Impact Project

Impact Research Centre, The University of Melbourne,
153 Barry Street, Carlton, Victoria 3053 Australia.

Telephone: (03) 344 7417 (*from overseas:* 61 3 344 7417)
Telex: AA 35185 UNIMEL Telegrams: UNIMELB, Parkville
Facsimile: (03) 344 5104 (*from overseas:* 61 3 344 5104)

DISTRIBUTIONAL EFFECTS OF ALTERNATIVE POLICY RESPONSES TO AUSTRALIA'S TERMS OF TRADE DETERIORATION

by

Nisha Agrawal

IMPACT Research Centre
University of Melbourne
and
Industries Assistance Commission

and

G.A. Meagher

Institute of Applied Economic
and Social Research
University of Melbourne

Preliminary Working Paper No. IP-31 Melbourne June 1987

ISSN 0813 7986 ISBN 0 642 10152 3

ABSTRACT

Australia has recently suffered a severe deterioration in its terms of trade. In this paper we present an analysis of the short-run distributional consequences of that shock. We also examine the differences in the distributional effects of some alternative demand management and incomes policies designed to offset the effects of the deterioration on the balance of trade. The analysis depends on simulations using an extended version of the ORANI model of the Australian economy, taken in conjunction with unit record data from the 1981/82 Income and Housing Survey. The distributional effects are examined across various classifications of individuals: across occupational groups; across groups with different principal sources of income; across demographic groups; and, across income deciles. For the occupational and demographic classifications, we examine employment changes as well as income changes.

CONTENTS

LIST OF TABLES

DISTRIBUTIONAL EFFECTS OF ALTERNATIVE POLICY RESPONSES TO AUSTRALIA'S TERMS OF TRADE DETERIORATION

by

Nisha Agrawal

and

G. A. Meagher*

1 INTRODUCTION

Since the end of 1984 Australia has experienced a sharp decline in its terms of trade. The decline exacerbated an already poor trading performance that saw the deficit on goods and services average more than 2.5 per cent of GDP between 1981 and 1984, and the net foreign debt rise from 6 per cent of GDP to 18 per cent over the same period. Beginning in early 1985, foreigners responded by attempting to reduce their holdings of Australian financial assets, resulting in a series of devaluations of the Australian dollar.

When a government is confronted with a large and increasing deficit in the balance of trade, there are two types of policies to

---

The authors are indebted to Alan Powell for his comments on an earlier draft of this paper. Financial support from the Australian Research Grants Scheme is also gratefully acknowledged.

which it may resort in the short run. It could seek to reduce domestic absorption, and hence expenditure on imports, either by reducing its own expenditure on goods and services or by increasing income tax rates. Alternatively, it could seek to switch expenditure in favour of domestically produced goods by lowering domestic costs and hence improving competitiveness. In an environment in which the nominal foreign currency value of the Australian dollar is already falling, this result could be achieved by an incomes policy which prevents pre-tax nominal wage rates from increasing as quickly as domestic prices. In other words, the policy would operate by persuading workers to take a cut in pre-tax real wage rates, thus ensuring that the nominal devaluations were converted into real ones.

Both types of policies have been pursued by the Australian Government since 1985. In successive budgets it has reduced the rate of growth - if not the amount - of its spending to its lowest level in 30 years. In the words of the Treasurer, the budgetary measures

> "involve a massive reordering of Government spending priorities to meet the huge collapse in our terms of trade." (Keating, 1987, p.1)

The Government has also been successful in negotiating wage settlements with the trade union movement which include devaluation discounting, albeit at the expense of cuts in income tax rates as a trade-off.[1]

In this paper we present an analysis of the short-run distributional consequences of a deterioration in the terms of trade, and of some

alternative demand management and incomes policies designed to offset the effects of the deterioration on the balance of trade. The analysis depends on simulations using an extended version of the ORANI model of the Australian economy, taken in conjunction with unit record data from the 1981/82 Income and Housing Survey (IHS). Details of the simulations are specified in Section 2 of the paper. Although our emphasis is on distribution, the analysis must be informed by a prior understanding of the associated macro and structural changes in the economy. This discussion is undertaken in Section 3. In Section 4 we describe the method whereby results from the extended ORANI model are used to update the IHS unit record data. In Section 5 we report results for changes in the employment and real disposable income of individuals by occupation, principal source of income, demographic characteristics and income decile. Section 6 contains some concluding remarks.

2 SPECIFICATION OF THE SIMULATIONS

2.1 The Model

The ORANI multisectoral model of the Australian economy is well known, having been applied by many users to a wide range of policy issues.[2] The standard version of the model is comprehensively documented in Dixon et al. (1982). In recent applications, it has often been augmented with a system of equations designed to improve its description of the national and government accounts. This extension, referred to as the NAGA model, is specified in Meagher and Parmenter (1985 and 1987). The latter reference also contains the NAGA database used in our simulations, while a record of the relevant ORANI database can be found in Blampied (1985).

To generate our distributional results, we first compute solutions to the combined ORANI/NAGA model to determine the effects of the decline in the terms of trade on a range of macro and structural variables of the economy. The equations of the ORANI model were implemented and solved using the GEMPACK general purpose software system for CGE models (Pearson, 1986). The process of solving the linear equations used the Harwell sparse matrix code (Duff, 1977). A selection of these variables, (concerning employment, factor prices and commodity prices) are then used to update the incomes and population weights of all the income recipients identified in the IHS unit records. Finally we compute distributional statistics for various groups from the updated records and compare them with the corresponding statistics computed from the original records. The general methodology has already been reported in Meagher and Agrawal (1986), but the current simulations incorporate some important modifications which are set out in Section 4.

2.2 The Terms of Trade Shock

Fallon and Thompson (1987) have estimated changes in the prices of Australia's imports and exports for the 18 month period ending in June 1986. Their estimates are given in Table 1 and have been adopted without alteration[3] as the initiating terms of trade decline in all our simulations. However, their use must be interpreted with some care.

Firstly, the price changes are specified in Australian dollars and hence they incorporate the effects of nominal devaluations

Table 1

Estimates of Export and Import Price Changes in $A for ORANI Commodities for the Eighteen Months to the end of June 1986

	Percentage Change
Exports	
Wool	9.6
Sheep	-10.0
Wheat	1.6
Barley	-30.7
Other grains	0.0
Other rural exports	4.0
Ferrous metal ores	4.2
Non-ferrous metal ores	20.6
Coal	7.9
Meat products	5.0
Other food products	35.0
Cotton ginning, wool scouring	5.2
Basic non-ferrous metals	17.5
Other non-rural exports	12.0
Export services	7.4
Imports	
Rural Imports	4.0
Food and beverages	28.5
Textiles	29.5
Clothing and footwear	26.4
Wood, wood products and furniture	28.5
Paper and paper products	35.9
Chemical products	33.5
Non-metallic mineral products	34.0
Basic metal products	26.8
Fabricated metal products	29.6
Transport equipment	57.8
Appliances and electrical equipment	30.1
Industrial machinery and equipment	56.3
Other manufacturing	40.8
Crude oil	-50.8
Petroleum products	-9.8
Other mineral imports	15.0
Import services	27.0

Source: Fallon and Thompson (1987).

during the stated period. Nevertheless, we have chosen to apply the changes to the foreign currency prices of imports and exports, as the conclusions we shall draw from our analysis depend only on their relative values. As far as real variables (including all relative prices) are concerned, the ORANI-NAGA model can only recognize changes in the real exchange rate; its results are not sensitive to the mix of changes in the nominal exchange rate and the domestic price level which make up a particular change in the real exchange rate. Indeed, we take the unit of foreign exchange to be the numeraire for the model, so that any induced changes in the real exchange rate formally appear only as changes in the domestic price level. If we were to allow a change in the nominal exchange rate, it would serve only to inflate or deflate the absolute price level, and, on that score, our analysis has nothing to say in any case.[4],[5]

These remarks are pertinent to an observation we made in Section 1. We noted that a nominal devaluation with less than full wage indexation will result in a real wage cut and hence in a real devaluation. What matters for the ORANI-NAGA solution is the size of the real wage cut and the corresponding real devaluation; it does not matter whether these real changes are accompanied by a nominal devaluation or not. Thus, even though we may formally model a real wage cut with the nominal exchange rate held constant, the results for real variables remain relevant to the situation just envisaged in which the nominal exchange rate varies.

A second complication in interpreting the terms of trade shock arises because the price changes reflect not only changed conditions (e.g., changes in taste or technology) in the rest of the

world, but also changes in the Australian economy during the apposite 18 months. The ORANI model makes the small country assumption on the import side but allows Australia some market power for its major exports. Hence, according to ORANI, the true change in the terms of trade will be masked to some extent by adjustments in Australian export supply over the period in question. Such effects are likely to be small and certainly difficult to estimate, so we have assumed the price changes are entirely due to changes in foreign conditions. In that case, it is appropriate to model the changes in export prices in Table 1 as shifts in the corresponding export demand curves, allowing the model to determine the equilibrium export prices after supply has adjusted. The changes in import prices in Table 1 are imposed directly on the corresponding model variables, which are exogenous.

Finally, we operate our model as a tool of comparative static policy analysis. This means that we impose the terms of trade shock at a particular point of time (rather than over an extended interval). As with any comparative static analysis, our results are not claimed to represent the actual evolution of the economy. Rather, they give a broad picture of how much difference the decline in the terms of trade would make to the economy after about two years of adjustment.

2.3 The Economic Environment

In the following sections we report results for five different simulations of the effects of the terms of trade deterioration. The simulations differ in the assumptions made about three instruments of economic policy: real current government expenditure on goods and services, the rate of indexation of the pre-tax nominal wage rate (the

indexation rate is assumed to be under government control via an incomes policy), and the rate of indexation of government transfers to persons (including unemployment benefits).[6] In both the latter cases, the rate of indexation is measured relative to the consumer price index (CPI).

In Simulation I, the government is assumed simply to allow the balance of trade to move further into deficit. It maintains the real value of its own spending and approves full indexation of wage rates and transfers. This simulation constitutes a benchmark (or Policy 1) in which the government is referred to as making "no policy response".

In the remaining simulations the government adopts various policies which neutralize the effect of the terms of trade deterioration on the balance of trade deficit. In Simulation II, it relies on demand management (Policy 2), cutting its spending but maintaining full indexation of wages and transfers. In Simulation III it relies on its incomes policy (Policy 3) to reduce real wage rates. In simulation IV, government spending again remains constant but a common rate of partial indexation is applied to income from wages and transfers (Policy 4). This simulation ostensibly goes some way to meet the Australian Government's commitment to

> "fairly share the burden of economic adjustment across the whole community" (Keating, 1987, p.15).

In the final simulation, the idea is taken one step further in that government expenditure cuts and the common rate of partial indexation are chosen so that the resulting reduction in real private expenditure

is equal to the reduction in real government expenditure (Policy 5). Thus, by this criterion at least, the burden is shared equally by the public and private sectors, as well as by the recipients of wages and transfers. Of course, it is an object of the analysis to provide information on just how "fair" such arrangements would turn out to be.

In all cases, the simulations are short-run[7] in the sense that industry specific land and capital are fixed, with rental rates adjusting to ensure that these factors remain fully employed. The labour market is assumed to be slack. The model also includes an absorption function which requires that real private consumption and investment each vary directly with real disposable income. Thus the model abstracts from the effects of the terms of trade shock and the countervailing government policies on the composition of private absorption.[8,9] Real public investment is assumed to move with real private investment.

