Real Gross National Disposable Income Adjusted for Terms of Trade 1970-1984

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REAL GROSS NATIONAL DISPOSABLE INCOME ADJUSTED FOR TERMS OF TRADE 1970-1984

— AN ASSESSMENT OF TECHNICAL ISSUES

Aidan Punch*

Introduction

The rate of economic growth has come to be regarded by many as one of the key indicators of economic performance[1] compiled by national statistical offices throughout the world. The published figures are very often construed as representing the success or failure of the economic policies being pursued by governments and in some of the larger economies their publication is frequently greeted with reverberations on domestic money markets and foreign exchange markets. And yet despite the significance attached to these numbers their appropriateness for policymaking is being subjected to searching scrutiny, even in countries such as the United States, with well-developed statistical systems:

> there is no shortage of government generated numbers that measure everything from leading economic indicators to retail sales. The problem is that more and more of the figures convey less and less about what is actually happening in the real world. How fast is the economy growing, for example? Nobody can say for sure (*International Business Week,* 13 May, 1985).

It is against this international backdrop that we come to consider in this article some of the technical issues underpinning the compilation of the growth rate data for Ireland. Because of the large share of Gross Domestic Product (GDP) accounted for by imports and exports and given the increase in recent years in net factor incomes paid abroad and net current transfers received from abroad the focus of this present article will be on constant price Gross National Product (GNP) and Gross National Disposable Income (GNDI) rather than GDP. Consideration will also be given to adjusting the trade flows for terms of trade effects.

The main contention of the paper is that GNDI is a better overall measure of economic well-being than GNP. To take an example: a switch in cattle

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The author takes sole responsibility, however, for the views expressed in the paper.

[1] See Nordhaus and Tobin (1972) however, for a criticism of GNP as an economy-wide measure of economic well-being and Okun (1971) for a defence of the conventional measure.

exports from one annual period to the next away from Libya to the EEC, assuming it could be accommodated, would be reflected in an increase in GNP. However, because the exports to Libya in the earlier period were augmented by EEC transfers it is unlikely that GNDI would change at all. The picture that emerges if we use GNDI rather than GNP will provide us with a truer impression of the change in the nation's command over resources. An examination of the technical problems involved in compiling real GNDI adjusted for terms of trade is particularly opportune at the moment given the emphasis accorded to this measure in the recent "Economic Background to the Budget" (p. 5).

The paper begins with a brief synopsis of the most common methods used by national accountants to compile real GDP. The objective of these methods is to factor value changes over time into separate price and quantity components. In the following section we chart the increasing influence exerted by both net factor incomes and net current transfers from the rest of the world on the Irish national accounts. We then continue with a description of the terms of trade adjustment and explore the various suggestions put forward in the literature as to how to calculate it.

The results obtained using six different methods of calculating the terms of trade are then analysed and in the ensuing section the question of how to deflate net factor income and net current transfers from abroad is examined. A preference is expressed for a single indicator to deflate both these flows and also to calculate the terms of trade adjustment. Using this deflator a series of real GNDI adjusted for terms of trade is compiled for the period 1970-1984. Various growth rate measures such as GDP, GNP and GNDI are compared over this period and movements in the Balance of Payments are explained by reference to the evolution of real domestic expenditure and real GNDI.

Compiling real GDP[2]

The literal interpretation of accounts at constant prices is a detailed revaluation of the relevant transactions carried out in the current period at the prices obtaining in some base period. This conversion to constant prices can also be achieved by deflating the current value of some flow of goods and services by a price index for an equivalent or related flow. The choice of the appropriate price index may not always be obvious with the result that deflation may give rise to a certain amount of arbitrariness in the constant price accounts.

One of the distinctive features shared by all of the components of the expenditure estimate of GDP (i.e., GDP(E)) is the fact that they each refer to well-defined "bundles" of goods and services, in theory uniquely deflatable to constant prices. For instance, Personal Expenditure at constant prices evolves as a mixture of re-pricing current quantities at base year prices and deflation of current values using detailed price indices. The first method is used for food, soft drinks, alcoholic beverages, tobacco and fuel products while the second method is used for the remaining items of personal expenditure.

On the income/output side of the accounts, a residual category such as value

[2]See Broderick (1968) for a detailed account of the problems encountered in measuring the growth rate.

added, obtained as the difference between gross output and intermediate inputs, can be associated with particular commodities and thus deflated to constant prices. For instance, the Gross Agricultural Product at constant market prices emerges as the difference between constant price gross agricultural output and inputs of materials and services, i.e., the method of double-deflation. By contrast, a single indicator (volume of output) is used to extrapolate the base-year GDP for Industry[3]. Therefore, we see that the constant price version of the output-based estimate of GDP (i.e., GDP(O)) can be derived through association with commodities. In the following section, we depart from the goods and services account to consider flows which may not be uniquely associated with commodities. The flows in question are net factor incomes from abroad and net current transfers from abroad.

Net Factor Income and Net Current Transfers from Abroad

We begin with an elaboration of the expenditure-based estimate of GDP. Denoting current price estimates with capital letters and the corresponding constant price estimates with lower case letters, we have

$$\text{GDP(E)} = C + I + G + X - M$$
$$\text{and Real GDP(E)} = C/P_c + I/P_i + G/P_g + X/P_x - M/P_m$$
$$= c + \imath + g + x - m$$

where C is personal expenditure on consumers' goods and services
I is gross domestic physical capital formation
G is net expenditure by public authorities on current goods and services
X is exports of goods and services
M is imports of goods and services and the Ps represent the appropriate price deflators for the various flows.

While GDP in current prices measures the values added from productive activity located in Ireland, (or the corresponding final expenditure on that output) it does not reveal how much of this income will accrue to Irish factors of production. Of more concern in a small open economy, such as Ireland, will be the value added retained in the country. By subtracting outflows of factor incomes and adding inflows in respect of income earned by Irish factors abroad we arrive at the GNP. By further adding net current transfers[4] from abroad we derive GNDI. Diagram 1 following illustrates the relationship between GDP (E) and GNDI in current values for the period 1970 to 1984. While net current transfers from abroad (R_C) have been positive over the period in question, net factor income (F) has changed from being positive pre-1976 to negative from 1976 onwards and the sum of both flows [R_C + F] has turned negative from 1981. So the ratio GNDI/GDP has fallen below unity since 1981, caused mainly by growing outflows of factor incomes during this period — the major contributors being outflows of profits, dividends and royalties and

[3] Hill (1971) analyses the conditions under which it may be better to use a single indicator (normally output) rather than double-deflation.

