CHAPTER 9
THE ACCOUNTING FRAMEWORK FOR THE NORTH SEA WITH SOME NEW PROJECTIONS

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Any assessment of prospects for the British economy requires taking specific account of economic transactions related to the development of the North Sea. This, however, is very difficult, due to the scarcity of data. No specific items relating to the North Sea have yet been shown in official economic statistics. It is our view that regular publication by the CSO of economic information relating to North Sea development is now overdue. The accounts below, which show CEPG estimates of historical series and projections for the period up to 1985, are modelled on the national income accounts published in the Blue Book, and are one possible format.

The accounts as presented are estimates of the magnitude of income and expenditure flows deriving directly from North Sea activities. They provide a measure of the contribution of the North Sea to national income and the balance of payments as it would appear *ex post* in national accounts. They are *not* an attempt to assess the ultimate effects of North Sea activity as compared to a hypothetical situation in which North Sea oil and gas did not exist. Estimates of the latter kind would depend on numerous assumptions about how the government and the private sector might have adjusted their behaviour if no oil or gas had been discovered in UK waters.

From the information presented in our accounts we can derive estimates of the *impact* effects of North Sea developments on national income and the balance of payments. The addition to national income consists of royalties, Petroleum Revenue Tax and Corporation Tax accruing to the government, profits due to the British National Oil Company (BNOC), and profits due to the UK private sector. The addition to the current balance of payments is sales of oil and gas, *less* North Sea purchases from abroad, *less* property income paid abroad. The addition to the balance of payments on current and capital account is the addition to the current account, *less* depreciation allowance paid to foreign companies, *plus* overseas finance for North Sea development expenditures, *less* repayments by UK companies of overseas loans out of North Sea profits (from Table 9.2).

One major reason why these estimates cannot purport to show the effect of having North Sea activity compared to an alternative position without it is that North Sea gas is sold by producers at a price very much below the cost of alternative fuel supplies. Any attempt to quantify the full effect of having the gas would require estimates of the sources and prices of alternative supplies of energy, and of the response of UK consumers of energy to the difference in prices. The real value of the gas as a substitute for alternative fuels is far higher than that shown in our accounts.

Definitions

Note: the value of expenditures is measured at market prices. For the past, 1966-76, values of expenditure and income are shown at current prices; for the future, 1977-85, these values are shown deflated by the rise in the domestic expenditure deflator relative to 1976 and are denoted 'in 1976 values'.

The volume of expenditures and output is measured at 1970 factor cost. Volume series are denoted with a suffix A after the reference number, which relates to Table 9.3.

(1), (1A) Development expenditures are the total of expenditures on goods and services for exploration, appraisal and development of the resources in the North Sea. They do not include current costs of production of oil and gas, such as platform maintenance and insurance once production is actually under way, but they do include such expenditures if incurred before production of oil or gas begins.

(2), (2A), (3), (3A) Sales of oil and gas are valued at 'landed' prices. 'Oil' includes gas liquids.

(4), (4A), (5), (5A) These items represent all purchases of goods and services (including employment on North Sea installations) whether for development or production activities.

(6) Royalties are classified as an indirect tax.

(7), (7A) Value added at factor cost is conceptually equal to gross trading profits on North Sea operations as they would be if all development expenditures were fully capitalised on the books

Table 9·1 The immediate impact of the North Sea (£ million in 1976 values)

	1971	1976	1981	1985	1976–80	1981–85
Real disposable national income ..	51	535	3,738	5,167	9,333	23,321
(of which to UK public sector) ..	16	135	2,648	4,492	4,849	18,829
Current balance of payments	−39	−558	4,279	6,668	10,945	29,377
Adjusted current balance of payments*	−39	−608	3,873	5,850	7,634	25,494
Basic balance of payments	108	1,232	4,918	6,139	13,205	28,802

*This is the current balance as it would be if depreciation allowances due to foreign companies were treated as income rather than as capital flows.

rather than treated as current costs for tax purposes.