3 THE MACRO AND STRUCTURAL EFFECTS

The ORANI-NAGA model generates results for the macroeconomy, the government accounts and a wide range of structural variables, including the industrial composition of production. We shall restrict our attention to the selection of macro and fiscal variables shown in Table 2, and to the industry outputs shown in Table 3. The five columns in each table represent the five simulations described at the end of the last section. Our results are typically presented in percentage change form. Thus the value 13.58 given for the consumer price index (CPI) in

Table 2

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : Selected Macro Variables

	Simulation	I	II	III	IV	V
	Variable*	Base simulation (no policy response)	Reduction in current government expenditure	Reduction in pre-tax real wage rate: Full indexation of transfer payments	Reduction in pre-tax real wage rate: Partial indexation of transfer payments	Balanced reductions in government expenditure, wage rates and transfer payments
1	Consumer price index (CPI)	13.58	11.25	10.71	10.77	11.01
2	Private absorption deflator (PAD)	14.69	12.43	11.63	11.76	12.10
3	Pre-tax nominal wage rate	13.58	11.25	7.64	8.46	9.86
4	Pre-tax real wage rate (CPI deflated)	0.00	0.00	-3.06	-2.32	-1.15
5	Disposable labour income	13.22	9.20	10.35	10.40	9.79
6	Disposable capitalist income	7.45	4.94	8.91	7.94	6.43
7	Government transfers to persons	13.85	12.77	8.69	7.01	9.92
8	Nominal disposable income	10.75	7.78	9.24	8.72	8.24
9	Real disposable income (PAD deflated)	-3.94	-4.65	-2.38	-3.04	-3.85
10	Volume of exports	1.06	5.08	8.74	7.92	7.10
11	Export receipts	11.71	14.34	16.72	16.19	15.26
12	Volume of imports	-15.00	-18.15	-15.48	-16.08	-16.67
13	Import expenditure	14.86	12.56	14.64	14.17	13.36
14	Balance of trade deficit	0.86	0.00	0.00	0.00	0.00
	Real gross domestic product -					
15	unadjusted for terms of trade decline	-0.24	-1.27	1.95	1.38	0.04
16	adjusted for terms of trade decline	-4.23	-5.26	-2.04	-2.60	-3.94
17	Aggregate employment	-0.36	-2.05	2.71	1.94	-0.07
18	Real private absorption	-3.94	-4.65	-2.38	-3.04	-3.85
19	Real current government expenditure on goods and services	0.00	-7.64	0.00	0.00	-3.85
20	Public sector borrowing requirement	1.38	0.38	0.45	0.43	0.40

* All variables are expressed as percentage changes except the balance of trade surplus and the public sector borrowing requirement, which are expressed as percentages of gross domestic product.

Table 3

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : Industry Outputs

	Simulation	I	II	III	IV	V
	Variable*	Base simulation (no policy response)	Reduction in current government expenditure	Reduction in pre-tax real wage rate		Balanced reductions in government expenditure, wage rates and transfer payments
				Full indexation of transfer payments	Partial indexation of transfer payments	
1	Pastoral zone	-4.94	-3.38	-1.26	-1.75	-2.57
2	Wheat-sheep zone	-6.80	-5.50	-3.79	-4.19	-4.85
3	High rainfall zone	-6.85	-4.98	-2.49	-3.07	-4.03
4	Northern beef	-13.50	-10.55	-6.70	-7.60	-9.09
5	Milk cattle and pigs	-3.66	-2.72	-1.22	-1.57	-2.15
6	Other farming - export	28.67	31.49	35.55	34.61	33.03
7	Other farming - import competing	0.83	1.29	3.92	3.30	2.29
8	Poultry	-5.93	-4.46	-2.48	-2.94	-3.71
9	Agricultural services	2.90	2.40	6.18	5.70	4.03
10	Forestry and logging	1.21	-1.66	1.07	0.73	-0.48
11	Fishing and hunting	2.95	3.30	4.73	4.41	3.85
12	Ferrous metal ores	-8.01	-6.35	-4.37	-4.83	-5.60
13	Non-ferrous metal ores	6.47	8.75	11.60	10.95	9.84
14	Black coal	-6.74	-3.90	-0.53	-1.30	-2.61
15	Oil, gas and brown coal	-5.77	-5.57	-5.27	-5.33	-5.45
16	Other minerals	-0.77	-0.86	1.58	0.98	0.05
17	Services to mining n.e.c.	-14.49	-14.06	-13.04	-13.22	-13.64
18	Meat products	-10.98	-8.16	-4.56	-5.40	-6.80
19	Milk products	0.25	0.21	0.60	0.51	0.36
20	Fruit and vegetable products	-0.99	-1.30	0.24	-0.16	-0.73
21	Margarine, oils and fats n.e.c.	5.44	5.57	7.63	7.15	6.35
22	Flour mill and cereal food products	1.34	1.64	2.66	2.42	2.02
23	Bread, cakes and biscuits	-0.70	-0.84	-0.20	-0.36	-0.60
24	Confectionery and cocoa products	-0.16	-0.32	1.22	0.82	0.25
25	Other food products	53.72	59.01	64.96	63.58	61.28
26	Soft drinks, cordials and syrups	-0.81	-1.31	0.53	0.10	-0.61
27	Beer and malt	-2.69	-3.20	-1.16	-1.74	-2.48
28	Other alcoholic beverages	-0.56	-0.81	2.90	1.88	0.52
29	Tobacco products	-1.47	-1.75	-0.27	-0.68	-1.22
30	Cotton ginning, wool scouring , etc.	-9.80	-7.24	-3.33	-4.24	-5.75
31	Man-made fibres, yarns, etc.	24.52	27.55	33.57	32.19	29.85
32	Cotton yarns, broadwoven fabrics, etc.	17.36	19.63	24.19	23.14	21.37
33	Worsted and woollen yarns, etc.	4.17	4.27	7.15	6.45	5.35
34	Textile finishing	2.34	2.34	4.62	4.07	3.20
35	Textile floor coverings, felt, etc.	0.80	0.08	4.48	3.30	1.67
36	Other textile products	2.08	1.63	5.19	4.44	3.02
37	Knitting mills	1.69	1.75	3.78	3.33	2.53
38	Clothing	1.47	1.65	3.43	3.01	2.32
39	Footwear	10.61	12.25	16.62	15.66	13.94
40	Sawmill products	3.03	3.25	6.12	5.42	4.32

...continued

Table 3 continued...

	Simulation	I	II	III	IV	V
		Base simulation (no policy response)	Reduction in current government expenditure	Reduction in pre-tax real wage rate		Balanced reductions in government expenditure, wage rates and transfer payments
	Variable*			Full indexation of transfer payments	Partial indexation of transfer payments	
41	Veneers and manufactured wood boards	-0.79	-1.55	1.72	0.92	-0.33
42	Joinery and wood products n.e.c.	-2.06	-2.97	-0.31	-0.95	-1.97
43	Furniture and mattresses	-3.87	-5.41	-0.89	-2.02	-3.73
44	Pulp, paper and paperboard	7.96	7.92	11.66	10.93	9.41
45	Bags, fibreboard containers	0.36	0.34	3.14	2.51	1.42
46	Paper products n.e.c.	1.47	0.88	3.73	3.16	2.01
47	Newspapers and books	3.76	2.80	6.44	5.80	4.29
48	Commercial printing	0.07	-1.04	2.22	1.64	0.29
49	Chemical fertilisers	1.73	3.03	5.70	5.11	4.06
50	Other basic chemicals	13.58	14.59	18.02	17.26	15.92
51	Paints and varnishes	7.14	7.18	9.63	9.03	8.10
52	Pharmaceutical products, etc.	1.52	0.11	4.90	4.03	2.05
53	Soap and detergents	-1.58	-2.08	0.10	-0.38	-1.24
54	Cosmetics and toilet preparations	-0.91	-1.37	0.49	0.05	-0.67
55	Other chemical products	5.22	5.14	8.58	7.91	6.51
56	Petroleum and coal products	2.17	1.65	4.36	3.72	2.68
57	Glass and glass products	4.39	4.32	7.24	6.53	5.42
58	Clay products and refractories	1.08	0.96	3.60	2.90	1.92
59	Cement	-4.10	-4.83	-2.38	-3.03	-3.94
60	Ready mixed concrete	-4.97	-5.80	-3.34	-4.01	-4.91
61	Concrete products	-4.95	-5.79	-3.31	-3.98	-4.89
62	Other non-metallic mineral products	-3.22	-3.73	-1.36	-1.99	-2.87
63	Basic iron and steel	4.82	4.87	7.52	6.88	5.87
64	Basic non-ferrous metals and products	4.50	7.19	10.71	9.90	8.53
65	Structural metal products	-2.64	-3.28	-0.56	-1.27	-2.29
66	Sheet metal products	1.72	1.26	3.78	3.16	2.20
67	Other metal products	6.80	6.70	10.19	9.38	8.03
68	Motor vehicles and parts, etc.	44.00	45.34	50.25	49.03	47.17
69	Ships and boats	5.23	3.44	5.13	4.94	4.18
70	Railway rolling stock and locomotives	-1.40	-2.61	0.77	0.26	-1.18
71	Aircraft	4.69	2.74	6.76	5.93	4.32
72	Photographic and scientific equipment	-1.53	-2.80	0.30	-0.31	-1.57
73	Electronic equipment	2.46	1.70	6.44	5.34	3.50
74	Household appliances and water heaters	-4.42	-4.92	-0.94	-2.07	-3.50
75	Other electrical equipment	-0.12	-0.97	2.09	1.34	0.18
76	Agricultural machinery	15.47	25.22	35.33	32.69	28.92
77	Construction machinery, etc.	2.40	1.89	3.56	3.15	2.51
78	Other machinery and equipment	5.80	5.43	7.57	7.00	6.21
79	Leather products	13.13	13.98	17.22	16.51	15.24
80	Rubber products	10.76	10.88	14.72	13.85	12.35

...continued

Table 3 continued...

Variable*	Simulation I: Base simulation (no policy response)	II: Reduction in current government expenditure	III: Reduction in pre-tax real wage rate — Full indexation of transfer payments	IV: Reduction in pre-tax real wage rate — Partial indexation of transfer payments	V: Balanced reductions in government expenditure, wage rates and transfer payments
81 Plastic and related products	8.00	8.22	11.68	10.91	9.55
82 Signs; writing and marking equipment	6.91	6.28	9.95	9.25	7.75
83 Other manufacturing	6.97	6.60	9.96	9.27	7.93
84 Electricity	-0.36	-1.05	1.91	1.27	0.10
85 Gas	1.91	1.07	3.98	3.29	2.17
86 Water, sewerage and drainage	-0.37	-1.21	0.99	0.64	-0.29
87 Residential building construction	-3.55	-4.19	-2.15	-2.75	-3.48
88 Other construction	-5.86	-6.79	-4.09	-4.81	-5.81
89 Wholesale trade	-0.38	-0.53	2.34	1.68	0.57
90 Retail trade	-3.75	-4.52	-2.32	-2.94	-3.73
91 Mechanical repairs	-4.04	-4.81	-1.51	-2.34	-3.59
92 Other repairs	-4.55	-5.38	-2.00	-2.85	-4.13
93 Road transport	0.37	0.01	2.80	2.26	1.13
94 Railway and other transport, etc.	-0.95	-2.11	1.60	1.14	-0.50
95 Water transport	3.23	3.28	5.24	4.91	4.09
96 Air transport	0.06	-0.89	3.45	2.46	0.77
97 Communication	-1.98	-3.10	0.42	-0.33	-1.73
98 Banking	-1.20	-2.94	0.69	0.13	-1.42
99 Non-bank finance	-0.73	-1.23	0.89	0.45	-0.40
100 Investment and financial services	-1.74	-2.35	-0.15	-0.68	-1.52
101 Insurance and insurance services	-2.72	-3.39	0.18	-0.73	-2.07
102 Other business services	-1.18	-2.20	1.07	0.41	-0.90
103 Ownership of dwellings	0.00	0.00	0.00	0.00	0.00
104 Public administration	-0.12	-6.76	0.32	0.20	-3.31
105 Defence	0.00	-7.55	0.00	0.00	-3.81
106 Health	-2.94	-7.33	-1.02	-1.70	-4.54
107 Education, museums and libraries	-0.46	-7.59	-0.14	-0.25	-3.95
108 Welfare and religious institutions, etc.	-1.79	-6.84	-0.40	-0.86	-3.88
109 Entertainment and recreation	-3.15	-5.42	-0.86	-1.67	-3.56
110 Restaurants, hotels and clubs	-3.92	-4.86	-1.20	-2.16	-3.52
111 Personal services	-4.27	-5.29	-1.30	-2.35	-3.83
112 Non-competing imports	-0.02	-7.65	-0.02	-0.02	-3.87

* All variables are expressed as percentage changes.

the first column of Table 2 has the following interpretation: about two years after a decline in the terms of trade as specified in Table 1, the CPI will be 13.58 per cent higher than it would have been in the absence of the decline.