[4] Net current transfers refer to receipts less payments to the rest of the world which are not in exchange for a specified amount of goods and services.

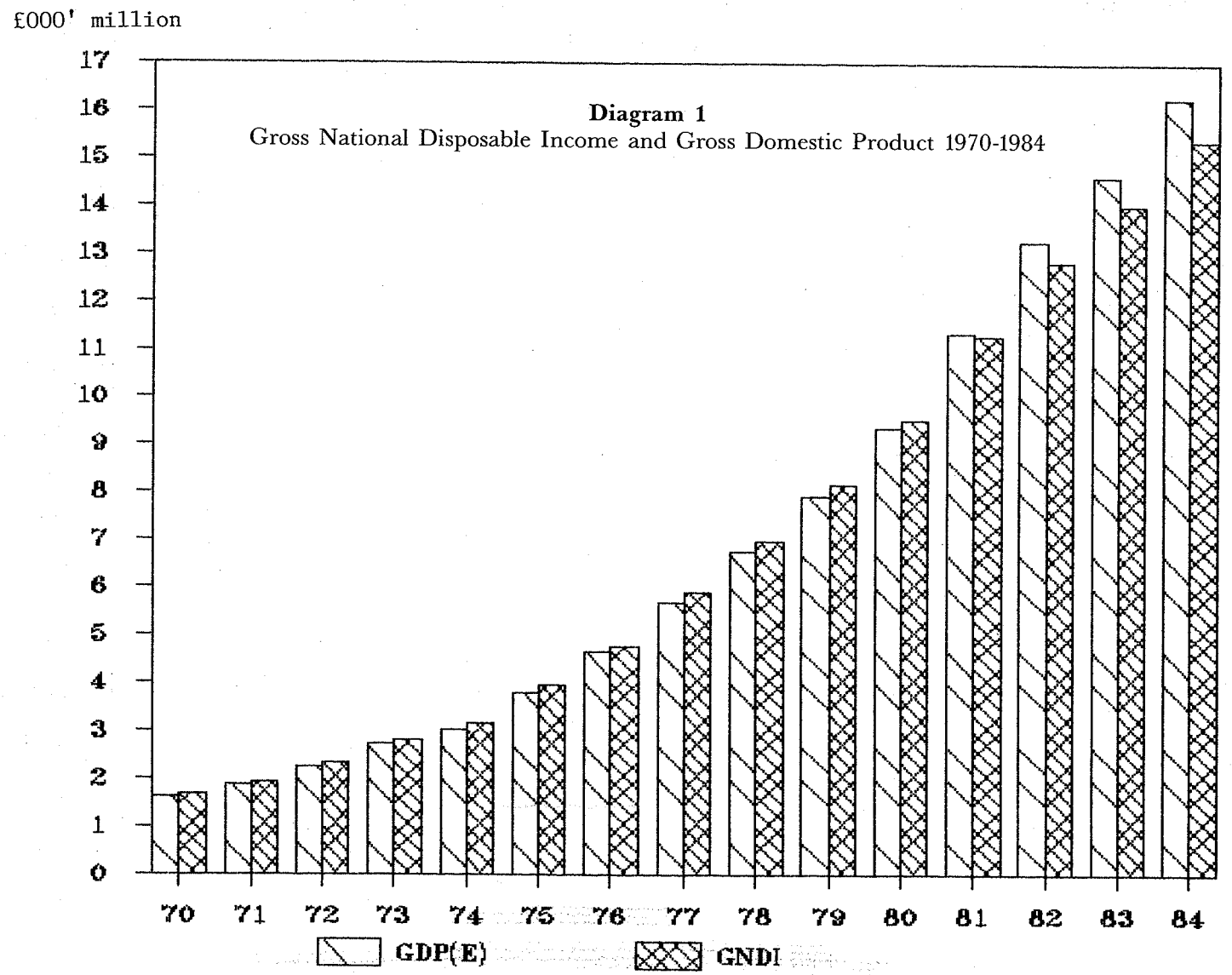
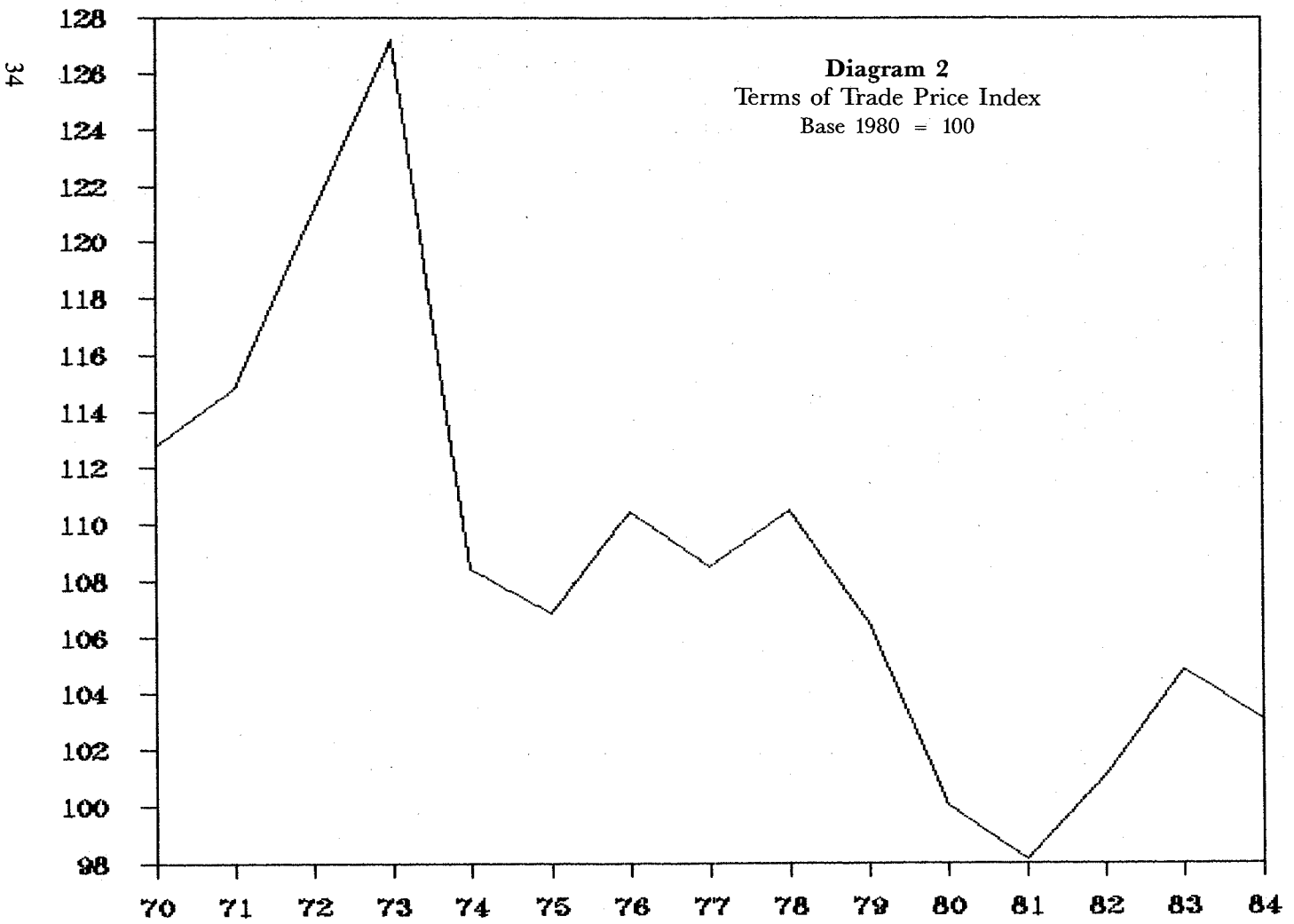