(8) Direct taxes are Petroleum Revenue Tax and Corporation Tax.

(9) Property income due abroad is equal to gross trading profits of foreign compamies *less* direct taxes, *less* depreciation allowances due to foreign companies, *plus* interest paid abroad by UK companies, *less* interest paid by foreign companies to the UK. Since finance raised from UK banks in the Eurodollar market must (normally) be raised by UK banks from abroad, the Eurodollar market is treated as being resident abroad.

(10) This is conceptually equal to BNOC's gross trading profits *less* direct taxes paid to the UK government, *less* interest paid abroad.

(11) Disposable income due to the UK private sector is equal to gross trading profits of UK companies *less* direct taxes, *less* interest paid abroad, *plus* interest received from foreign companies.

(12) Depreciation allowances due to foreign companies represent that part of North Sea income due to foreign companies which is not subject to Corporation Tax as capitalised development expenditures are written off the books. Following national income accounting conventions, these allowances are included in profits due to the UK. In the financial accounts the allowances appear as capital outflows.

(13), (14), (15) Finance by the overseas sector is the overseas sector's share of development expenditure, *plus* overseas loan finance for the UK private sector and BNOC shares, *less* loan finance from the UK private sector and BNOC. Items (13) and (14) are defined analogously except that financial transactions between BNOC and the UK private sector are excluded from consideration. It is recognised that the conceptual basis for allocating certain tranches of finance to expenditures in the North Sea in the accounts of companies which have operations outside the North Sea is very weak.

To make these items reconcile with sector capital accounts, item (12) must be added to item (13) and subtracted from item (15), and adjustments must be made for net loan repayments between the two UK sectors and the overseas sector.

This latter item has been estimated as a net flow from the UK to overseas, but has not been broken down into components, as follows:

Table 9·2 Loan repayments from UK to abroad
(£m at 1976 values)

1976	3·0	1981	154·6
1977	2·9	1982	194·7
1978	90·7	1983	275·7
1979	106·5	1984	267·9
1980	101·4	1985	351·2

Data sources and assumptions underlying projections

The primary data, i.e. estimates of oil output, gas output, operating costs, and development expenditures in the North Sea, are based on work done by Jon Morgan and Colin Robinson at the University of Surrey, and by Martin Lovegrove at Wood-MacKenzie in Edinburgh. The estimates could also not have been produced in their present form without the aid of Jon Morgan's computer model of the North Sea tax system and his willingness to modify it to accommodat CEPG assumptions. The work presented in this chapter has essentially been to set out estimates of oil and gas production together with all the related financial transactions within a single accounting framework, which is consistent with the usual national income concepts, and which can therefore be easily integrated with the rest of the CEPG model. The fundamental purpose of the exercise is to make it possible to consider the North Sea operation and the functioning of the rest of the economy separately as well as together. In the process of getting out consistent accounts significant modifications to the primary sources were made for which we take full responsibility.

The main assumptions to which the calculations are sensitive are as follows:

(1) Gas output is assumed to consist of gas from existing fields in the Southern basin, Brent and Frigg (UK); a small estimate is also made for other oil-associated gas and probable discoveries. Gas production is assumed to rise to a peak of 21·8 billion therms in 1980. No allowance is made for the gas-gathering pipeline currently under consideration.

(2) Oil output is assumed to come from 14 proven fields (Argyll, Auk, Beryl, Brent, Claymore, Cormorant, Dunlin, Forties, Heather, Montrose, Ninian, Piper, Thistle, and Statfjord (UK)), seventeen probable fields, unknown possible discoveries deriving from future licensing rounds, and includes a small amount of gas liquids. Oil output is assumed to reach a peak of 160·9 million tons in 1984.

(3) North Sea oil is valued at $12·80 per barrel in 1976, is assumed to have an average price of $14·00 in 1977, and is assumed to rise in dollar terms at 5% per annum thereafter.