3.1 The Base Simulation: No Policy Response

The macro results for Simulation I can be best understood as the outcome of three separate effects flowing from the terms of trade decline: a foreign price effect, a wage effect and an income effect. Under this decomposition, the sizes of the three effects (but not their total) do depend on the absolute price changes constituting the shock.

Most of the foreign price changes in Table 1 are increases. Abstracting from any flows through into wages or into aggregate demand, the increased prices of foreign traded goods tend to improve the international competitiveness of the economy. However, as the higher import prices feed through into the CPI, full wage indexation results in an increase in the pre-tax nominal wage rate. This second effect works against the first, raising domestic costs and reducing competitiveness.

Although the foreign prices of most exports and imports may increase, the terms of trade actually decline; hence, the increase in import prices exceeds the increase in export prices on average. Furthermore, full wage indexation implies that domestic costs tend to rise with import prices. Hence, exporters are caught in a cost-price squeeze, and real returns to non-labour primary factors tend to fall in export industries. The absorption function translates the income loss

into reduced demand for consumption and investment goods, setting in motion a downward multiplier process. As a side-effect, this deflationary process also tends to improve competitiveness.

On balance, there is a sense in which we can say that the competitiveness of the economy has improved, as the volume of exports has increased and the volume of imports has decreased. The balance of trade still deteriorates, however, because of the reduction in the valuation of exports relative to imports. Furthermore, the impetus given to output and employment by the increases in export and import replacement activities is outweighed by the reduction in absorption associated with the income effect. Both, aggregate output (as measured by real gross domestic product without adjustment for the terms of trade decline) and aggregate employment fall slightly.

Our interpretation of the macro results is borne out in somewhat more detail by the structural results for Simulation I. In Table 3 we have reported the change in output for all 112 industries identified in the ORANI model. This level of industry disaggregation provides important background information for the disaggregated occupational results discussed in Section 5. For our present purposes, it is sufficient to consider only the industries whose outputs change the most. Thus, in Table 4, we have ranked (by output) the twenty main gainers and losers for Simulation I. Moreover, we have identified separately the contributions of the foreign price effect, the wage effect and the income effect to the total change in output. These are described as Simulations IA, IB and IC, respectively.

Table 4

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : Components of Base Simulation

	Simulation		IA Foreign Price Effect		IB Wage Effect		IC Income Effect		I Total Effect	
	Variable*		% Change	Rank	% Change	Rank	% Change	Rank	% Change	Rank
	Terms of trade deterioration		1.00		0.00		0.00		1.00	
	Pre-tax nominal wage rate		0.00		13.58		0.00		13.58	
	Real private absorption		0.00		0.00		-3.94		-3.94	
	Industry outputs, main losers -									
17	Services to mining n.e.c.	NT	-11.18	1	-3.45	50	0.14	102	-14.49	1
4	Northern beef	ER	2.03	28	-15.81	4	0.28	105	-13.50	2
18	Meat products	E	3.68	47	-14.97	6	0.31	106	-10.98	3
30	Cotton ginning, wool scouring , etc.	E	5.02	56	-14.62	9	-0.21	93	-9.80	4
12	Ferrous metal ores	E	0.27	13	-8.68	17	0.40	108	-8.01	5
3	High rainfall zone	E	3.11	41	-10.12	14	0.16	104	-6.85	6
2	Wheat-sheep zone	E	0.06	11	-7.00	22	0.15	103	-6.80	7
14	Black coal	E	7.38	73	-14.88	7	0.77	111	-6.74	8
8	Poultry	ER	1.95	26	-7.96	20	0.07	100	-5.93	9
88	Other construction	NT	-1.39	3	-0.27	102	-4.20	14	-5.86	10
15	Oil, gas and brown coal	NT	-4.62	2	-1.16	86	0.01	99	-5.77	11
60	Ready mixed concrete	NT	-0.84	4	-0.19	105	-3.94	17	-4.97	12
61	Concrete products	NT	-0.81	5	-0.20	104	-3.94	16	-4.95	13
1	Pastoral zone	E	3.46	45	-8.54	18	0.14	101	-4.94	14
92	Other repairs	NT	1.70	23	-1.84	72	-4.41	11	-4.55	15
74	Household appliances and water heaters	IC	4.09	50	-2.81	59	-5.70	3	-4.42	16
111	Personal services	NT	3.06	40	-1.74	75	-5.60	4	-4.27	17
59	Cement	NT	0.20	12	-0.61	96	-3.69	21	-4.10	18
91	Mechanical repairs	NT	2.15	29	-1.94	69	-4.25	13	-4.04	19
110	Restaraunts, hotels and clubs	NT	2.79	37	-1.60	76	-5.11	5	-3.92	20

...continued

Table 4 continued...

Variable*	Simulation	IA Foreign Price Effect		IB Wage Effect		IC Income Effect		I Total Effect	
		% Change	Rank	% Change	Rank	% Change	Rank	% Change	Rank
Industry outputs, main gainers -									
69 Ships and boats	ER & IC	5.18	58	1.88	111	-1.83	69	5.23	93
21 Margarine, oils and fats n.e.c.	IC	10.60	88	-3.57	47	-1.59	74	5.44	94
78 Other machinery and equipment	IC	10.12	85	-1.49	80	-2.83	41	5.80	95
13 Non-ferrous metal ores	E	18.17	101	-12.13	12	0.44	109	6.47	96
67 Other metal products	IC	14.86	98	-5.02	29	-3.03	35	6.80	97
82 Signs; writing and marking equipment	IC	14.11	97	-4.69	33	-2.50	48	6.91	98
83 Other manufacturing	IC	14.04	96	-4.63	34	-2.44	51	6.97	99
51 Paints and varnishes	NT	13.05	94	-3.65	45	-2.26	56	7.14	100
44 Pulp, paper and paperboard	IC	16.63	99	-6.66	23	-2.00	66	7.96	101
81 Plastic and related products	IC	16.66	100	-6.28	25	-2.38	54	8.00	102
39 Footwear	IC	24.48	106	-12.67	11	-1.20	81	10.61	103
80 Rubber products	IC	20.08	103	-6.46	24	-2.86	39	10.76	104
79 Leather products	IC	22.60	104	-8.23	19	-1.24	80	13.13	105
50 Other basic chemicals	IC	23.87	105	-8.94	15	-1.35	78	13.58	106
76 Agricultural machinery	IC & ER	60.83	111	-46.06	1	0.70	110	15.47	107
32 Cotton yarns, broadwoven fabrics, etc.	IC	33.07	107	-14.72	8	-0.99	82	17.36	108
31 Man-made fibres, yarns, etc.	IC	45.35	109	-19.56	3	-1.28	79	24.52	109
6 Other farming - export	ER	44.42	108	-15.74	5	-0.01	96	28.66	110
68 Motor vehivles and parts, etc.	IC	58.61	110	-11.41	13	-3.20	30	44.00	111
25 Other food products	E	79.28	112	-27.01	2	1.45	112	53.72	112

* All variables are expressed in percentage changes except the "terms of trade deterioration". An entry of one in the row for this variable indicates that the foreign prices changes of Table 1 are operative ; an entry of zero indicates that they are not. The acronyms E, ER, IC and NT represent trade categories and are defined in Section 3.1 of the text.

Following Dixon et al. (1982, p.307), each industry appearing in Table 4 has been assigned to one of four categories according to its status in international trade. Import competing industries (IC) are those which sell in markets where the level of import penetration is significant and where imports and domestic output are close substitutes. Export industries (E) are those for which exports constitute a significant proportion of total sales. (Exports in such industries are endogenously determined in the simulations.) The export-related category (ER) includes industries producing commodities that are not exported directly but which are sold largely to export industries. The final classification, nontraded (NT), is applied to all the remaining industries.

Among the main losers, almost half are classified as export industries or export-related industries. They all owe their ranking to the reduction in competitiveness arising from the wage effect (Simulation IB). Another group (industries 88,60,61 and 59) is associated with construction and suffers from the reduction in investment demand associated with the income effect (Simulation IC). The same effect is mainly responsible for the ranking of industries 74, 110 and 111, although this time it is the associated reduction in consumption demand that is pertinent. The repairs industries 91 and 92 are large suppliers to intermediate industries (Transport in the case of Mechanical repairs and Wholesale and Retail trade in the case of Other repairs) which in turn supply margins on sales to final demand. Thus, the income effect is again at work, albeit by a more indirect route.[10]

The remaining two members of the set of losers, the nontraded industries 17 (Services to mining n.e.c.) and 15 (Oil, gas and brown

coal), are mainly affected by the foreign price effect (Simulation IA). Although nominally nontraded, the domestic oil industry still loses significant sales to imports because of the very large reduction in the price of foreign oil (see Table 1). Services to mining sells nearly all its output to itself, to industry 15 (which, as we just noted, is contracting) or to final investment. In Simulation IA, total investment is constant but the share going to mining industries falls, and hence so does the demand for the output of industry 17.

Turning to the main gainers, it is immediately clear that the foreign price effect dominates the rankings. The two export industries 13 (Non-ferrous metal ores) and 25 (Other food products), whose export demand curves shift upwards the most, appear among the gainers. The export-related industry 6 (Other farming-export) figures in the group by virtue of its sales to industry 25. Practically all the rest are import competing industries for which the increase in competitiveness due to the foreign price effect more than outweighs the reduction in it due to the wage effect. These industries are characterized by:

(i) a large initial import penetration of their domestic markets;

(ii) a large elasticity of substitution between the imported and the domestically produced varieties of their products;

and/or

(iii) a large increase in the price of the imported varieties.

3.2 Simulations II to V : The Policy Responses

Returning to the macro results of Table 2, we consider next the demand management policy represented by Simulation II. This policy operates on the balance of trade at three levels. Firstly, the reduction in government expenditure directly reduces its own demand for imports. Secondly, since it also reduces the demand for domestically produced goods and services, it induces corresponding reductions in employment, real disposable income and private absorption. Thus private spending on imports is reduced. Finally, the deflationary pressure reduces non-labour factor prices, improving competitiveness and causing a switch in demand in favour of domestic goods. The upshot is that export volumes increase by more and import volumes fall by more than they did in Simulation I.

In Simulation III, employed workers are persuaded by the government to take a cut in their pre-tax real wage rate. Since we assume that income tax rates remain constant, they suffer the same cut in their real disposable income. Two separate effects are set in train. The reduction in wages as a cost improves competitiveness and stimulates output and employment in traded industries. This increase in employment leads, in its turn, to increases in disposable income and private absorption, and hence to further increases in employment in industries supplying domestic final demand. The reduction in wages as an income tends to reverse the latter process. As it turns out, private absorption falls in aggregate, but employment increases strongly. This policy is more export oriented than Simulation II, with export volumes increasing by more and import volumes decreasing by less.

It is interesting to note here that although the government deficit is higher in Simulation III than in Simulation II, it is not markedly so. This occurs despite the fact that current government expenditure on goods and services remains constant under Simulation III while it is reduced by 7.6 per cent under Simulation II. This result occurs because the higher level of economic activity in Simulation III increases the direct and indirect tax bases and reduces the number of recipients of unemployment benefits.