Diagram 1
Gross National Disposable Income and Gross Domestic Product 1970-1984

Diagram 2
Terms of Trade Price Index
Base 1980 = 100



interest on Government foreign borrowing. Setting out our equation for GNDI in terms of its component parts we have

$$Y_d = C + I + G + X - M + F + R_c \quad (1)$$

The first three terms on aggregation make up Gross Domestic Expenditure (E) while the sum of the last four components we denote by N. This term is closely related to the net balance on current account of the Balance of International Payments (CA), the precise form of the relationship being

$$CA = N + R_k \quad (2)$$

where R_k represents capital transfers from abroad[5].

We can, therefore, re-write Equation (1) as follows:

$$Y_d = E + CA - R_k = E + N \quad (3)$$

where N is the balance on current account less capital transfers from abroad. As regards expressing the flows in constant prices we immediately see that real income (GNDI) at constant prices will differ from real product (GDP) because of the influence exercised by the presence of F and R_c.

Terms of Trade

A further effect, not captured in Equation (1) will be the gains or losses to the Irish economy because of differential import and export price movements. This, we call a terms of trade effect defined in index form as TOT = P_x/P_m[6]. Diagram 2 shows the evolution of TOT over the period 1970-1984. If P_m rises faster than P_x as it did between 1973 and 1974, then a greater volume of domestic output is required in order to purchase the same volume of imports, while if P_x rises faster than P_m it is possible to acquire a greater volume of imports with a given output.

The problem is how to capture this feature in the accounts at constant prices. This problem, which is not new, has been the subject of much inquiry by writers in this field for over thirty years. The prime objective of most of these writers has been to maintain a fully balanced set of accounts at constant prices. By extending the set of accounts elaborated by Geary (1961) to include net current transfers from abroad and net factor income from abroad we get

Domestic Product Account	$Y = C + I + G + X - M$
Disposable Income Account	$Y_d = Y + F + R_c$
External Account	$X - M + F + R_c = N$
Consumer Account	$C + G + S = Y_d$, where S = Savings
Capital Account	$I + N = S$

We assume that the flows are gross, i.e., include depreciation. This set of accounts is a classic double entry system with each item appearing on both sides of the equality sign. It can be simplified further to approximate the system outlined by Broderick (1967) as follows:—

[5]The inclusion of capital transfers from abroad in the balance on current account represents current international practice in balance of payments statistics (see CSO 1984a).

[6]TOT may differ from the officially published terms of trade index which relates to merchandise trade only. The above, being based on the implied deflators for X and M, also takes account of non-merchandise flows.

$$C + I + G + X - M = Y \quad (4)$$
$$Y + F + R_C = C + G + S \quad (5)$$
$$S = I + N \quad (6)$$
$$N = X - M + F + R_C \quad (7)$$

Now the four equations specified resolve into a set of three independent equations, i.e., Equations (4), (5) and (7) will determine Equation (6). Assuming for the moment that F and R_C are uniquely deflatable to constant prices, then as all of the components on the left hand side of Equation (4) are uniquely deflatable, we have determined the deflated value of S uniquely. A problem may arise with Equation (7), however, while N may be positive in current prices, its deflated value as defined by the sum of the separately deflated items in (7) may, in fact, be negative. This undesirable outcome is analogous to deriving negative value added in constant prices using double-deflation. The agreed solution to maintaining a balanced set of accounts in constant prices is to add a "trading gain" term T to the real domestic product, where

$$T = \frac{X - M}{P} - (x - m) \quad (8)$$

P being a specially selected price deflator. We immediately see that

$$x - m + T = \frac{X - M}{P}$$

will always take on the same sign as (X - M).

Our constant price set of accounts then materialises as

$$c + i + g + x - m = y \quad (9)$$
$$y + f + r_C + T = c + g + s \quad (10)$$
$$s = i + n \quad (11)$$
$$n = x - m + T + f + r_C \quad (12)$$

Therefore, real gross national disposable income will be greater than or less than real product to the extent that

$$f + r_C + T \gtrless 0$$

While there is agreement throughout on the single fundamental formula for T, the terms of trade effect, shown in Equation (8), there is no universal agreement on the choice of a suitable price deflator, P, nor on how to deflate F and R_C. In the next section we will examine the various suggestions put forward for P in the literature and in a later section we will explore the deflation of F and R_C.

Choice of a Suitable Deflator

Bowley (1944) (p. vi) credits J. L. Nicholson as being the originator of the idea that the deflator for (X - M) should be the import price index (P_m). In Nicholson (1960), the writer sets out the advantages to be gained from using such a deflator.

> The method recommended here can be said to have the merits of: (i) applying consistent treatment to a surplus or deficit in the balance of payments and to a change in the terms of trade; (ii) satisfying the condition of symmetry in the case of two countries trading only with each other; (iii) being fool-proof against the paradoxical results obtainable by other methods, noticed by Dr. A. L. Gaathon; (iv) being simple and easy for the "man-in-the-street" to understand; and (v) above all making sense as economics. The same cannot be said of any of the other methods which have been proposed.