(4) There is assumed to be a general world dollar inflation of 5% per annum from 1976 to 1985. The UK is assumed to experience 15% inflation in 1977, 10% per annum thereafter. The dollar/sterling exchange rate is assumed to average $1·7941 in 1976 and adjust according to purchasing power parity thereafter. The implication of these assumptions is that the real price of oil would rise by just over 4% in 1977 and remain constant thereafter. By doing the calculations in current sterling terms the effect of UK inflation on the real value of capital allowances is fully allowed for. The price of gas is assumed to rise in line with UK inflation at 1976 values of 2·16 pence per therm for gas from the Southern basin, 6·95 pence per therm for gas from Frigg (UK) and 7·63 pence per therm for Brent and 'other' gas.

(5) Corporation Tax is assumed levied on sales of oil and gas *less* operating expenditures, *less* royalties (at 10% average rate), *less* petroleum revenue tax, *less* interest payments, *less* depreciation allowances (which are assumed carried forward if not used). Because Corporation Tax is on a corporation basis within the ring fence (assumed to apply since mid-1974), but not on a project basis, this is the most problematical

part of the exercise. Taxation of oil production by the Shell/Esso group (Auk, Brent, Cormorant, Dunlin, Cormorant Extension, Tern), by BP (Forties, Magnus, Andrew), by the Occidental Group (Piper, Claymore) and by the Mobil Group (Beryl, West Beryl) was treated on a company basis and a 52% tax rate was assumed. The rest of the proven and probable oil fields and the Brent and Frigg (UK) gas fields were treated the impact on a project basis. To allow crudely for of deferred Corporation Tax on the field by using depreciation allowances accrued on another field, an effective corporation tax of 20% in 1978, 30% in 1979, 40% in 1980, 45% in 1981, and 50% thereafter was assumed, but no depreciation allowances were credited on the 'possible' discoveries for use in deferring Corporation Tax. This means that in 1980 taxation of 73·3 million tons of oil is treated properly on a corporation basis, the remaining output (30·6 million tons) is treated on a project basis, with an assumed effective Corporation Tax rate of 40%.

Corporation Tax is assumed to be paid in the final quarter of the government's financial year immediately following the calendar year in which the relevant production took place. Thus there is a 2-year lag on a calendar year basis.

Table 9.3 North Sea accounts

£ million

	Reference Number	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
At 1970 Factor Cost											
Development Expenditures ..	(1A)	22	69	72	86	63	68	98	89	183	446
Sales of Gas	(2A)	—	2	7	18	41	67	98	107	129	132
Sales of Oil	(3A)	—	—	—	—	—	—	—	—	—	10
less Purchases from UK ..	(4A)	7	21	23	31	26	31	46	45	77	212
less Purchases from Abroad	(5A)	15	48	50	61	46	51	73	67	134	287
Value added at Factor Cost*	(7A)	—	2	6	12	32	53	77	84	101	109
At Current Prices											
Development Expenditures ..	(1)	19	64	69	85	67	81	128	155	473	1551
Sales of Gas	(2)	—	4	12	23	49	80	116	138	202	245
Sales of Oil	(3)	—	—	—	—	—	—	—	—	—	59
less Purchases from UK ..	(4)	6	19	22	28	28	37	60	72	179	681
less Purchases from Abroad	(5)	14	45	49	60	49	60	95	115	340	946
less Royalties	(6)	—	—	1	2	5	8	12	14	20	30
Value Added at Factor Cost* ..	(7)	—	3	9	17	35	56	77	92	135	198
Allocation of Factor Income at Current Prices											
Direct Taxes paid to U.K. Government	(8)	—	—	—	—	—	—	—	—	—	—
Property Income paid Abroad	(9)	—	—	3	9	24	39	53	64	95	152
Disposable Income due BNOC	(10)	—	—	—	—	—	—	—	—	—	—
Disposable Income due UK Private Sector	(11)	—	3	7	8	10	17	24	28	40	40
Depreciation Allowances due Foreign Companies ..	(12)	—	—	—	—	—	—	—	—	—	7
Value Added at Factor Cost* ..	(7)	—	3	9	17	35	56	77	92	135	198
North Sea Capital Account at Current Prices											
Development Expenditures	(1)	19	64	69	85	67	81	128	155	473	1551
Financed by UK Private Sector	(13)	14	9	23	29	21	9	47	79	128	308
Financed by BNOC	(14)	—	—	—	—	—	—	—	—	—	—
Financed by Overseas Sector	(15)	5	55	46	56	46	72	81	76	345	1243

*Totals may not add due to rounding.