In Simulation IV, we assume that there is a common rate of indexation on wages and transfers. The rate required to stabilize the balance of trade is 78.5 per cent, compared with a wage indexation rate of 71.3 per cent in Simulation III. The change in policy has the effect of transferring the burden of adjustment not only from employed workers to previous transfer recipients, but also from previously employed workers to newly unemployed ones: in Simulation IV, some of the employed workers lose their jobs. As the reduction in wage-costs is now less than before, so also is the stimulation of employment and income; consequently, the decrease in private absorption is higher.

In the final simulation, the burden of adjustment is shared equally between the public and private sectors to the extent that they are subject to the same reduction in real absorption. In addition, we still maintain a common rate of indexation for wages and transfers, which now rises to 89.6 per cent. As with Simulation IV, the attempt to ease the burden on employed workers results in some of them becoming unemployed.

As we wish to focus on distributional issues, we shall not present a detailed analysis of the structural results for simulations II to IV. Rather we conclude this section by noting that, to the extent that government policy succeeds in lowering the pre-tax real wage rate, the balance of trade can be stabilized with a higher level of employment, especially in the traded sector. This is the key result for the distributional analysis that follows.

4 THE DISTRIBUTIONAL EFFECTS: METHODOLOGY

To examine the effect of an economic change on the distribution of personal incomes, we update unit record data from the 1981-82 Income and Housing Survey (IHS) to incorporate the income and employment changes indicated by the solutions of the ORANI-NAGA model. We then compare the distribution of the pre- and post-shock incomes. For income changes we follow the method of Meagher and Agrawal (1986); for employment changes we follow Agrawal (1986a).

4.1 Interfacing the ORANI-NAGA Model with the IHS Income Data

A solution of the ORANI-NAGA model includes results, expressed as percentage changes, for the following variables:

(i) the pre-tax nominal wage rate (w);

(ii) the rental rate on capital in the industry 'Ownership of dwellings' (π_D);

(iii) the average income earned by primary factors in agriculture (y_A);

(iv) the average income earned by all primary factors, excluding agriculture and the 'Ownership of dwellings' industry (y_O);

(v) the average income earned by all non-labour primary factors, excluding agriculture and the 'Ownership of dwellings' industry (π);

(vi) the consumer price index (ξ);

(vii) the government benefit index (g).

These results are used to adjust the IHS data in three ways.

Firstly, pre-tax factor incomes are adjusted to reflect computed changes in factor prices. Specifically, ORANI-NAGA variables are applied to the five classes of factor incomes identified in the IHS data as follows:

(a) wages and salaries - w
(b) own business or partnership, farmers - y_A
(c) own business or partnership, other - y_O
(d) interest, dividends, bonds, etc. - π
(e) rent - π_D.

Secondly, pre-tax incomes from some transfer payments (such as alimony, workers' compensation and superannuation) are assumed to be indexed to the consumer price index (ξ), and are adjusted accordingly.

Thirdly, all government benefits are indexed to the government benefit index and adjusted accordingly. In some of our simulations government benefits remain fully indexed to the CPI while in other they are discounted at the same rate as wages. The government benefit index is just an indicator of the amount by which government benefits increase in any simulation.

Table 5 contains the values of all the variables required to make these adjustments for each of the five simulations. It contains the values of the percentage changes in relative and absolute factor prices, in the CPI, and in the government benefits for each simulation. These values are used to adjust incomes from various sources as discussed above.

4.2 Adjusting the Population Weights

All persons on the IHS data tape can be classified into 3 categories according to their labour force status: employed, unemployed and not in the labour force. Further, each person in the sample is assigned a population weight which reflects the number of persons in the population that she/he represents. In our simulations, a change in the demand for labour leads to a change in the number of persons employed, and hence to corresponding changes in the numbers of persons belonging to the other two categories. The weights attached to each person in the sample must therefore be adjusted to reflect the new proportions of persons in the various labour force categories.

Table 5

Projected Effects on Selected Interface Variables

Variable*	Symbol	I	II	III	IV	V
		Base simulation (no policy response)	Reduction in current government expenditure	Reduction in pre-tax real wage rate		Balanced reductions in government expenditure, wage rates and transfer payments
				Full indexation of transfer payments	Partial indexation of transfer payments	
1. Pre-tax nominal wage rate	w	13.58	11.25	7.64	8.46	9.86
2. Rent, ownership of dwellings	π_D	0.77	-3.73	3.49	1.25	-1.26
3. Return to primary factors, agriculture	y_A	8.83	8.83	8.70	8.72	8.78
4. Return to primary factors, excluding agriculture and ownership of dwellings	y_O	12.30	9.78	8.05	8.46	9.13
5. Return to non-labour primary factors, excluding agriculture and ownership of dwellings	π	7.34	4.11	9.64	8.46	6.27
6. Consumer price index	ξ	13.58	11.25	10.71	10.77	11.01
7. Government benefits	g	13.58	11.25	10.71	8.46	9.86

* Variables are expressed as percentage changes. Variables 1 through 5 are notionally $ per relevant quantity unit.

To implement these adjustments, we decompose the effect of the change in the number of employed persons into a change in the number of unemployed persons and a change in the number of persons not in the labour force. For a given change in aggregate employment, this decomposition depends on the distribution of the employment changes across full-time and part-time labour markets and also across various demographic groups. To capture these differential effects of the employment changes, we adopt the following strategy.

Suppose that the adverse movement in the terms of trade causes a decrease in the aggregate demand for labour and hence, under the assumptions of our model, a decrease in the number of persons employed. Those who lose their jobs join the ranks of those already unemployed or those not in the labour force. The workers who withdraw from the labour force do so because they are convinced that job hunting would be a hopeless pursuit; that is, because of the operation of the 'discouraged worker effect'. It is well known that the labour force participation of individuals responds to changes in their employment opportunities (see, for example, Gregory (1984) or Withers (1984)). Furthermore, in a recent study, Peters and Petridis (1985) have shown that the magnitude of this response is not only a function of certain demographic characteristics of the individual, but also depends on whether the change in the employment opportunities originates in the full-time (F-T) labour market or the part-time (P-T) one.

Peters and Petridis (1985) estimated the participation responses of various demographic groups to changes in the probability of their being employed. They used the employment ratio (the ratio of total employment to the working-age population) as a proxy for the

probability of being employed. They fitted the following equation for each of seven demographic groups:

$$PR = \text{constant} + b_1 FTER + b_2 PTER \quad , \qquad (1)$$

where

PR = the labour force participation rate,

FTER = the group-specific full-time employment ratio,

PTER = the group-specific part-time employment ratio.

In their view, the coefficients b_1 and b_2 capture the magnitude of the 'employment opportunity effect', which measures the discouragement to labour force participation of a shrinking job market and encouragement to participation of an expanding one.

The results of their estimations for the period 1974 to 1983 are presented in Table 6. The table shows a marked dispersion of F-T employment coefficients and, for the groups for whom P-T employment is important (teenagers and married women), significantly higher P-T than F-T coefficients. The table also reports the values of the corresponding participation elasticities which we evaluated from group means using data from the 1981-82 IHS database. We incorporate these elasticity values into our study as follows:

(1) The terms of trade deterioration alters the demand for labour by various industries. From ORANI we get the change in the demand for person-hours by each of the 112 ORANI industries.

Table 6

Estimated Relationship Between Labour Force Participation and Employment

1974 to 1983

Demographic Category	Estimated Values of the Coefficients[a] of the:		Elasticity[b] of labour force participation with respect to:	
	Full-time Employment Ratio (b_1)	Part-time Employment Ratio (b_2)	Full-time Employment	Part-time Employment
Male teenagers (15-19)[c]	.4639	1.3884	.367	.068
Female teenagers (15-19)[c]	.3769	.7917	.264	.085
Young adult males (20-24)	.0794	.0835	.065	.004
Prime males (25-54)	.2571	.0659	.237	.002
Senior males (55+)[c]	.9119	1.1429	.787	.101
Married women[c]	.8959	1.2248	.422	.589
Non-married adult women(20+)[c]	.8977	.7588	.671	.130
Aggregate[c]	.4419	.8395	.344	.128

(a) Source: Peters and Petridis (1985). The form of the regression equation is given in section 4.2, equation (1).

(b) These elasticities are evaluated from group means using data from the 1981-82 Income and Housing Survey.

(c) For these categories, the difference betweeen the coefficients of the full-time and part-time employment ratios is significant at the 5 per cent level.

(2) The numbers of hours worked per employed person are assumed to be unchanged by the shock. Under this assumption, any changes in the demand for labour have to be met by changes in the number of persons employed. We use this assumption to calculate the change in the number of persons employed in each of the 112 ORANI industries.

(3) Using a mapping based on 1981 Census data[11], we then calculate the change in the number of persons employed in each of the 62 IHS occupations. These numbers are used to adjust the weights attached to each employed person according to his/her occupation.

(4) Next, we decompose the employment changes in each occupation into changes in the number of F-T and P-T jobs. For lack of alternative data, we calculate these changes using the assumption that the ratio of F-T to P-T jobs in each occupation remains the same as in the IHS data base.

(5) The employment changes in each occupation and each market (F-T and P-T) are broken down further into changes in the number of jobs for each of the seven demographic categories listed in Table 6. Again we assume that the demographic composition of workers in each occupation remains the same as in the IHS database.

(6) We then aggregate the job changes across occupations to get the total change in the job opportunities for each of the demographic groups. This is done separately for the F-T and P-T employment changes.

(7) Next, we use the values for participation elasticities listed in Table 6 to calculate the change in the number of workforce participants for each of the demographic groups. We use these numbers to adjust the weight attached to each person who is not in the labour force according to the demographic group to which the person belongs.

(8) Once we know the change in the number of persons employed (for each demographic group) and the change in the number of participants in the labour force (also for each demographic group), we calculate as the residual the change in the number of persons unemployed (belonging to each of these groups). The IHS data tape provides information about whether a currently unemployed person is looking for F-T or P-T work. This is used to calculate the change in the numbers of persons in each of these categories. These numbers are then used to adjust the weight attached to each previously unemployed person depending on his/her age, sex and marital status, and depending on whether the person was looking for F-T or P-T work.

5 THE DISTRIBUTIONAL EFFECTS : RESULTS

In our analysis, an economic change impinges on the distribution of personal incomes in three ways:

(i) through the changes in relative and absolute factor prices;
(ii) through the changes in employment levels for labour; and
(iii) through the rate of discounting of government benefits.

After making the required adjustments to take account of these changes, we obtain the post-shock distribution of income. We then compare this distribution with the pre-shock one in order to assess the distributional impact of the change. In this paper, we examine the changes in the distribution of income across occupational groups, across groups with different principal sources of income, across demographic groups, and across incomes deciles. For the occupational and demographic classifications, we consider employment changes as well as income changes.

5.1 Distributional Effects Across Occupations

We start by examining the effects of the terms of trade shock and the four active policy responses on the distribution of income and employment across workers in 61 occupations. In section 3 we saw in passing that the terms of trade shock causes a substantial change in the industrial composition of output and employment. Since the occupational classification we use is, to a large extent, industry and not skill specific, the shock is likely to alter significantly the distribution of employment across occupations as well. The results for the changes in employment and in incomes across our occupational categories are presented in Tables 7 and 8 respectively.