The "paradoxical results" mentioned by Nicholson concerned an objection raised by Gaathon to the method suggested by Burge and Geary (1957) for the deflator of (X − M), that two countries on amalgamation should have a trading gain with the rest of the world equal to the sum of the individual trading gains. The method suggested by Burge and Geary envisaged deflation by P_x where $X > M$ or P_m where $M > X$ and the incorporation of the derived "external trading gain" into the accounts as shown in Equations (9) - (12) above. The rationale for this approach was that any excess was part of the flow in question and should, therefore, be deflated by the corresponding deflator. This was intended to meet Stone's (1956) objection that

> it is impossible to find a unique set of deflated values of the non-commodity transactions in the accounting system such that the accounts continue to balance in real terms.

Geary (1961) subsequently suggested $P = \frac{1}{2}(P_x + P_m)$ as a deflator that would meet the Gaathon objection. In the same article, he defined some desirable properties which the formula for the trading gain should possess:

> it may be well at this stage to set down certain algebraic conditions which seem desirable in the formula for the trading gain:
>
> (1) The trading gain should be nil when import and export price indexes are equal.
> (2) In a two-country case (or one country and the rest of the world) the sum of the trading gains should be nil.
> (3) The Gaathon point: two countries on amalgamation should have a trading gain with the rest of the world equal to the sum of the trading gains of each country.
> (4) The surplus of exports over imports, if positive, should be regarded as part of exports or, if negative, part of imports.

The Burge-Geary suggestion satisfied (1), (2) and (4) but not (3). The revised Geary suggestion satisfied (1), (2) and (3) but not (4) while Geary (1961) suggested that the Nicholson system satisfied (1) and (3) but not (2) and (4). However, Nicholson (1960) had argued:

> it is wrong to assume, as is sometimes done, that the adjustments to income (or the adjustments to product) in the two country case should be equal and opposite. The desire for articulation should not lose touch with economics. The gain (or loss) from changes in the

terms of trade in the *product* of the one country is necessarily equal to the loss (or gain) in the *income* of the other country (this writer's emphasis).

Stuvel (1959) used the implied deflator for net domestic product at market prices to deflate each of the elements in the accounts

$$\text{i.e., } P_s = \frac{C + I + G + X - M - D}{c + i + g + x - m - d}$$

where D is depreciation. His choice of P_s came about from his desire to obtain an index of wide coverage free from duplication (hence net rather than gross) while the market price valuation as distinct from factor cost is preferred as "it is the price concept that underlies all economic transactions".

Courbis (1969) and Kurabayashi (1971) have independently suggested a measure of P which embraces both imports and exports. Courbis (p. 46) suggests

$$P_n = a\,P_x + (1-a)\,P_m \quad \text{where } a = \frac{x}{x + m}$$

while Kurabayashi (p. 290) suggests a harmonic mean

$$P_n = \frac{1}{b\,\frac{1}{P_x} + (1-b)\,\frac{1}{P_m}} \quad \text{where } b = \frac{X}{X + M}$$

In both cases we get

$$P_n = \frac{X + M}{x + m}$$

The Geary method suggested earlier is the particular case of Courbis where $a = 1 - a = \frac{1}{2}$. Courbis claims a purchasing power connotation for P_n, i.e., "an index linked to the 'value' of the national currency on the international market". Gutmann (1981) finds the Courbis/Kurabayashi formula "conceptually more interesting" than the others, a view not shared by Hibbert (1975): "It seems difficult, to say the least, to give the results of this method a clear economic interpretation".

Finally, Scott (1981) represents a challenge to what he terms the "national income establishment". He begins by considering a closed economy in which there is perfect competition and no government or taxes. Investment, he argues, can be considered as either so much consumption sacrificed or as the net present value of so much consumption gained. The appropriate price deflator for all of domestic expenditure is, therefore, the price index of consumption goods, a proposal which circumvents the seemingly intractable problem of allowing for quality changes in capital goods.

Extending his system to include X, M, F and R_c means choosing an indicator for net foreign investment ($CA - R_k$) which he treats in precisely the same way as domestic investment. Hence deflation by a price index for consumption is recommended for all of the constituent flows of GNDI. Scott

TABLE 1: Terms of Trade using Different Price Deflators

Method	Price Deflator: P	Terms of Trade Effect $T = \frac{X-M}{P} - (x-m)$
Nicholson	$P = P_m$	$X(\frac{1}{P_m} - \frac{1}{P_x})$
Burge, Geary	$P = P_m$ for $M>X$ $P = P_x$ for $X>M$	$X(\frac{1}{P_m} - \frac{1}{P_x})$ $M(\frac{1}{P_m} - \frac{1}{P_x})$
Geary	$P = \frac{1}{2}(Px + Pm)$	$x(\frac{Px-Pm}{Px+Pm}) + m(\frac{Px-Pm}{Px+Pm})$
Stuvel	$P = \frac{C+I+G+X-M-D}{c+i+g+x-m-d}$	$x(\frac{Px}{P} - 1) + m(1-\frac{Pm}{P})$
Courbis/Kurabayashi	$P = \frac{X+M}{x+m}$	$\frac{M}{X-M} x(\frac{Px}{Pm} -1) - \frac{X}{X+M} m(\frac{Pm}{Px} - 1)$
Scott	P = CPI	$x(\frac{Px}{P} -1) + m(1-\frac{Pm}{P})$

vehemently rejects the use of P_m as used in the Nicholson case. The rationale that investment abroad earns foreign currency which is then used to purchase extra imports, misses the point he claims. It is his contention that investment, either domestic or foreign is not made to get either exportables or importables tomorrow but to get future consumption. Therefore, he sees the Consumer Price Index (CPI) filling the role of the deflator to be used.

It seems useful at this stage, before progressing to a discussion on the application of the formulae, to set out in tabular form the various proposals for P along with the derived values for T.