Other assumptions of lesser importance are as follows:

(6) All companies are assumed to finance 20% of their development with equity capital and 80% with loan capital. Foreign companies are assumed to be financed 100% from abroad. UK companies, including BNOC, are assumed to raise half their loan finance in the UK and half abroad. Interest is paid at 12% per annum. Before production begins it is rolled over and capitalised. Interest payments begin when production begins. Loan repayment begins the year before peak production and full amortisation takes seven years.

(7) BNOC is assumed to have fully acquired the National Coal Board holdings in Statfjord (UK), Murchison, and Hutton, and also the Burmah holdings in Thistle and Ninian. BNOC is also assumed to have a 51% share in all future licensing rounds. No account is taken of option-to-buy participation arrangements. Because of complications in the calculations, the BNOC take is net of direct taxes on its existing holdings but gross on future discoveries.

(8) 80% of operating costs are assumed to be paid to the UK, 20% abroad. Development expenditures are assumed to be paid 70% abroad until 1974, falling to 40% in 1980 and 30% by 1985.

£ million

	Reference Number	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
At 1970 Factor Cost											
Development Expenditures ..	(1A)	500	323	230	260	318	338	357	293	241	248
Sales of Gas	(2A)	146	160	177	198	213	206	197	189	180	171
Sales of Oil	(3A)	85	236	417	555	664	751	841	928	1029	1018
less Purchases from UK ..	(4A)	258	229	237	289	351	400	442	428	419	436
less Purchases from Abroad	(5A)	314	199	145	153	167	175	183	159	141	140
Value Added at Factor Cost* ..	(7A)	159	291	442	571	677	720	770	823	890	861
At 1976 Values											
Development Expenditures ..	(1)	2232	1460	1043	1185	1463	1554	1632	1329	1084	1100
Sales of Gas	(2)	324	369	494	659	809	796	774	746	703	660
Sales of Oil	(3)	697	2008	3498	4718	5696	6458	7204	7915	8701	8464
less Purchases from UK ..	(4)	1089	954	957	1194	1490	1690	1883	1788	1728	1783
less Purchases from Abroad	(5)	1388	881	640	676	749	796	810	716	632	626
less Royalties	(6)	102	238	399	538	650	725	798	866	940	912
Value Added at Factor Cost* ..	(7)	674	1764	3038	4155	5079	5598	6118	6620	7188	6903
Allocation of Factor Income at 1976 values											
Direct Taxes paid to UK Government	(8)	33	80	321	794	1202	1601	2164	2821	2921	3045
Property Income paid Abroad	(9)	191	252	798	1138	1614	2179	1994	1595	1866	1830
Disposable Income due BNOC	(10)	—	6	63	168	255	322	331	377	471	535
Disposable Income due UK Private Sector	(11)	400	891	1090	1010	1093	1090	1043	831	853	675
Depreciation Allowances due Foreign Companies ..	(12)	50	535	766	1045	915	406	586	996	1077	818
Value Added at Factor Cost* ..	(7)	674	1764	3038	4155	5079	5598	6118	6620	7188	6903
North Sea Capital Account at 1976 values											
Development Expenditures ..	(1)	2232	1460	1043	1185	1463	1554	1632	1329	1084	1100
Financed by UK Private Sector	(13)	295	159	155	198	291	208	222	187	156	157
Financed by BNOC	(14)	94	126	49	62	78	146	238	254	275	303
Financed by Overseas Sector	(15)	1843	1175	839	925	1094	1200	1172	888	653	640

*Totals may not add due to rounding.