Column I of Table 7 shows how the aggregate employment effect of the terms of trade decline is distributed across the 61

Table 7
Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : Employment by Occupation

Variable*	Simulation I: Base simulation (no policy response)	II: Reduction in current government expenditure	III: Reduction in pre-tax real wage rate — Full indexation of transfer payments	IV: Reduction in pre-tax real wage rate — Partial indexation of transfer payments	V: Balanced reductions in government expenditure, wage rates and transfer payments
1 Architects, engineers, etc.	0.08	-1.48	3.39	2.55	0.51
2 Physical scientists	-0.51	-2.84	2.30	1.71	-0.58
3 Medical practitioners, dentists	-2.87	-7.53	-0.84	-1.55	-4.56
4 Nurses	-2.85	-7.49	-0.81	-1.53	-4.53
5 Medical workers n.e.c.	-3.21	-6.64	-1.19	-1.92	-4.30
6 Teachers	-0.37	-7.44	0.04	-0.09	-3.80
7 Law professionals	-1.47	-3.63	1.63	0.73	-1.47
8 Artists, entertainers, etc.	-1.48	-4.15	1.17	0.36	-1.91
9 Draftsmen, technicians n.e.c.	0.36	-2.04	3.30	2.54	0.23
10 Other professional workers	-0.62	-3.89	1.76	1.10	-1.42
11 Administrative, executive	-0.19	-5.81	0.81	0.55	-2.66
12 Employers, directors n.e.c.	-1.33	-2.27	1.70	0.83	-0.73
13 Book-keepers, cashiers	-1.77	-3.10	1.16	0.29	-1.42
14 Stenographers, typists	-0.67	-3.69	1.76	1.08	-1.32
15 Other clerical workers	-0.91	-3.21	1.79	1.03	-1.11
16 Insurance, real estate	-2.17	-3.44	1.32	0.29	-1.59
17 Commercial travellers	0.55	0.26	4.06	3.20	1.72
18 Proprietors, shopkeepers	-3.51	-4.31	-1.14	-1.96	-3.15
19 Farmers, farm managers	-0.62	2.08	6.24	5.27	3.66
20 Farm workers	-0.84	0.00	4.54	3.66	1.81
21 Other rural workers	2.52	1.46	4.34	3.82	2.63
22 Miners and related workers	-6.96	-3.40	1.74	0.57	-1.43
23 Pilots, navigators, etc.	1.08	0.08	3.92	3.32	1.69
24 Railway firemen and drivers	-0.11	-0.95	2.79	2.26	0.65
25 Postmasters	-2.38	-4.03	1.13	0.08	-1.99
26 Postmen and messengers	-2.38	-4.03	1.13	0.08	-1.99
27 Road drivers	-0.17	-1.04	2.70	2.02	0.48
28 Railway guards, conductors	1.08	0.08	3.92	3.32	1.69
29 Stationmasters, etc.	-0.23	-1.27	2.64	2.04	0.37
30 Other railway workers	-0.23	-1.27	2.64	2.04	0.37
31 Telecommunication workers	-1.67	-3.49	1.54	0.61	-1.46
32 Transport, communication n.e.c.	1.08	0.08	3.92	3.32	1.69
33 Textile workers	8.17	9.03	13.20	12.23	10.62
34 Tailors, cutters, etc.	1.91	1.74	4.92	4.18	2.95
35 Leather workers	3.04	3.17	6.02	5.35	4.25
36 Furnacemen, etc.	2.35	1.94	5.81	4.94	3.43
37 Watchmakers, jewellers	0.86	-0.34	4.13	3.28	1.45
38 Mechanics, plumbers, etc.	2.35	1.94	5.81	4.94	3.43
39 Electricians, etc.	-1.40	-2.40	2.13	1.14	-0.64
40 Metal workers	8.11	8.12	12.18	11.23	9.66

...continued

Table 7 continued...

Variable*	I Base simulation (no policy response)	II Reduction in current government expenditure	III Reduction in pre-tax real wage rate Full indexation of transfer payments	IV Reduction in pre-tax real wage rate Partial indexation of transfer payments	V Balanced reductions in government expenditure, wage rates and transfer payments
41 Carpenters, etc.	-1.76	-2.79	1.11	0.19	-1.31
42 Painters, decorators	-1.24	-2.27	1.42	0.57	-0.86
43 Bricklayers, etc.	-4.87	-5.99	-2.51	-3.38	-4.70
44 Compositors, etc.	2.47	1.36	5.59	4.83	3.08
45 Millers, bakers, etc.	0.77	1.36	4.78	3.95	2.64
46 Tobacco workers, etc.	0.77	1.36	4.78	3.95	2.64
47 Rubber, plastic workers, etc.	5.29	4.33	8.85	7.99	6.14
48 Packers, wrappers, labellers	1.33	1.53	5.09	4.26	2.88
49 Lifting equipment operators	-0.11	-0.76	3.40	2.54	0.88
50 Storemen, freight handlers	1.12	0.45	4.32	3.53	1.98
51 Labourers n.e.c.	0.77	-0.46	3.78	3.01	1.26
52 Protective services workers	0.06	-5.08	1.29	0.97	-2.08
53 Housekeepers, cooks, etc.	-2.75	-5.60	-0.16	-1.00	-3.32
54 Waiters, bartenders	-4.47	-5.69	-1.26	-2.38	-4.05
56 Caretakers, cleaners	-1.08	-4.14	1.43	0.70	-1.74
56 Barbers, beauticians	-5.64	-7.03	-1.64	-3.04	-5.05
57 Launderers, etc.	-3.52	-5.67	-0.25	-1.33	-3.51
58 Atheletes, undertakers	-3.56	-6.23	-0.66	-1.63	-3.95
59 Photographers	-2.75	-4.68	0.58	-0.49	-2.60
60 Service workers n.e.c.	-2.80	-6.90	-0.56	-1.31	-4.13
61 Members of armed services	0.11	-7.41	0.13	0.13	-3.67
62 Occupation not clear	0.00	0.00	0.00	0.00	0.00

* Variables are expressed as percentage changes.

Table 8

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : Real Mean Income per Employed Person by Occupation

Variable*	I Base simulation (no policy response)	II Reduction in current government expenditure	III Reduction in pre-tax real wage rate: Full indexation of transfer payments	IV Reduction in pre-tax real wage rate: Partial indexation of transfer payments	V Balanced reductions in government expenditure, wage rates and transfer payments
1 Architects, engineers, etc.	-0.13	-0.17	-1.95	-1.52	-0.85
2 Physical scientists	0.09	0.07	-2.10	-1.65	-0.93
3 Medical practitioners, dentists	-0.76	-0.90	-1.81	-1.56	-1.23
4 Nurses	-0.10	-0.11	-2.26	-1.76	-0.96
5 Medical workers n.e.c.	-0.64	-0.74	-2.05	-1.69	-1.21
6 Teachers	-0.02	-0.03	-2.07	-1.58	-0.81
7 Law professionals	-0.54	-0.68	-1.81	-1.51	-1.07
8 Artists, entertainers, etc.	-0.25	-0.31	-1.98	-1.59	-1.00
9 Draftsmen, technicians n.e.c.	0.02	0.00	-2.08	-1.60	-0.83
10 Other professional workers	-0.16	-0.20	-2.00	-1.55	-0.89
11 Administrative, executive	0.10	0.09	-1.97	-1.48	-0.71
12 Employers, directors n.e.c.	-0.38	-0.47	-1.98	-1.61	-1.05
13 Book-keepers, cashiers	-0.35	-0.40	-2.22	-1.79	-1.12
14 Stenographers, typists	-0.29	-0.32	-2.29	-1.81	-1.07
15 Other clerical workers	-0.09	-0.11	-2.20	-1.71	-0.95
16 Insurance, real estate	-0.33	-0.40	-2.04	-1.65	-1.03
17 Commercial travellers	0.06	0.04	-2.19	-1.68	-0.88
18 Proprietors, shopkeepers	-0.31	-0.36	-2.19	-1.75	-1.08
19 Farmers, farm managers	-3.14	-1.99	-1.51	-1.59	-1.81
20 Farm workers	-0.26	-0.32	-2.01	-1.71	-1.06
21 Other rural workers	-0.73	-0.87	-2.00	-1.71	-1.29
22 Miners and related workers	0.14	0.13	-1.92	-1.43	-0.67
23 Pilots, navigators, etc.	0.19	0.18	-1.99	-1.51	-0.76
24 Railway firemen and drivers	0.08	0.08	-2.13	-1.57	-0.74
25 Postmasters	0.07	0.06	-2.03	-1.52	-0.72
26 Postmen and messengers	0.05	0.04	-2.21	-1.69	-0.87
27 Road drivers	-0.24	-0.29	-2.13	-1.68	-0.99
28 Railway guards, conductors	0.17	0.17	-1.92	-1.41	-0.61
29 Stationmasters, etc.	0.13	0.13	-2.08	-1.59	-0.79
30 Other railway workers	0.14	0.13	-2.03	-1.52	-0.70
31 Telecommunication workers	-0.04	-0.05	-2.30	-1.74	-0.87
32 Transport, communication n.e.c.	0.14	0.14	-2.13	-1.63	-0.85
33 Textile workers	0.02	0.00	-2.22	-1.72	-0.94
34 Tailors, cutters, etc.	-0.20	-0.23	-2.17	-1.71	-1.00
35 Leather workers	-0.18	-0.21	-2.20	-1.73	-1.03
36 Furnacemen, etc.	0.13	0.13	-2.13	-1.61	-0.77
37 Watchmakers, jewellers	0.02	-0.05	-2.11	-1.61	-0.82
38 Mechanics, plumbers, etc.	0.04	0.02	-2.18	-1.67	-0.88
39 Electricians, etc.	0.02	0.00	-2.15	-1.63	-0.84
40 Metal workers	0.09	0.08	-2.23	-1.71	-0.86

...continued

Table 8 continued...

Variable*	I Base simulation (no policy response)	II Reduction in current government expenditure	III Reduction in pre-tax real wage rate Full indexation of transfer payments	IV Reduction in pre-tax real wage rate Partial indexation of transfer payments	V Balanced reductions in government expenditure, wage rates and transfer payments
41 Carpenters, etc.	-0.26	-0.31	-2.15	-1.70	-1.01
42 Painters, decorators	-0.41	-0.48	-2.12	-1.70	-1.11
43 Bricklayers, etc.	-0.42	-0.53	-2.11	-1.76	-1.22
44 Compositors, etc.	-0.06	-0.09	-2.15	-1.66	-0.92
45 Millers, bakers, etc.	-0.22	-0.26	-2.19	-1.72	-0.98
46 Tobacco workers, etc.	0.10	0.09	-2.17	-1.64	-0.84
47 Rubber, plastic workers, etc.	0.02	0.00	-2.11	-1.65	-0.95
48 Packers, wrappers, labellers	0.00	-0.01	-2.26	-1.74	-0.99
49 Lifting equipment operators	0.15	0.14	-2.18	-1.66	-0.84
50 Storemen, freight handlers	0.09	0.09	-2.24	-1.70	-0.87
51 Labourers n.e.c.	0.27	0.26	-2.18	-1.67	-0.87
52 Protective services workers	0.07	0.05	-1.95	-1.45	-0.71
53 Housekeepers, cooks, etc.	-0.45	-0.48	-2.37	-1.91	-1.23
54 Waiters, bartenders	-0.11	-0.12	-2.25	-1.76	-1.01
56 Caretakers, cleaners	0.02	0.01	-2.23	-1.74	-1.00
56 Barbers, beauticians	-0.21	-0.28	-2.19	-1.80	-1.21
57 Launderers, etc.	-0.08	-0.10	-2.22	-1.75	-0.99
58 Atheletes, undertakers	-0.46	-0.54	-2.07	-1.69	-1.13
59 Photographers	-0.22	-0.24	-2.05	-1.60	-0.91
60 Service workers n.e.c.	0.03	0.03	-2.19	-1.67	-0.88
61 Members of armed services	0.25	0.24	-2.17	-1.62	-0.80
62 Occupation not clear	0.00	0.00	0.00	0.00	0.00

* Variables are expressed as percentage changes.

occupations. It is apparent from it that the terms of trade shock causes a sizeable reallocation of jobs across various occupations. Underlying the changes in Column I are two main features of the shock : first, the adverse changes in the relative prices of exports and imports; and second, the 3.9 per cent cut in private absorption induced by the shock.

