

Prices and Economic Planning

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The national economic plans of Ireland and the United Kingdom<sup>(1)</sup> are set out in constant prices. Target values for 1970, the terminal year of both plans, are expressed in the prices of the base years, respectively 1960 and 1964. Prominent among these values are the outputs of the different sectors of production and the balance of the external account.

Frequently, these constant price values are interpreted as if they were current price values<sup>(2)</sup>. It is pointed out in this paper that the two sets of values should be interpreted differently, and that changes in both relative and general prices over the planning period may produce considerable differences between them. It is suggested that current price values are the more appropriate for national planning purposes, and consequently that projections of relative prices should be integrated within the framework of national economic planning.

Output

It is not clear, in either the Second Programme or the National Plan, whether constant prices are to be regarded as a substitute for current prices in the absence of projections of

(1) Second Programme for Economic Expansion, Part II, The Stationery Office, Dublin 1964 and The National Plan, HMSO, London 1965.

(2) Throughout the paper the phrase "constant prices" is used to refer to the relative prices of the base-year of the plan, and "current prices" to the relative prices of the end-year of the plan, except where otherwise indicated.

relative prices, or whether they are preferred on theoretical grounds.<sup>(3)</sup> In fact, there is little recognition that there might be any significant difference, either theoretically or practically, between values measured in the two sets of prices.

So far as output is concerned, the output of a sector measured in constant prices has a more limited meaning than output in current prices. Whereas the constant price measure is confined to volume output, the current price output can also be used to measure the comparative efficiency of different sectors of production. For example, if a worker in sector A produces a bicycle and a worker in sector B produces one ton of potatoes, any set of relative prices of bicycles and potatoes can be used to describe this volume of output. However, the comparative efficiency of the workers in A and B in any time period must be measured using the set of relative prices peculiar to that period. One cannot make statements about the efficiency of sectors A and B in a given year, using the prices of another year.

Thus economic plans in which sector outputs are measured in constant prices should be interpreted as specifying only volume of output. This is a rather important limitation, since it means that from the point of view of resource allocation, one cannot say whether or not a faster rate of growth of one sector's output is desirable. In public discussion, the distinction between volume and value frequently gets lost, with the

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<sup>(3)</sup> It may be significant, however, that in the Industrial Inquiry Questionnaire summarised in Appendix C of the National Plan, no questions are asked about prices.

result that economic growth is widely regarded as a matter of increasing sector output rather than a problem in the allocation of resources.

### Net Output

There is little doubt that net output, i.e. gross output minus materials and services used provides a more reliable measure of sector output than does gross output. This is so whether gross output is measured gross or net of intrasectoral transactions: in either case, the measure of gross output is not independent of the organisation of production between establishments within the sector.<sup>(4)</sup>

Accordingly the rate of growth of each sector of the economy in the UK and Irish plans is measured by sector net output at constant prices. There are, however, two important characteristics about this measure. First, it is the difference between the quantity of output of a sector and the quantity of materials and services used as inputs. When constant price net output increases, this is sometimes interpreted as an index of efficiency on the part of the sector, in the sense that it has apparently economised in the use of its materials.<sup>(5)</sup>

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(4) Except in the special case where there are no transactions between these establishments.

(5) This interpretation of constant price net output is supported by the use of such synonyms as "sector real product" and "contribution to national output", although a constant price measure has no welfare connotation.

In fact, an increase in the difference between the quantities produced and consumed may be the result of one or more of a number of changes, including substitution between material and factor inputs, some of which are consistent with a decrease in efficiency.