Calculation of Terms of Trade Effect for Ireland, 1970-1984 using Different Price Deflators

Previous authors have examined the results of applying different deflators to (X−M) to determine the terms of trade effect for Ireland. Geary and Pratschke (1968) computed a trading gain T′ for each pair of consecutive years between 1958 and 1964 using three different deflators — those of Nicholson (P_m), Geary $\frac{(P_x + P_m)}{2}$ and a third value, P = 1, which according to the authors implied that "net external investment N in any year is money and the formula might be regarded as representing Fabricant's position in an extreme form".[7]

[7] "Fabricant's position" is not clear from Geary and Pratschke (1968). The authors merely state that "S. Fabricant would use some capital price deflator" for N (see Equation (7) earlier).

TABLE 2: Imports, Exports and Expenditure-based Gross Domestic Product at Current Prices and Constant (1980) Prices, 1970-1984
£ million

Category	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Imports															
current	728.5	803.9	893.1	1,211.0	1,708.4	1,849.0	2,522.2	3,336.8	4,043.4	5,235.1	5,899.9	7,117.2	7,414.5	8,164	9,778
constant (1980)	3,143.7	3,290.2	3,456.5	4,114.5	4,020.4	3,610.2	4,139.9	4,689.1	5,425.6	6,177.7	5,899.9	6,000.8	5,813.7	6,085	6,664
Exports															
current	598.9	669.1	773.2	1,026.4	1,271.7	1,619.0	2,152.4	2,817.0	3,373.8	3,936.3	4,638.6	5,503.6	6,433.3	7,752	9,742
constant (1980)	2,291.2	2,385.1	2,471.0	2,740.7	2,760.1	2,958.3	3,198.4	3,647.2	4,096.5	4,361.5	4,638.6	4,729.3	4,991.1	5,513	6,442
Gross Domestic Product (Expenditure)															
current	1,620.2	1,855.5	2,254.7	2,729.0	3,021.4	3,792.0	4,653.2	5,703.4	6,756.8	7,916.9	9,360.7	11,347.5	13,261.8	14,636	16,282
constant (1980)	6,022.0	6,248.0	6,703.5	7,033.9	7,320.7	7,491.4	7,595.9	8,219.6	8,810.3	9,081.1	9,360.7	9,600.9	9,678.5	9,674	10,100

Sources: CSO, 1985; CSO 1984b and author's own estimates.

The results showed a remarkable degree of similarity which led the authors to conclude:

> There is no significant difference between the figures in the three columns over a testing period in which every kind of aberration in relative prices and in the net external deficit is encountered.

Geoghegan (1968) examined the slightly longer period 1958-1965 and compiled trading gains based on the formulations of Courbis/Kurabayashi, Geary, Stuvel and Nicholson. His conclusion was broadly similar to Geary/Pratschke's, i.e., a close degree of agreement between the results of the various methods apart from Stuvel post-1961 — a result he attributed to differential GNP and trade price movements.

The period 1970 to 1984 has been chosen for the current exercise for a number of reasons. First, it includes two interesting sub-periods, 1973/74 and 1979/80, in which for an oil importing country such as Ireland, changes in relative external prices have been very pronounced (see Diagram 2 earlier). Second, CSO (1984b) provides a welcome extended time-series of national accounts data for the period 1970-1982 which has subsequently been updated to 1984 (see CSO, 1985). The re-basing of the Irish national accounts to 1980 prices and the linking of the former 1975 price data at 1978 means that a definitive series to base 1980, while maintaining existing growth rates for 1970-1978, is readily deriveable. Table 2 provides such a series distinguishing Imports, Exports, and GDP(E), both at current and at constant (1980) prices, for the period 1970 to 1984. The data in this table, together with the CPI provides us with the necessary elements for computing the terms of trade effect T for each of the six formulations summarised above. As we have seen earlier, the terms of trade effect has been established as follows:

$$T = \frac{(X - M)}{P} - (x - m)$$

where the price deflator P will vary according to the different formulations suggested. Table 3 sets out the results of calculating T for Ireland based on 1980 constant price details for the period 1970-1984. The formulations taken for P are those of Nicholson, Burge/Geary, Geary, Stuvel, Courbis/Kurabayashi and Scott. The Stuvel deflator is the implied price index of gross domestic product at market prices, rather than net domestic product at market prices because depreciation at constant prices is not directly estimated in the Irish national accounts.

The most immediate result of Table 3 is the equivalence of the Nicholson and Burge/Geary estimates for the period under consideration because of the persistent import excess. The similarity of the results of the Geary and Courbis/Kurabayashi formulations is also evident, both being weighted averages of the imports and exports deflators with the Geary method using equal weights. There is also a close degree of agreement between the Stuvel and Scott variants due to the closeness of the measures on which they depend, i.e., the GDP deflator and the CPI. Overall, there is a marked degree of uniformity of trend from series to series, all versions recording the sharp declines in 1973/74 and 1979/81.

TABLE 3: Terms of Trade Effect at Constant (1980) Prices 1970-1984 £ million

Year	Nicholson	Burge/ Geary	Geary	Stuvel	Courbis/ Kurabayashi	Scott
1970	293.2	293.2	326.9	370.8	321.9	386.3
1971	353.4	353.4	391.4	451.2	385.7	460.2
1972	521.5	521.5	565.8	629.0	559.0	621.1
1973	746.6	746.6	821.8	898.0	808.2	896.4
1974	232.6	232.6	274.2	202.2	266.7	240.0
1975	202.8	202.8	217.7	197.5	216.3	207.9
1976	334.5	334.5	364.7	337.8	361.0	336.3
1977	311.4	311.4	341.4	292.8	337.7	292.9
1978	430.6	430.6	475.5	456.0	469.5	432.7
1979	283.5	283.5	331.8	326.4	323.7	281.0
1980	0.0	0.0	0.0	0.0	0.0	0.0
1981	- 89.0	- 89.0	- 101.9	- 93.7	- 100.4	- 68.7
1982	53.2	53.2	57.3	106.5	57.0	127.2
1983	264.9	264.9	272.1	299.7	271.8	307.6
1984	197.5	197.5	197.8	199.7	197.8	200.7

Computing pair-wise Pearson correlation coefficients for GNP adjusted for terms of trade using the different elaborations reinforces the visual impression of series that are very closely related, most of the coefficients being very close to one. These coefficients are shown in the following table, only the upper diagonal comparisons being retained because of symmetry.