As expected, the main losers from the adverse price movements underlying column I are the workers in the traditional export industries -- farming and mining. Miners, in particular, suffer a relatively high loss in employment (7.0 per cent) caused by the sharp projected declines in the outputs of the predominantly export-oriented mining industries (the outputs of ferrous metal ores and black coal industries decline by 8.0 and 6.7 per cent, respectively). The main gainers are, of course, the workers in the import-competing manufacturing industries, the chief ones being the heavily sheltered textile, clothing and footwear (TCF) industries and the motor vehicles industry. For example, the rise in the output of industries such as man-made fibres & yarns and cotton yarns and fabrics by 24.5 and 17.4 per cent, respectively, leads to an increase in the employment of textile workers by 8.2 per cent. Similarly, since almost a quarter of all metal workers are employed in the motor vehicles industry, the 44 per cent projected increase in the output of the motor vehicles industry leads to an 8.1 per cent increase in the demand for metal workers.

The employment of workers in the non-traded sectors of the economy is primarily influenced by the effect of the shock on the level of domestic demand. Thus, it is the induced reduction of 3.9 per cent in real private expenditures which is the chief factor underlying the

job losses suffered by professional workers such as medical practitioners or nurses. These expenditure cuts cause a certain amount of unemployment in all occupations. The sizes of these effects, however, differ across occupations. As household consumption demand contracts, workers employed in the production of commodities with higher income elasticities of demand are likely to suffer higher job losses relative to other workers. This explains why those in service occupations (numbers 52-60) on an average, face such high losses in employment. Two groups of these workers, in particular, face severe job losses : housekeepers & cooks and barbers & beauticians. This happens because both groups of workers are engaged, almost entirely, in the production of commodities ('restaurants & hotels' and 'personal services', respectively) with a high income elasticity of demand (1.4 for both commodities) and which thus face significant declines in their outputs (of 3.9 and 4.3 per cent, respectively).

The final result that needs explaining is the prominent job losses of bricklayers and other construction workers (4.9 per cent). These workers are employed in the residential building and other construction industries, the outputs of which decline by 3.6 and 5.9 per cent, respectively. The outputs of these industries are used primarily for investment purposes. Thus, when aggregate investment declines by 3.9 per cent, the demand for these commodities falls as well.

Next, we briefly examine the employment effects of each of the active policy options in turn. The results for the policy of restoring equilibrium in the balance of payments by reducing current government expenditures on goods and services (henceforth, also referred to as Policy 2, Policy 1 being no response to the terms of trade shock)

are presented in column II of Table 7. This demand reduction policy leads to a high level of aggregate employment loss (2.1 per cent, see Table 2). This loss, however, is not distributed evenly across occupations. Workers in the traded sectors of the economy are better off relative to those in the non-traded sectors. Thus, while workers in service occupations (numbers 52-61) face severe job losses (4-7 per cent), textile and metal workers face substantial increases in their job opportunities (8-9 per cent). For workers in most occupations, however, this policy further exacerbates the unemployment created by the terms of trade shock.

Column III presents results for the policy of discounting wages by the full amount necessary to eliminate the balance of trade deficit (henceforth, also referred to as Policy 3). In this policy the entire burden of adjustment is placed on employed workers. The policy requires a cut of 3.1 per cent in the pre-tax real wage rate, which leads to an increase of 2.7 per cent in aggregate employment (see Table 2). Again, while most workers face employment gains, the size of these gains is not uniform across occupations. Wage-discounting has a more favourable effect on the traded sectors of the economy, and consequently, the workers in these sectors gain relative to those in the non-traded sectors. For example, the employment of farmers and farm managers rises by 6.2 per cent as compared to the national average of 2.7 per cent. Similarly, workers in most manufacturing-process occupations (numbers 33-51) are relatively better off; for example, textile workers face employment gains of 13.2 per cent. On the other hand, workers belonging to service occupations (numbers 51-61), whose output is largely non-traded, face small employment losses. Similarly, the employment gains of most professional workers are well below the

average. The group that is worst off is the bricklayers -- they suffer an employment loss of 2.5 per cent. The 2.4 per cent fall in real investment expenditures, which causes a fall in the demand for the output of the construction industries is, of course, responsible for this result.

Column IV of Table 7 shows the employment effects of a policy in which the burden of adjustment is shared between the employed and those receiving government benefits. In this policy (henceforth, also referred to as Policy 4) pre-tax real wages and real government benefits fall by 2.3 per cent (see Table 2). Since wages now need to fall by a smaller amount than in Policy 3, employment gains are correspondingly smaller : aggregate employment now rises by 1.9 per cent as opposed to the 2.7 per cent increase under Policy 3. This is reflected in the smaller employment gains (and larger losses) for workers in all occupations as shown in column IV. The relative winners and losers are still the same; workers in the traded sectors of the economy are better off relative to those in the non-traded.

The last set of employment results is presented in column V of Table 7. These figures show the effect of distributing the adjustment in equal proportions among the government, the employed and those receiving transfer payments. Under this policy real government consumption expenditure is reduced by the same proportion as real private consumption expenditure (3.8 per cent). Further, real wages and real transfer payments are reduced by an equivalent amount (1.2 per cent). The net effect of this policy (henceforth, also referred to as Policy 5) on employment is a slight decrease of 0.1 per cent. This results in employment losses for most workers under Policy 5. Again,

the relative effects of this policy across occupations are uneven; the employment losses fall mainly on workers in the non-traded industries; workers in the traded-goods producing industries, such as textile and metal workers, instead enjoy substantial employment increases.

To summarize, the four active policies (numbers 2-5) differ considerably in the amount of aggregate employment they create: at one extreme, Policy 2 leads to relatively large job losses; at the other, Policy 3 leads to relatively large gains. Relative to the passive Policy 1, each of the active policies has a favourable effect on the traded-goods-producing sectors of the economy: thus Policies 2-5 all favour the employment of workers in those sectors. Consequently, no matter which policy we adopt, workers in professional and service occupations will be relatively worse off compared to their counterparts in farming, mining or manufacturing. Further, under all policies, the fall in investment expenditure accompanying the adjustment process is likely to lead to considerable job losses for construction workers.

We now examine the effect of the economic changes on the distribution of income across employed workers in the 61 occupations. Table 8 presents the changes in the average real disposable incomes of workers in these occupations for the five simulations. The columns in Table 8 correspond to those in Table 7. If we compare any column in Table 7 with the corresponding column in Table 8 , one result is immediately obvious: in all our simulations there is a greater dispersion in employment changes than in income changes. This result is due to the following assumptions of our model. In the short-run, we assume that there exists an excess supply of labour in each occupation, so that changes in labour demand are reflected in changes in employment

rather than in wages. Further, we peg all occupational wages to the same price index so that we do not allow for any change in the relative wage structure across occupations. It is useful to keep these assumptions in mind when comparing Tables 7 and 8.

The main result that dominates Column I of Table 8 is that the terms of trade shock, under the assumption of full wage indexation, causes hardly any change in the average income of employed workers. This is not surprising, given that in this simulation all wages and salaries are fully indexed to the CPI and that income tax rates remain unchanged, so that there is no change in the disposable labour income of employed workers. Since most workers derive the bulk of their incomes from wages and salaries, this leads to only minor changes in their total disposable incomes. The exception is the group of farmers and farm managers whose mean income falls by 3.1 per cent. Persons belonging to this occupational category are mainly owner-operators who derive a considerable proportion of their income from the capital and land they own. Since the return to primary factors in agriculture falls by 4.8 per cent (relative to the CPI), the farmers and farm managers suffer a considerably larger decline in their incomes relative to other employed workers.

The cut in current government spending reinforces the depressing effect on incomes of the terms of trade shock. Consequently, the numbers in column II of Table 8 show a slightly higher income loss (or smaller income gain) for most occupations. However, since wages are still fully indexed to the CPI, the numbers in Column II are still quite small for most occupations. The exceptions, again, are farmers and farm managers. They still suffer a relatively higher loss in incomes (2 per

cent) than all other workers. However, their loss is considerably less than that shown in Column I, where no policy action was taken. The reason is that Policy 2 has a relatively favourable effect on the cost structure of the agricultural sector. Output and profits are both higher when Policy 2 is adopted than if no policy response was forthcoming; the real return to primary factors in agriculture falls by only 2.4 per cent under Policy 2 compared to a 4.8 fall under Policy 1.

Column III of Table 8 shows the effect of achieving our objective (no further deterioration in the balance of trade) through discounting pre-tax wages by 3.1 per cent. The result is a decrease of about 2-3 per cent in the real disposable incomes of most workers. The differences across occupations arise for two reasons. Firstly, for a given cut in the pre-tax wage rate, a worker's post-tax income will depend on his/her average income and thus on the rate of taxation he/she faces. Since average incomes differ considerably across occupations, this will cause differences in the post-tax incomes of workers across occupations. Secondly, workers in different occupations vary with respect to the proportion of income they receive from various sources. Thus, as pointed out earlier, a large number of farmers and farm managers are owner operators and receive the bulk of their income (about 80 per cent) as a return to their business rather than as wages and salaries. Under Policy 3, the returns to primary factors in agriculture rise relative to wages and salaries. This is the opposite of what happens under the no-policy stance or under Policy 2. As a result, while in columns I and II farmers and farm managers suffered the largest losses in incomes, in column III they suffer the smallest. Under Policy 3, wages and salaries fall relative to all sources of income except rental income. Thus, workers who derive a higher proportion of their

income from wages and salaries will tend to be worse off than other workers. For example, telecommunication workers, who receive over 90 per cent of their income as wages and salaries and were thus virtually unaffected in columns I and II, now suffer one of the largest income losses.

Columns IV and V of Table 8 show the effects of successively reducing the burden on the employed workers and of re-distributing it among other members of society. It is evident that smaller wage cuts are required when they are used along with other government policy instruments for achieving our trade balance target. While the size of the income losses are smaller for all occupations under Policy 4 as compared with Policy 5, the relative winners and losers are approximately the same. Thus, for example, workers in service occupations, such as housekeepers and cooks, who derive a high proportion of their income as wages and salaries, suffer a comparatively higher loss under both policies.

This completes our discussion of the occupational effects of the terms of trade shock and of the policy options considered in this paper. The first point to be noted is that irrespective of the policy used, the elimination of the balance of trade deficit will necessitate a reduction in the real income of employed workers. The question, however, is by how much? Each policy examined involves a different trade off between maintaining the incomes of the employed and between creating new jobs for the unemployed. At one end is Policy 3, which leads to the largest creation of jobs, but at the expense of the largest wage cuts for the employed. At the other end is Policy 2, which requires the smallest wage cuts for the employed, but leads to

considerable unemployment. Which policy results in a more equitable distribution of income remains to be seen. While the creation of jobs under Policy 3 is likely to make the distribution of income in the economy more equal, it is not immediately obvious what the net effect of a cut in wages and salaries will be. To answer this question we need to examine in more detail the differences in the sources of income of the high income and low income recipients; to ascertain, for example, which group derives a higher proportion of its income in the form of wages and salaries. This will be done in section 5.4. In this sub-section we have achieved the task of identifying the winners and losers in different occupations, and of assessing the sizes of their gains and losses under each of our simulations.

5.2 Distributional Effects Across Groups with Different Principal Sources of Income

In this section we examine the effects of the policy simulations on the distribution of income across persons who differ with respect to their principal source of income. It is obvious from glancing at Table 5 that the terms of trade shock causes considerable changes in the relative returns to various factors of production. Hence, it is also likely to change the distribution of income among persons who differ with respect to their ownership of these factors. In addition, the shock causes a change in the number of persons belonging to various labour force categories; in particular, it leads to a reduction in the number of employed persons and an increase in the numbers of unemployed persons and of those not in the workforce. These changes are likely to alter the number of persons dependent on various sources of income. For example, an increase in unemployment is likely

to lead to a reduction in the number of persons whose primary source of income is wages and salaries and an increase in the number of those dependent on government benefits for their livelihood. Since the average income of a person can vary significantly depending on his/her primary source of income, the changes in the number of persons receiving various types of incomes are likely to alter the existing distribution of income.