For example, input quantities may just as efficiently be transformed into output prices as into output quantities. When this happens, the constant price net output measure may decline while current price net output increases. Thus the continuing trend towards packaging, advertising, etc of manufactured consumer goods is reflected in an increased quantity of purchased materials and services accompanied by increases in the price of output. Unless the increased price of output relative to the prices of inputs is projected, then net output will apparently decline as a result of the increased quantity of materials used.<sup>(6)</sup>

The second point about the use of constant price net output in economic planning is that it is a non-commodity flow and, as such, cannot be projected directly. Whereas, for any commodity flow there is

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<sup>(6)</sup> Irish agricultural data can be used to illustrate the limitations of the constant price net output measure. Over the period 1953-1963, the gross output of agriculture in constant prices (i.e. volume) and the net output in current prices both increased by roughly 20%. But as a result of the increase of more than 50% in the quantity of farm materials used, the index of constant price net output increased by only about 5%. This figure may, in some sense, measure the growth of volume of agricultural output, but it clearly cannot be used to represent the performance in an efficiency sense of the agricultural sector. The increase in current price net output suggests that some of the increased quantities of fertilisers and feedingstuffs, etc. were transformed into increased unit output prices. See Tables 74 and 75, Statistical Abstract of Ireland, 1964, The Stationery Office, Dublin 1964. Output includes turf and the value of changes in livestock numbers.

an appropriate quantity index, there is no theory which will suggest a unique index for a quantitative projection of a non-commodity flow.<sup>(7)</sup>

Faced with this situation there are two possible approaches. The first is to make a direct but arbitrary projection of the non-commodity flow.<sup>(8)</sup> The second is an indirect approach. An estimate is obtained residually in an account in which the other elements have been projected directly. Thus an estimate of net output at constant prices is obtained by subtracting the projected quantity of materials used from the projected quantity of output. When prices change, accounts whose elements are valued in prices of an earlier year do not balance. Consequently, whichever element in a constant-price account is estimated residually differs from its actual current-price value by an amount corresponding to the extent to which prices have changed. Needless to say, unless the quantitative changes have been correctly forecast, the actual difference may be even greater. The probable size of this difference is discussed below.

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(7) This is analogous to the problem of finding a unique price-index to deflate a non-commodity flow. On the latter subject, see R. Stone, Quantity and Price Indexes in National Accounts, OECD Paris 1956, pp.89-97, R. C. Geary in P. Deane ed. Studies in Social and Financial Accounting Series IX, London 1961, and G. Jaszi in A Critique of the U.S. Income and Product Accounts, Studies in Income and Wealth, Vol.22, Princeton 1958.

(8) Presumably, the constant price projections of such items as Housing Subsidies, Benefits, and Assistance, and Imputed Rents of Public Buildings in the National Plan, pp.178, 180, and 185 were obtained by such direct methods. Despite the observation in another official publication that "... there is no satisfactory way of valuing income from abroad in real terms", (National Income Statistics, Sources and Methods, HMSO 1956, p.37) the National Plan does attempt such a valuation under the heading "Other Invisibles, Net" in the table on p.83.

Balance of Payments

Whether constant price net output or current price net output is the more appropriate measure of sector output for the purposes of economic planning might remain a matter for disagreement. So far as the balance of payments is concerned no-one would deny that the elements of this account would be more appropriately expressed in current prices. If the critical element, from the policy point of view, is the balance on current account, then what is relevant in 1970 is the balance in that year's prices, and not the balance in the prices of an earlier year.

Being a non-commodity flow like net output, the net foreign balance must also be determined residually, if an arbitrary projection is to be avoided. Thus the net foreign balance on current account at constant prices is obtained as the difference between the quantitative projections of exports and imports.

It is clear from the texts<sup>(9)</sup> of both the UK and Irish plans that the estimated constant price balance is interpreted as if it were, in fact, the current price balance. This is quite reasonable if the size of the two items are almost the same. If, however, there are grounds for thinking that the size of the two items will differ significantly, then the constant price measure becomes quite inadequate as a guide to the balance in current prices.

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<sup>(9)</sup>Second Programme, Part II, pp. 290/293 and the National Plan, pp. 82/83

Some Numerical Examples

It can be shown that estimates of values in constant prices, obtained by the indirect method, can differ not only in magnitude but even in sign from the corresponding current price value. The actual empirical significance of these differences can only be determined in particular cases, although, in general, one should expect that the longer the time period the greater the change in both relative prices and the general price level.

