	1969	1970	
<i>M</i>	400.3	417.6	474.3	523.8	548.1	

13. See, for example, Holt (1962) Theil (1964) and Pindyck (1973). The present model is non-linear, and so the assumptions of the so-called certainty equivalence theorem do not hold. That theorem could however, be invoked as an approximation. See Malinvaud (1969).

The effect of changes in discretionary budget policy on real imports can be calculated as the difference between the predicted  $M$  values in Table 6 and the  $M$  values in Table 7. The effect on the level of imports at current market prices is then found by multiplying the figures derived in the last-mentioned step by the import price index for the year in question. Since exports of goods and services are, in the short run, exogenously determined, the resulting import-value figures, denoted by  $B$  in Table 8, give the effect of discretionary budget changes on the balance of payments on current account. The interpretation of the  $B(t)$  elements in Table 8 is: The deficit in the balance of payments on current account in year  $t$  would have been  $B(t)$  less than it actually was in year  $t$  if no changes in discretionary budget policy had been made in that year.

TABLE 8: *Effect of discretionary budget changes on the balance of payments on current account, £ million*

Year	1960	1961	1962	1963	1964	1965
$B$	4.4	11.5	11.1	10.5	15.5	8.2
Year	1966	1967	1968	1969	1970	
$B$	0.9	14.3	27.7	34.6	21.2	

Comparison of Tables 4 and 8 suggests that, in the period under review, the trade-off between increase in real income brought about by discretionary budget measures and the balance of payments on current account was about minus one. A one million pound increase in *real* income at 1958 prices was attained at a cost of an increase in the current account balance of payments deficit of about a million pounds.

Table 9 is derived by deflating the  $B$  figures above by the import price index (1958 = 1).

TABLE 9: *Effect of discretionary budget changes on the balance of payments on current account, £ million, 1958 prices*

Year	1960	1961	1962	1963	1964	1965
Real $B$	4.4	11.4	11.0	10.2	14.9	7.7
Year	1966	1967	1968	1969	1970	
Real $B$	0.8	13.4	24.1	28.8	16.5	

These calculations give a slight improvement in the trade-off that is suggested by Table 8.

## IV

*Conclusion*

Fiscal policy in the eleven years 1960–70 was, in contrast to earlier years, highly expansionary. Real GNP increased, monotonically, at an average annual rate of about 4 per cent. This is in contrast to an average annual growth rate of 1 per cent in 1950–58, inclusive. With exports regarded as exogenous, we estimated that the average annual effect on real income of discretionary budget changes was 1.91 per cent of GNP, i.e., an average annual growth rate of 1.91 per cent in GNP can be attributed to the short-run effects of changes in fiscal instruments. Thus, the estimated cumulative short-run effects on GNP of fiscal measures account for close to one half of the overall growth in the economy in the eleven years after 1959.

The short-run trade-off, brought about by discretionary budget measures, between increase in real income and the current account balance of payments was very unfavourable. Therefore, in the absence of foreign borrowing substantially in excess of that which actually took place, the expansionary fiscal policies would have foundered on balance of payments constraints had exports of goods and services not been increasing rapidly. It seems unlikely that fiscal changes in a given year significantly affected exports in the same year: that is why we have so far regarded exports as exogenously determined. In the longer-run, however, they were greatly affected by fiscal incentives (see McAleese (1974), OECD (1973), Carolan and McGrath (1967)). Increased exports played a dual role in the growth process, by expanding aggregate demand on one hand, but also, and perhaps just as important, by easing balance of payments constraints on domestic expansion. Although the model used to generate the results in Section II may in some respects overestimate the cumulative short-run effects of discretionary fiscal measures on real income,<sup>14</sup> its treatment of exports as exogenous may well lead to net underestimates of the longer-run impacts of fiscal policy on economic growth.

One final set of remarks in closing. The model used, due to constraints of data and zero research assistance, has necessarily been very aggregative. It is hoped, however, that it sets a framework for further research. Contingent on finance for research assistance being forthcoming, it is planned (hopefully using 1953–72 as the sample period) to expand and disaggregate the basic model into a more general-purpose policy-orientated econometric model of the economy. It is surprising that very little work has been done in Ireland to date in this important area.

14. That is because (as noted by Hansen) it is difficult to know precisely which fiscal measures are discretionary.

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