Table 9 contains the results for this sub-section. Its top half shows the changes in the number of persons dependent on each of six sources of income. Its bottom half shows the changes in the real mean disposable incomes of these persons. We first discuss the results pertaining to the changes in numbers, and then those for the changes in incomes. Column I of the table contains the results for the terms of trade shock. The first three groups of persons consist of those whose primary source of income is either wages and salaries, or farming, or non-farming business. Since the shock leads to a loss in aggregate employment, and since the majority of those in the first three categories are employed persons, the number of persons dependent on each of these sources declines. Further, since the shock leads to a relatively large decline in profits, the number of persons dependent on income from self-employment decreases the most.

The remaining three categories in Table 9 consist of those whose primary source of income is either government benefits, or interest, dividends and rents, or 'other' income. This last source consists of income from superannuation, alimony, workers' compensation and a residual 'other' category (defined by the ABS) which contains all

Table 9

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : All Income Recipients by Principal Source of Income

Variable* \ Simulation	I Base simulation (no policy response)	II Reduction in current government expenditure	III Reduction in pre-tax real wage rate: Full indexation of transfer payments	IV Reduction in pre-tax real wage rate: Partial indexation of transfer payments	V Balanced reductions in government expenditure, wage rates and transfer payments
Number of persons -					
1 Wages and salaries	-0.31	-1.45	1.11	0.72	-0.37
2 Own business or partnership - farmers	-0.55	2.13	5.85	4.96	3.53
3 Own business or partnership - other	-0.92	-1.49	0.52	0.09	-0.71
4 Government benefits	0.72	2.38	-2.16	-1.41	0.50
5 Interest, dividends, rent, etc.	0.46	1.60	-1.01	-0.60	0.51
6 Other	0.60	2.09	-2.82	-1.94	0.09
Real mean income -					
1 Wages and salaries	0.04	-0.24	-1.86	-1.42	-0.87
2 Own business or partnership - farmers	-3.47	-2.09	-1.34	-1.47	-1.79
3 Own business or partnership - other	-1.23	-1.64	-1.78	-1.66	-1.65
4 Government benefits	-0.31	-0.18	-0.69	-0.60	-0.38
5 Interest, dividends, rent, etc.	-4.60	-5.85	-1.05	-2.05	-3.97
6 Other	-1.26	-1.77	-0.26	-0.54	-1.19

* Variables are expressed as percentage changes. Note that in the IHS data, the annual mean disposable incomes of these six groups are respectively: $ 11141, $ 10452, $ 10395, $ 3168, $ 4914, $ 7066.

incomes not elsewhere classified. The population in these three groups consists largely (80-90 per cent) of persons who are either unemployed or not in the workforce. As employment falls due to the terms of trade shock, some of those who lose their jobs join the pool of unemployed workers while others withdraw from the labour force. In addition, some of the previously unemployed workers respond to the increase in the unemployment rate by not pursuing their job-seeking activities further, and instead join the pool of other discouraged workers who had withdrawn earlier from the workforce. As the number of unemployed and non-participants rises, the number of persons dependent on government benefits, various forms of capital income, and 'other' sources of income all register an increase.

Column II of the top half of Table 9 shows the effect of government expenditure cuts on the number of persons dependent on different sources of income. Again, since the policy leads to an increase in unemployment, it reduces the number of persons dependent on labour and non-farming business incomes and increases the number of those dependent on government, capital and other incomes. However, despite the aggregate fall in employment, the number of persons dependent on agricultural income still rises. The reason, as we saw earlier, is that the increase in competitiveness due to the policy has a favourable effect on the output and employment in the exporting agricultural sectors.

Policies 3 and 4 cause an increase in aggregate employment. This result is reflected in columns III and IV of the top half Table 9, respectively. Under each of these policies, the number of persons dependent on either wages and salaries, farm income, or business income

rises, while the number of those whose primary source of income is government benefits, capital or other income falls. While the relative effects across these categories are broadly similar, the size of these effects vary under each policy, depending on the amount of aggregate employment created. Policy 3 causes the largest increases in the numbers of persons belonging to each of the first three categories and Policy 5, the smallest.

Policy 5 has effects similar to Policy 2; they both lead to a decrease in aggregate employment but to an increase in the employment of farmers. This is reflected in columns II and V of Table 2 which show decreases in the number of persons dependent on non-farm earned incomes and increases in the numbers of those dependent on all other sources.

Next, we examine the effects of our policy simulations on the average disposable incomes of persons classified according to their principal source of income. The bottom half of Table 9 contains these results. Column I indicates that the income loss due to the terms of trade shock is distributed quite unevenly across persons who differ on the basis of their primary source of income. Since wages and salaries are fully indexed to the CPI in this simulation, those mainly dependent on this form of income, who are also those with the highest average income to begin with, suffer no loss at all. On the other hand, since the shock depresses the return to primary factors in agriculture, persons whose main source of income is farming suffer a 3.5 per cent loss in their incomes. Similarly, since real housing and other rentals fall considerably due to the contraction in aggregate demand, persons

dependent on such forms of capital income suffer a 4.6 per cent loss in real terms.

The cut in government spending leads to a larger fall in average disposable incomes than the no-policy stance. As shown in column II, however, the main losers are still the same; the income of those dependent on rents and other capital incomes falls by 5.9 per cent. The persons who suffer the smallest losses are those on government benefits, since these are still fully indexed to the CPI. While wages and salaries are also still fully indexed to the CPI, the reallocation of workers from higher paying jobs (such as those for professional workers) to lower paying ones (such as those for manufacturing process workers) leads to a slight loss in the real income of wage and salary earners.

The effects of the wage-cut policy (Policy 3) are quite different from those of the government-expenditure-cut policy (Policy 2). It should be remembered that Policy 3 leads to a large (3.1 per cent) decline in the real (CPI deflated) pre-tax wage rate of workers. It also leads to an increase in the return to all non-labour factors (except rents) relative to the return to labour. As a result, wage and salary earners now suffer the largest income losses of all groups (1.9 per cent). On the other hand, persons receiving incomes from the ownership of various forms of capital change from being the largest losers to being one of the smallest.

Policy 4 also leads to a loss in the income of all groups (Table 9, column IV). The relative losses, however, vary across the groups. While pre-tax transfer payments have been discounted by the

same proportion as pre-tax wages, it is apparent that persons dependent on government benefits do not suffer the same loss in post-tax real incomes as do persons dependent on wages and salaries; the former lose 0.6 per cent of their post-tax incomes, while the latter lose a much higher 1.4 per cent. There are two main reasons for this difference.

The first, and more important reason for the differences between the changes in the pre-tax and post-tax incomes of the two groups arises from the differences in their mean incomes and hence, from the differential impact of the progressive tax system on them. While the mean post-tax income of the wage and salary earners is $11141, that of government benefit recipients is only $3168. Thus, when pre-tax incomes fall, it is possible that some members of the latter group become eligible for additional means-tested government benefits which partially offset, or maybe even fully compensate, the loss of pre-tax incomes for these persons. This is less likely to occur for the higher income wage earners. In our model, this difference could arise from the dependent spouse rebate which is part of our tax system. It is a means-tested rebate for which we reassess the eligibility of, and the amount received by, each person during every simulation.

The second is that the two groups differ with respect to the proportion of their total income that they receive from various sources. Thus, while the wage and salary earners derive 97 per cent of their total income from sources that are being discounted (96 per cent from wages and salaries and 1 per cent from government benefits), this proportion is only 92 per cent (90 per cent from government benefits and 2 per cent from wages and salaries) for those dependent on government benefits. In other words, the group dependent on government benefits

receives a slightly higher proportion of its income from sources that rise relative to labour income and, as a result, suffers a smaller loss than wage receivers.

Under Policy 4, the smallest loss in income is suffered by those dependent on 'other' sources of income. Persons who belong to this category receive about 70 per cent of their income from sources that remain fully indexed to the CPI under all simulations. Thus, it is only the changes in the remaining 30 per cent of their income, which they derive from the ownership of labour or capital, that cause changes in the income of this group.

The final set of results for this section are presented in column V and pertain to Policy 5, the balanced package. This policy also causes a loss in real incomes for all groups. The largest losers, as under the no-policy stance and under Policy 2, are those who receive their incomes from rent and other capital incomes, though their absolute losses are not as high now. The reason, as earlier, is that the large fall in aggregate demand depresses returns on housing and other capital. The smallest losses are suffered by those receiving government benefits, as under Policy 2. This group benefits from the fact that the pre-tax income of all non-labour factors falls by more than their income. In addition, as pointed out earlier, government benefit recipients face more favourable marginal tax rates than wage and salary recipients.

This completes our discussion of the results presented in Table 9. The policies examined were found to have considerably different effects on the incomes of persons classified into groups according to their principal source of income. Since the mean incomes

of persons belonging to these groups also differ enormously, these policies are also likely to affect the distribution of income among the high- and low-income recipients. Wage earners have the highest mean income of all groups; thus any policy that reduces their income relative to others is likely to lead to a more equal distribution of income. By the same token, any policy that increases the relative income of those dependent on government benefits, the group with the lowest mean income, is likely to lead to a more equal distribution. Policies 3 and 4, which place a larger burden of adjustment on wage earners relative to other groups, seem likely to result in a more equal distribution of income than the other two. This question is examined, and the policy resulting in the most equal distribution of income identified, in section 5.4.

5.3 Distributional Effects Across Demographic Groups

We have shown earlier that the effect of the terms of trade shock, and of the policy responses to the shock, are distributed unevenly across industries, and hence across occupations. Since workers are not uniformly distributed across industries and occupations with respect to demographic characteristics such as age, sex and marital status, the implication is that the effects of these economic changes will not be distributed evenly across demographic groups as well. In this section we present results that confirm this hypothesis. The main results are presented in Table 10. The top half of the table shows how the aggregate employment changes in each simulation are distributed across each of seven demographic groups defined on the basis of sex, age and marital status. The bottom half contains the corresponding income results.

Table 10

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : All Income Recipients by Selected Demographic Categories

Variable*	Simulation I: Base simulation (no policy response)	II: Reduction in current government expenditure	III: Reduction in pre-tax real wage rate — Full indexation of transfer payments	IV: Reduction in pre-tax real wage rate — Partial indexation of transfer payments	V: Balanced reductions in government expenditure, wage rates and transfer payments
Employment -					
1 Male teenagers (15-19)	0.24	-0.51	3.49	2.65	1.06
2 Young adult males (20-24)	-0.18	-1.36	2.97	2.16	0.38
3 Prime males (25-54)	-0.42	-1.74	2.72	1.93	0.08
4 Senior males (55+)	-0.42	-1.24	3.02	2.20	0.47
5 Female teenagers (15-19)	-1.60	-3.41	1.06	0.27	-1.59
6 Married women (20+)	-1.11	-3.22	1.59	0.87	-1.19
7 Single women (20+)	-1.29	-3.89	1.20	0.47	-1.73
Real mean income -					
1 Male teenagers (15-19)	0.19	-0.10	-0.97	-0.74	-0.50
2 Young adult males (20-24)	-0.11	-0.56	-1.18	-0.96	-0.80
3 Prime males (25-54)	-0.38	-1.11	-0.97	-0.85	-1.02
4 Senior males (55+)	-0.89	-1.30	-0.69	-0.75	-1.04
5 Female teenagers (15-19)	-0.31	-0.90	-1.72	-1.45	-1.26
6 Married women (20+)	-1.24	-2.40	-1.18	-1.22	-1.83
7 Single women (20+)	-0.75	-1.68	-1.19	-1.12	-1.42

* Variables are expressed as percentage changes.

A glance at column I of Table 10 reveals that the employment effects of the terms of trade shock vary considerably across demographic groups. As aggregate employment falls, all groups except male teenagers suffer a loss in employment. Male teenagers, instead, experience a slight gain in employment. This occurs because the employment of this group is concentrated in sectors that are favourably affected by the shock. Almost 70 per cent of all male teenagers are employed in the largely import-substituting manufacturing sector in which job opportunities are created due to the shock. The single largest occupation which accounts for the employment of this group is mechanics and plumbers in which almost 30 per cent of male teenagers are employed (probably largely as apprentices). The demand for workers in this occupation rises by 2.4 per cent due to the shock. Male teenagers also do well because relatively few of them belong to occupations for which demand falls. For example, only 3 per cent of all male teenagers are employed in the service occupations (numbers 52-60) which experience a significant decline in employment.