The present section examines some UK and Irish data relating to sector output and the balance of payments to see what inferences may be drawn about projections of these items. This involves a comparison of actual 1964 data in 1964 prices with the corresponding items for 1964 expressed in 1958 prices.<sup>(10)</sup>

If plans had been drawn up in 1958 to project, in that year's prices, exports and imports to 1964, and if, furthermore, these forecasts had been completely accurate, the results would have been as shown in columns (2) and (5) of Table 1. How do the net balances projected at constant prices compare with those actually realised, columns (1) and (4)? So far as Ireland is concerned, it is clear that even a completely correct quantitative projection would not have provided a very useful guide to the actual balances in 1964. If a similar projection had been made for the United Kingdom, the resulting estimate of the balance at constant prices would have been much closer to the actual balance.

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<sup>(10)</sup> Data for the UK relate to 1963.

TABLE I

Net Foreign Balance £ million

	<u>Ireland</u>			<u>United Kingdom</u>		
	1964 at current prices  (1)	1964 at 1958 prices  (2)	Adjusted for General Price Increase  (3)	1963 at current prices  (4)	1963 at 1958 prices  (5)	Adjusted for General price Increase  (6)
Imports	-392	-374		-7615	-7252	
Exports	<u>-361</u>	<u>318</u>	<u>        </u>	<u>5805</u>	<u>5567</u>	<u>        </u>
Balance	- 31	- 56	-69	-1810	-1685	-1887

The adjustment to columns (3) and (6) is made by multiplying the balances in columns (2) and (5) by 1.23 and 1.12 respectively, the implicit GNP price deflators.



The actually realised balance in 1964 is the result not only of changes in quantities and relative prices in the external account since 1958; it is also the result partly of changes in the general level of prices.<sup>(11)</sup> If the planners in 1958 had correctly foreseen the direction of the general price change, but still had made no allowance for changes in relative prices then in the case of the UK external account, the estimate of the net balance, Column (6), would then have been even closer to the actual outturn. However, in the Irish case, it is clear that any attempt to adjust for general price changes (upwards) without trying to forecast relative price changes would have widened the gap between the resulting forecast Column (5), and the actual outturn. It would involve multiplying £56m. by a positive constant greater than 1, if the general price level is expected to move upwards.

Stone has made a forecast of the British balance of payments in 1970 at 1960 prices. Warning of the hazards of long-term projections of the foreign-account, he point out that "quite small changes in the relative prices of imports and exports could convert a substantial positive balance into a negative one and vice versa".<sup>(12)</sup>

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(11) How much of the total price change is held to be due to relative and how much to general price changes depends on the price which is selected as numéraire. In Table 1, the change in the general level of prices is taken to be that of the implicit GNP price deflator.

(12) R. Stone; "Exploring 1970", A Programme for Growth, Vol. 6, Cambridge 1965, p.58.

It is difficult to compare constant price with current price sector net output from historical data, since the Irish national accounts do not publish a constant price net output series. The UK national accounts publish index numbers of output by industry at constant factor cost.<sup>(13)</sup> But, with the exception of the data for agriculture, these index numbers really measure gross rather than net sector output.<sup>(14)</sup> Since both Irish and U.K. plans project the net output of agriculture to 1970 in constant prices, the following data may offer some guide to the adequacy of such projections.

TABLE II.  
Agricultural Sector Net Output: £ million

	1963 at current prices (1)	1963 at 1958 prices (2)	Adjusted for General Price increase
UK	972	1038	1162
Ireland	173	166	186

Col (3) = Col (2) multiplied by 1.12

The figures show that a quantitatively accurate projection of agricultural net output made in 1958 prices for the year 1963 would have come within 10% of the actual 1963 value in both the UK. and Ireland. However, if an adjustment had been made for the expected increase in the general level of prices, then the discrepancy would have been larger in the case of the UK.

(13) National Income and Expenditure, 1964, HMSO London Table 14.

(14) "The object is to measure in real terms, the change in the net contribution of each industry to the gross domestic product. It is seldom possible, however, to obtain a direct measure of changes in net output (i.e. gross output minus input) and sufficient information is not normally available to enable both gross output and input to be estimated in real terms (i.e. at constant prices). In practice, therefore the change in net output is generally represented by a measure which relates to gross output:"

As an illustration, the projections in column (2) have been multiplied by 1.12, the implicit GNP price deflator in both countries.