TABLE 4: Pearson Correlation Coefficients for GNP* Adjusted for Terms of Trade under Different Assumptions for P: 1970-1984

	Nicholson	Burge/ Geary	Geary	Stuvel	Courbis/ Kurabayashi	Scott
Nicholson	1	1	0.99969	0.99840	0.99979	0.99888
Burge/Geary		1	0.99969	0.99840	0.99979	0.99888
Geary			1	0.99876	0.99999	0.99878
Stuvel				1	0.99873	0.99970
Courbis/ Kurabayashi					1	0.99883
Scott						1

*Average measure

Given the closeness of the results, over a period which embraced major shifts in the relative prices of imports and exports, it would appear that in practical terms it makes little difference which of the formulations is chosen for our price deflator.

Kurabayashi (1985) in the context of a progress report on the review of the System of National Accounts, describes recent attempts at international level to reach agreement on the choice of deflator for compiling terms of trade effects. In particular, with regard to the outcome of the March 1983 meeting of the Working Party on National Accounts, held under the aegis of the Statistical Office of the European Communities, he felt that:—

> No consensus was reached on a standard method for measuring the terms of trade, although there was general agreement on the importance of that subject.

A subsequent meeting in May 1984, at the OECD, dealt with the analytical interpretation of various terms of trade measures, with the Secretariat favouring the Nicholson method of deflating exports by import price indices. However, detailed guidelines on the estimation procedures are still to be worked out.

This is a question which Hibbert (1975) has already addressed. His paper marked the inauguration of a series of gross national disposable income at constant market prices for the United Kingdom. The Nicholson method, which in Hibbert's opinion "appears to be capable of a clear economic interpretation", underpins his calculation. The economic interpretation is such that we observe the difference between "the volume of imports at base year which could be purchased with the proceeds of the current year's export volume in the base year and in the current year". This involves adopting a convention that an external deficit is really an import volume financed out of past savings or current borrowings while a surplus is an import volume forgone.

Deflation of F and R_c

Hence we may logically extend this to cover net factor incomes from abroad and net current transfers from abroad. The fact that it is the "net" figure in both of these flows rather than the gross outflows and inflows making up the "net" contribution, which occupies our attention, is based on our unwillingness to deal with a positive net figure becoming negative on deflation (or vice versa). In other words, separate deflation of the gross flows could lead to unbalanced accounts at constant prices because of the relative price effects of the deflators.

In progressing from GDP to GNP at constant prices in the Irish national accounts the net factor income from abroad is separately deflated. The present method of deflation is such that when net factor income from abroad is positive, then it is deflated by the implied price index for imports of goods and non-factor services, when negative it is deflated by the implied price index for exports of goods and non-factor services. The rationale for this approach is that positive net factor income can be used to finance imports while negative net factor income must be met with increased exports. The transition to GNP allowing for changes in the terms of trade is made using the Nicholson solution, whereby (X – M) is deflated by P_m[8]

At present, gross national disposable income at constant prices is not distinguished in the Irish national accounts. In order to estimate this item we would have to extend the real GNP, adjusted for terms of trade, to include deflated net current transfers from abroad. Extending the present method of deflating net factor income from abroad, while entirely logical, would not be straightforward to implement. In the period under consideration, 1970-1984, net factor income from abroad was positive up to 1975, but increasingly negative since. So, P_m was used for deflating net factor income from abroad in the earlier period, P_x in the later period. As net current transfers from abroad were positive throughout, then we should logically deflate this flow by P_m in order to get real gross national disposable income (adjusted for terms

[8]The results are shown in index number form in CSO (1985) — Table 8.

TABLE 5: Progression from Gross Domestic Product to Gross National Disposable Income at Current and Constant (1980) Prices 1970-1984

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Current Prices															
Gross Domestic Product	1,620.2	1,855.5	2,254.7	2,729.0	3,021.4	3,792.0	4,653.2	5,703.4	6,756.8	7,916.9	9,360.7	11,347.5	13,261.8	14,636	16,282
Net factor income from abroad	28.3	26.6	29.6	12.5	19.2	4.3	– 36.0	– 108.4	– 228.2	– 283.0	– 358.1	– 504.6	– 927.7	– 1,184	– 1,609
Gross National Product	1,648.5	1,882.1	2,284.3	2,741.5	3,040.6	3,796.3	4,617.2	5,595.0	6,528.6	7,633.9	9,002.6	10,842.9	12,334.1	13,452	14,673
Net current transfers from abroad	36.0	37.2	41.9	78.8	123.0	168.0	158.9	319.4	438.4	522.9	518.4	443.4	494.2	579	721
Gross National Disposable Income	1,684.5	1,919.3	2,326.2	2,820.3	3,163.6	3,964.3	4,776.1	5,914.4	6,976.0	8,156.8	9,521.0	11,286.3	12,828.3	14,031	15,394
Constant (1980) Prices															
Gross Domestic Product*	6,141.7	6,425.7	6,832.4	7,196.4	7,443,3	7,533.3	7,710.2	8,254.1	8,864.2	9,161.7	9,360.6	9,552.5	9,609.1	9,617	10,100
Net factor income from abroad	122.1	108.9	114.6	42.5	45.2	8.4	– 59.1	152.3	– 306.2	– 334.0	– 358.1	– 425.4	– 727.4	– 883	– 1,097
Gross National Product**	6,263.8	6,534.5	6,947.0	7,238.8	7,488.8	7,541.7	7,651.1	8,101.7	8,557.9	8,827.7	9,002.5	9,127.1	8,881.7	8,734	9,003
Terms of Trade Adjustment	293.2	353.4	521.5	746.6	232.6	202.8	334.5	311.4	430.6	283.5	—	– 89.0	53.2	265	198
Gross National Product adjusted for terms of trade	6,557.0	6,887.9	7,468.4	7,985.4	7,721.4	7,744.5	7,985.6	8,413.2	8,988.5	9,111.2	9,002.5	9,038.1	8,934.9	8,999	9,201
Net current transfers from abroad	155.4	152.3	162.2	267.7	289.5	328.0	260.8	448.8	588.3	617.1	518.4	373.8	387.5	432	491
Gross National Disposable Income	6,712.4	7,040.2	7,630.6	8,253.2	8,010.9	8,072.5	8,246.4	8,862.0	9,576.8	9,728.3	9,520.9	9,411.9	9,322.4	9,431	9,692

*Average of expenditure and output apart from 1984 which is expenditure only.

**Differs from officially published series because of different method of deflating net factor income from abroad.

of trade). But should we not consider the sum of net factor income from abroad and net current transfers from abroad as the relevant flow for deflation? After all, it is the sum of these components which forms the link between output and income. If we accept this latter situation, then as the sum of the two flows is positive from 1975-1980 and negative thereafter, we should deflate it by P_m in the earlier period and P_x in the later period. The solution, therefore, would depend on whether we wish to deflate net factor income and net current transfers from abroad separately or when combined[9].