The foregoing figures have been used purely as an illustration. The pattern of relative price changes over an arbitrary period of years in the past need not be repeated over a similar number of years in the future. It was also assumed that the quantitative projections were 100% correct: one cannot say whether the errors which normally occur in such quantitative projections bring the forecast value closer to the actual value or not. Nevertheless, the figures do not support the notion that price changes are unlikely to make much difference to the values projected over the planning period in constant prices.

#### Projecting Relative Prices.

If it is agreed that projecting end year relative prices would be a useful part of economic planning, then the only remaining justification of the practice of constant price projections is that the alternative is too difficult. Presumably, the reliability of price projections is thought not to be worth the additional effort required.

Although reliable projections of relative prices are widely assumed to be more difficult than quantity projections, it is noteworthy that there have been few tests of the reliability of quantitative projections in long-term economic planning. But the question is really whether assumptions which are made about future price changes are likely to be more accurate than the assumption that there will be no such changes.

Taking as numéraire a commodity whose price is expected to move with an index of the general level of prices, then it should be possible to project at least the direction of price changes of different goods. For example, one should expect a relative fall in the prices of fuel, power, synthetic materials and electronic components, a lesser relative decline in the prices of most agricultural products, and at the other end of the scale, a significant increase in the relative price of services and labour-intensive goods. Both the experience of the immediate past <sup>(15)</sup> and the relative price structures of more advanced countries can provide a guide to the size of the projected changes.

Where wide fluctuations in prices are to be expected, as for example in the prices of primary commodities, then one can either project an unchanged relative price or make two alternative projections representing the limits of a range of values.

The projected relative price trends for the output of each sector of production can be included consistently in a comprehensive inter-industry planning model. While there are many possible variants, in general the system requires that if there are  $n$  sectors of production, there are  $2n$  unknowns: the output price and the net output of each sector. This means that if the  $n$  sector prices are independently projected, the resulting net output can be determined for each sector, or vice versa.

Alternatively,  $h$  sector prices and  $k$  sector net outputs may be projected, and the remainder determined by the system, where  $h+k = n$ . This means that some prices can be taken as given, e.g. export and

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<sup>(15)</sup> In this context, one must mention the forthcoming E.R.I. study on Prices in Ireland by R.C. Geary & J. Pratschke.

import prices, whereas the prices in other sectors are determined by changes in factor costs.

When relative price changes as well as quantities have been projected in a comprehensive planning model the result is a system of accounts in which each item stands in the same relative value to the others, (assuming the projections are accurate) as would the actual terminal values. To obtain the system in the actual terminal year values it is only necessary to multiply each item in the system by the same factor. Thus, if the numéraire has been fixed at 100 in 1970, whereas the absolute price level of that commodity is expected to rise 30% by 1970, the same element in the system of accounts would be multiplied by 130.

Both the Second Programme and the National Plan deal with the relation between prices, wages and productivity in only the most general terms. Since the publication of the plans however, this question has become once more a central issue of economic policy. This would seem to provide a further reason for including prices as well as quantities within the framework of systematic economic planning.

### Conclusion

"In all problems of measurement, the fundamental question is - what questions can be answered better as a result of the measure devised?"<sup>(16)</sup>. The inferences to be drawn from highly aggregated national plans projected in constant prices are strictly limited.

<sup>(16)</sup> Kenneth Boulding: Output, Input, and Productivity Measurement. Studies in Income and Wealth, Vol. 25 Princeton 1961, p.340.

In particular, one can make statements only about the volume of output of different sectors of production; inferences about their performance or efficiency are ruled out.

In circumstances where price changes are likely to be empirically important e.g. balance of payments situations, then the values determined at constant prices may not be a useful guide to the size of the actual values.

The integration of price projections with quantity projections can best take place in three stages. First, quantity projections set out the change in each commodity flow in constant prices. These values are then multiplied by the appropriate indexes of relative price changes, to give the relative end-year values of all the variables. The results are helpful in establishing the relative efficiency of each sector of production. Finally, each element is multiplied by an index of the general level of prices to estimate the absolute end year values. This result is useful where the absolute size of a variable is important, e.g. the net foreign balance.