Each of the methods of deriving terms of trade adjustments mentioned above can be extended to the non-commodity components F and R_c. In the last section, we saw that there was a very close degree of agreement between the results obtained for the terms of trade using these different methods for the 1970-84 period. While each of the methods possessed certain advantages as regards economic interpretation, certain shortcomings were also identified by the various authors. Whatever method one selects will entail some conventional treatment of surplus income unspent or expenditure in excess of income. The convention in the Nicholson case elaborated in Hibbert (1975), holds a certain attractiveness for Ireland on account of the openness of the economy. We recall our formulation of the rest of the world account:

$$N = X - M + F + R_c$$

The Nicholson convention is such that when N is positive then it represents an import volume forgone while if it is negative it represents an import volume purchased from current borrowings (or past savings). Adoption of the Nicholson method for Ireland would imply a unified approach to deflating the components of N which is unambiguous. The fact that it is in line with international recommendations, though not an argument in itself, is none the less a highly desirable administrative advantage. This writer, therefore, favours the Nicholson[10] method of estimating real gross national disposable income. The Nicholson method, we recall, means deflating (X – M), F and R_c by P_m regardless of the direction of the flows.

Real Gross National Disposable Income for Ireland

The results obtained by applying the Nicholson solution to Irish data for the period 1970 to 1984 are shown in Table 5. The progression from GDP through GNP to GNDI is shown in both current and constant prices, the constant price GDP being the average of the output and expenditure measures. One immediate side-effect of the proposed solution would be the amendment of the GNP at constant price details from 1976 onwards, because of the suggested method of deflating net factor income from abroad. The differences are shown in Table 6.

[9] A case could be made for deflating certain EEC transfers (inflows) by the corresponding export commodity indices and deflating the net remainder by our selected deflator. This is not pursued further here, however.

[10] Imports are valued c.i.f. (i.e., at factor cost) in the method used in this article. Hibbert (1975) suggests market prices as the appropriate basis for measuring changes in real income reserving factor cost for measuring the additional resources required to maintain a given level of domestic expenditure and external current balance.

TABLE 6: GNP Growth Rates* using Different Methods to Deflate net Factor Income from Abroad

	1975/ '76	1976/ '77	1977/ '78	1978/ '79	1979/ '80	1980/ '81	1981/ '82	1982/ '83	1983/ '84
Officially published series	1.5	5.9	5.7	3.0	1.7	1.3	-2.5	-1.3	2.3
Nicholson Method	1.5	5.9	5.6	3.2	2.0	1.4	-2.7	-1.7	3.1

*Average of expenditure and output measures — 1984 expenditure only

An examination of the data in Table 5 provides us with an insight into developments over the period under consideration, i.e., 1970-1984. It seems useful from an analytical point of view to sub-divide this period into three separate sub-periods: 1970-1973 — immediately preceding the first major oil shock; 1973-1979 — following on from the first to the second oil shock and 1979-1984 — the aftermath of the second shock. Table 7 shows the average annual growth rates of various constant price economic aggregates for these three sub-periods and the period as a whole.

TABLE 7: Average Annual Growth Rates (%)

	1970-73	1973-79	1979-84	1970-84
Gross Domestic Product (GDP)	5.4	4.1	2.0	3.6
Gross National Product (GNP)	4.9	3.4	0.4	2.6
GNP adjusted for terms of trade (GNP_{TOT})	6.8	2.2	0.2	2.4
Gross National Disposable Income (GNDI)	7.1	2.8	-0.1	2.7
Gross Domestic Expenditure (GDE)	7.0	4.3	-1.1	2.9

The increase over time in the "wedge" between GDP and GNP is immediately apparent from this table as is the unfavourable terms of trade effect in the latter two sub-periods. The diminution in real current transfers from abroad since 1979 is responsible for converting a slight growth in GNP_{TOT} into a fall in real income during 1979-84. The most striking contrast, however, in this sub-period is the 2 per cent growth in GDP translating into a 0.1 per cent fall in GNDI, the major portion of the difference being explained away in increasing real factor outflows, i.e., profit repatriation and interest on government foreign borrowing. Diagram 3 charts this contrast between output and income for all years during 1970-84. The marked deterioriation in the terms of trade is evident from this diagram in the comparisons for 1973/74 and 1979/80.

Returning to Table 7, it is also of interest to examine the evolution of real GDE when compared with real GNDI. The expansionary fiscal policy of 1977-1979 is reflected in the GDE growth for 1973-79 while the more contractionary policies since 1981 are captured by the 1.1 per cent average annual decline in the latest sub-period. From the accounting system developed earlier in the article we saw the relationship between income, expenditure and the balance of payments. When expenditure growth exceeds income growth, the discrepancy is reflected in a worsening of the balance of payments. Table 8 portrays this annual growth in real GNDI and real GDE and the resultant balance of payments situation.

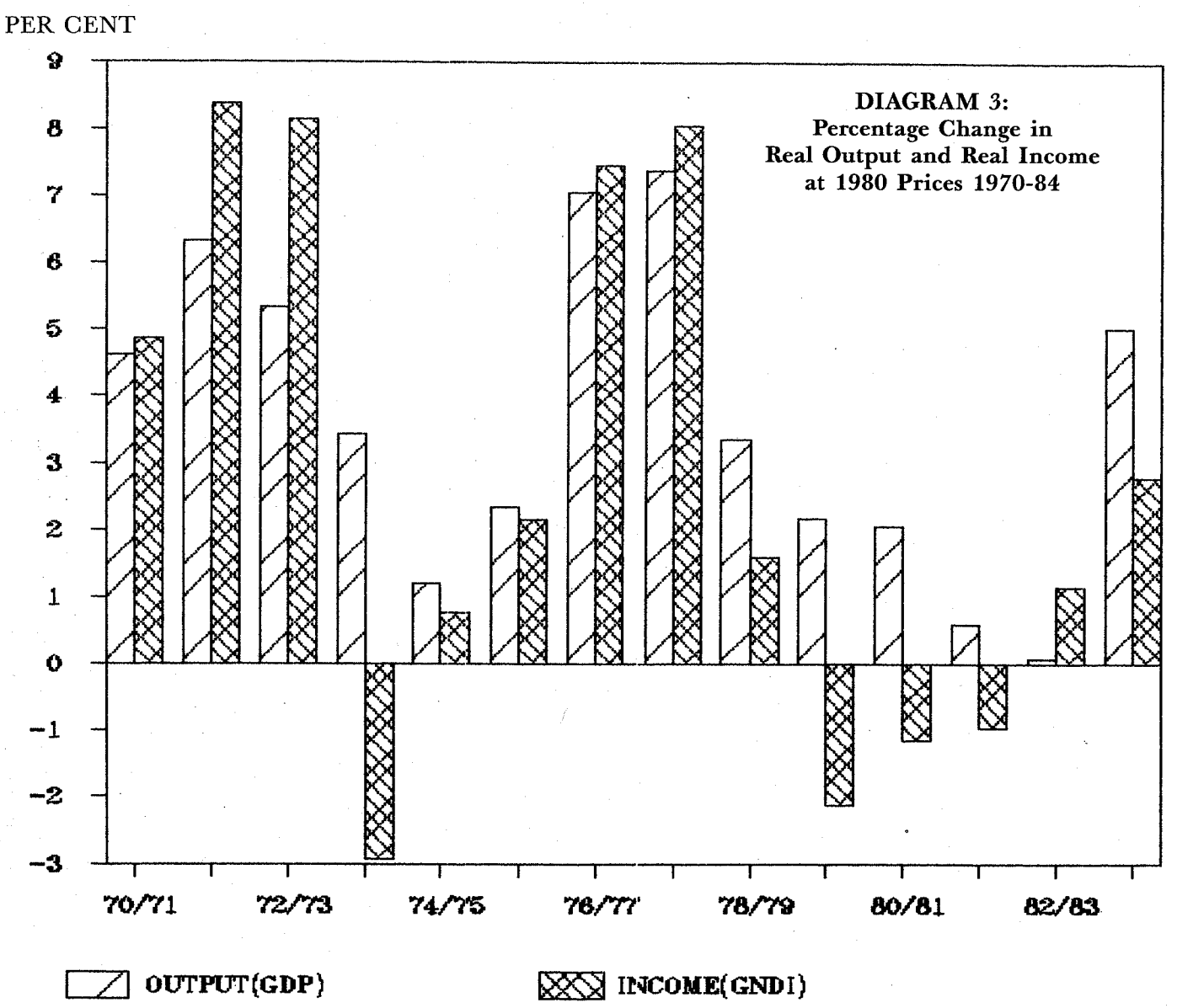

PER CENT
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
70/71
72/73
74/75
76/77
78/79
80/81
82/83
DIAGRAM 3:
Percentage Change in
Real Output and Real Income
at 1980 Prices 1970-84
OUTPUT(GDP)
INCOME(GNDI)

TABLE 8: Gross Domestic Expenditure and Gross National Disposable Income at Constant (1980) Prices and Balance of Payments on Current Account

Year	Gross Domestic Expenditure at constant (1980) prices		Gross National Disposable Income at constant (1980) prices		Net Balance on Current Account (Balance of International Payments)	BoP as a % of GNDI (current)
	£m	Percentage change on previous period	£m	Percentage change on previous period	£m (all debits)	
						%
1970	6,924.0		6,712.4		65.3	3.9
1971	7,204.5	4.1	7,040.2	4.9	71.0	3.7
1972	7,727.6	7.3	7,630.6	8.4	48.4	2.1
1973	8,479.9	9.7	8,253.2	8.2	93.3	3.3
1974	8,574.1	1.1	8,010.9	- 2.9	294.5	9.3
1975	8,105.2	- 5.5	8,072.5	0.8	55.9	1.4
1976	8,580.5	5.9	8,246.4	2.2	238.1	5.0
1977	9,269.7	8.0	8,862.0	7.5	299.5	5.1
1978	10,139.4	9.4	9,576.8	8.1	444.2	6.4
1979	10,897.3	7.5	9,728.3	1.6	1,025.9	12.6
1980	10,622.0	- 2.5	9,520.9	- 2.1	1,037.9	10.9
1981	10,872.4	2.4	9,411.9	- 1.1	1,594.7	14.1
1982	10,501.1	- 3.4	9,322.4	- 1.0	1,315.7	10.3
1983	10,246.0	- 2.4	9,431.0	1.2	925.2	6.6
1984	10,322.0	0.7	9,692.0	2.8	837.0	5.4

Sources: CSO 1985 and author's own estimates.

Both real domestic expenditure and real GNDI moved in close harmony during 1970-1973 giving rise to only minor changes in the balance of payments (BoP). The sharp deterioration in the terms of trade between 1973 and 1974 which was not matched by a commensurate decline in real expenditure was reflected in a worsening of the BoP deficit on current account. 1975 saw a reversal of this trend, the fall in real expenditure being caused mainly by a decline in agricultural stock levels. The growth in real expenditure again exceeded real GNDI growth in 1976 with the expected result in the BoP.

In the years 1977 to 1981, the annual percentage changes in real domestic expenditure easily exceeded those in real incomes, apart from 1979-80, the fall in real domestic expenditure being mainly due, as in 1975, to a decrease in agricultural stocks in 1980. As a consequence of these diverging growth rates there was a sharp deterioration in the balance of payments on current account. This was particularly pronounced in 1978/79 and 1980/81. Since 1981, there has been a reversal in this trend with real expenditure changes falling short of changes in real national disposable incomes, the result of which has seen a steady improvement in the balance of payments on current account.

Conclusions

The paper examined the technical aspects of compiling a series of gross national disposable income at constant prices adjusted for terms of trade. A review of the literature on terms of trade suggested six possible candidates for consideration. It was found that all six measures provided very similar results

over the testing period 1970-1984. A preference was expressed for the Nicholson method of deflating net exports (X – M) by the implied deflator for imports P_m, because of its clear economic interpretation. A unified approach to deflating net factor income (F) and net current transfers from abroad (R_c) was suggested. This entailed also deflating these flows by P_m.

In the final section, the results obtained for real gross national disposable income for Ireland during 1970-1984 were examined. It was found that in the latest sub-period 1979-1984 the major part of the discrepancy between output and income growth was attributable to a rise in real net factor income paid abroad. The lesson from the income/expenditure comparisons over the 1970-84 period was also clear from the derived data, i.e., raising real expenditure when there is insufficient real income growth can only come about through a worsening of the balance of payments.

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