All other males face a slight decrease in their employment opportunities. The size of the effect on these males, however, is relatively small. Their job losses in the agricultural and mining sectors are partially compensated for by their job gains in the manufacturing sectors. Further, since only about 5 per cent of them are employed in the service occupations (numbers 52-60), they remain relatively unaffected by the sizeable job losses in this area.

Overall, the groups that are affected the most are those containing women -- irrespective of their age or marital status. This is due to their industrial/occupational distribution differing dramatically from that of men. They tend to be concentrated in a narrower range of industries and occupations and in particular, in those industries and occupations that relate to the non-traded sectors of the economy (see Agrawal, 1986b).

Female teenagers suffer the largest decline in their job opportunities due to the terms of trade shock. The reason is that almost 70 per cent of them are employed in just four occupations, all of which suffer employment declines. Thus, about 30 per cent of female teenagers work as 'other clerical workers'; about 22 per cent as proprietors and shopkeepers; about 10 per cent as stenographers and typists; and finally, about 8 per cent as book-keepers and cashiers. All these occupations experience a decline in employment. In addition, another 12 per cent of female teenagers belong to service occupations, which also suffer a decline in demand for their skills. Other groups of women also tend to be concentrated in these occupations, and hence suffer larger than average employment losses. For example, less than 10 per cent of all employed women are engaged in the manufacturing process occupations (numbers 33-51) which, by and large, are the ones that experience any employment gains.

The government expenditure cuts underlying column II of Table 10 lead to even larger employment losses for all groups. Different groups, however, do not suffer the same losses; the losses of the female workers are quite substantial (3-4 per cent) and almost twice those of the males. Again, teenage males suffer the smallest losses. The reason

is as before: the manufacturing sector, in which the majority of this group is employed, suffers the smallest losses in output and employment due to this policy. Within the group of women, the largest employment loss (3.9 percent) is now suffered by single adult women; married women of the same age group suffer only a 3.2 per cent loss. This difference arises because our IHS data base reveals that the occupational/industrial distribution of women differs according to their marital status. For example, the proportion of single women belonging to professional occupations (numbers 1-10), which suffer a large decline in their demand due to Policy 2, is higher than the proportion of married women attached to these occupations. About 23 per cent of single employed women are professional workers as compared to 18 per cent of married employed women. On the other hand, a higher proportion of married women are employed in agricultural and manufacturing jobs and so are relatively favourably affected by Policy 2. This is especially true in agriculture (numbers 19 and 20) which employs 6.7 per cent of employed married women compared to only 1.5 per cent of employed single women. Similarly, manufacturing occupations (numbers 52-60) employ 11 per cent of all employed married women, while the corresponding number for single women is only 7 per cent. These differences in the occupational distribution of married and single women result in a given policy having differential effects on their employment opportunities.

Columns III, IV and V of Table 10 confirm that irrespective of which policy is adopted in response to the terms of trade shock, females are likely to bear a larger share of the burden of adjustment than males. Since women belong to a narrower range of occupations than

sectors of the economy, they gain less from the favourable effects of all the policies on the traded sectors of the economy. Of the three groups of males, teenage males enjoy the largest increase in their employment opportunities under all policies, since a higher proportion of them is employed in agriculture, mining and manufacturing. For the same reason, of the three groups of females, married women are relatively better off than either teenage or single adult women under these three policies. The absolute size of the employment gain of any group, of course, depends on the policy adopted, with all groups being best off under Policy 3 and worst off under Policy 5.

We now examine the results presented in the bottom half of Table 10. These show the effects of different policy options on the incomes of various demographic groups. Column I of the table reveals that the terms of trade shock causes a fall in the real disposable incomes of all groups except for teenage males. The income of teenage males rises (slightly) for two reasons: firstly, they face employment increases; and secondly, they suffer no loss in income from the decline in the return to capital and land due to the shock. This group receives almost its entire income in forms which are fully indexed to the CPI and hence do not fall in real terms (90 per cent as wages and salaries and another 6 per cent as government benefits). Female teenagers also do much better now; even though they were the largest losers in terms of employment, their income losses are relatively minor. The reason is that their employment losses are partially compensated for by the fact that 98 per cent of their incomes remain indexed to the CPI and hence suffer no declines (88 per cent as wages and salaries and another 10 per cent as government benefits). Since the shock causes a substantial fall in income from rent (by 12.8 per cent) and income from capital (by 6.2

per cent), it is groups who derive a high proportion of their incomes in these forms who suffer relatively larger income losses due to the terms of trade shock.

Of all groups, married women suffer the largest income losses (1.2 per cent). This is because they derive the smallest proportion of their incomes from sources that remain constant in real terms (57 per cent from wages and salaries, 14 per cent from government benefits, and 1 per cent from 'other' income). Their income losses from the remaining sources are compounded by their employment losses, to make them the highest income losers. The reason why this group derives only 57 per cent of its income as wage and salaries is that the labour force participation rate of this group is relatively small; only 43 per cent of married women participate in the workforce (including the 2 per cent who are unemployed).

Policy 2 (column II) imposes a higher income loss on all groups. In addition, these losses are distributed quite unevenly across the demographic groups. Married women, single adult women and senior males suffer larger losses than the other four groups. The explanation is related to the labour force status of these groups and, partially as a result of that, to the proportion of their income derived from wages and salaries. These three groups have the lowest labour force participation rates; only 41 per cent of senior males, 43 per cent of married women and 46 per cent of single women are in the workforce. One reason is that these groups contain all the retired workers; only 29 per cent of senior males are below the age of 60, while the corresponding numbers for married and single women are 84 and 62 per cent, respectively. These three groups derive only 50-60 per cent of

their incomes as wages and salaries, while the corresponding numbers for the other four groups are 80-90 per cent. Thus, any policy which raises wage and salary income relative to other incomes is likely to lead to larger income losses for groups that contain a higher proportion of non-participants. This explains why, for example, even when the employment losses of teenage females are more than double those of senior males (3.4 per cent compared to 1.2), their income losses are much smaller (only 0.9 per cent compared to 1.3).

While Policy 3 leads to significant gains in employment for all demographic groups, these gains are not enough to offset the loss in income due to the wage cut required by the policy. As a result, all groups suffer a decline in their income. The policy, however, places a relatively larger share of the burden of adjustment on wage receivers. The groups that derive a high proportion of their income from wages and salaries are: female teenagers, whose incomes fall by 1.7 per cent; young adult males, whose incomes fall by 1.2 per cent; and male teenagers, whose incomes fall by 1.0 per cent. These three groups derive 88-90 per cent of their total incomes from wages and salaries, which fall relative to most other sources of income. The smallest losers are now senior males, whose income falls by only 0.7 per cent. The reason is that a large proportion of this group is retired and hence, wages and salaries comprise a relatively smaller proportion of this group's income (only 51 per cent).

Policy 4 (column IV) leads to the largest income losses for the three demographic groups containing women. One reason, of course, is that these groups enjoy the smallest employment gains due to this policy. The other is that they derive a smaller proportion of their

income from either business income or capital income which rise relative to wages and salaries and government benefits in this simulation. Thus, the largest group of losers are female teenagers because they derive 98 per cent of their incomes from sources that are being discounted. On the other hand, the smallest group of losers are male teenagers, partly because of the large employment gains they enjoy.

The final set of results that need examining in this section are those presented in column V of Table 10. These show the effect of Policy 5 on incomes across demographic groups. Again, while all groups lose, we can identify relative winners and losers of this policy. As under Policy 4, the largest losses are borne by the three groups of women. This time, instead of female teenagers, married women do worst. As pointed out earlier, female teenagers derive almost their entire income (98 per cent) from either wages and salaries or government benefits; they own very little capital or property. Married women, on the other hand, derive income from businesses they own (19 per cent) or other property and capital they own (9 per cent). Both these forms of income decline relative to wages and government benefits. As a result, married women lose relative to female teenagers. Male teenagers, as under Policy 2, are the main winners. Their small income losses can be explained by two factors. First, they enjoy the largest employment gains; and second, they derive the bulk of their incomes from sources (wages and salaries and government benefits) which do not suffer as much of a decline as other forms of income.

This concludes our discussion of the results presented in Table 10. It is clear that neither the employment nor the income effects of the policies are uniform across demographic groups. Under

each of the policy responses, female groups suffer larger employment losses (or smaller gains) than their male counterparts. Even in terms of income, women are usually still the larger losers. Since the mean incomes of the various groups are considerably different, these employment and income changes are likely to alter the distribution of income across high- and low-income groups as well. We turn to this issue in the next section where we examine the size distribution of income.

5.4 Distributional Effects Across Income Deciles

In this section we examine the effects of the shock on the distribution of income between low income recipients and high income recipients. For this purpose, all persons have been classified into income deciles on the basis of their real disposable incomes. Table 11 contains the main results for this section. The top half of the table shows the effect of the simulations on the mean incomes of each decile class; the bottom half shows the corresponding changes in their income shares. The deciles in the table are ranked in increasing order of incomes, so that the first decile contains those with the lowest incomes and the tenth decile those with the highest.

Before we analyse our results, it should be noted that in this paper we are interested only in examining the effects of the shock on individuals' disposable incomes. No attempt has been made in this study to undertake any welfare analysis. We realize that for such an analysis, it would be necessary to use family incomes instead of individual incomes and further, to adjust these incomes to take into

Table 11

Projected Effects of Different Policy Responses to a Deterioration in the Terms of Trade : All Income Recipients by Decile Class

Variable*	Simulation I: Base simulation (no policy response)	II: Reduction in current government expenditure	III: Reduction in pre-tax real wage rate — Full indexation of transfer payments	IV: Reduction in pre-tax real wage rate — Partial indexation of transfer payments	V: Balanced reductions in government expenditure, wage rates and transfer payments
Real mean income -					
1 First decile	-2.24	-4.55	1.14	0.22	-2.20
2 Second decile	-1.54	-3.33	0.73	0.11	-1.64
3 Third decile	-0.89	-1.72	0.35	0.01	-0.87
4 Fourth decile	-1.19	-2.42	0.30	-0.10	-1.28
5 Fifth decile	-1.07	-2.43	0.00	-0.30	-1.40
6 Sixth decile	-0.82	-2.03	-0.60	-0.69	-1.40
7 Seventh decile	-0.33	-1.14	-1.38	-1.20	-1.27
8 Eighth decile	-0.50	-1.13	-1.67	-1.40	-1.29
9 Ninth decile	-0.28	-0.76	-1.50	-1.21	-0.99
10 Tenth decile	-0.52	-0.88	-1.50	-1.27	-1.09
Income shares -					
1 First decile	-0.01	-0.02	0.01	0.01	-0.01
2 Second decile	-0.03	-0.06	0.05	0.03	-0.01
3 Third decile	-0.01	-0.01	0.07	0.05	0.02
4 Fourth decile	-0.03	-0.06	0.08	0.05	0.00
5 Fifth decile	-0.04	-0.09	0.08	0.05	-0.02
6 Sixth decile	-0.02	-0.07	0.04	0.03	-0.02
7 Seventh decile	0.04	0.03	-0.04	-0.03	-0.01
8 Eighth decile	0.02	0.04	-0.10	-0.07	-0.01
9 Ninth decile	0.06	0.11	-0.08	-0.04	0.04
10 Tenth decile	0.02	0.12	-0.11	-0.08	0.03

* Mean incomes are expressed as percentage changes. Income shares are expressed as percentage point changes in the original shares.

account family size and composition (Kakwani, 1986). Thus, the terms 'rich' and 'poor' in this paper are used to refer to groups with high and low levels of income rather than wealth. The effects of our simulations are transmitted largely through changes in the employment levels of individuals who differ on the basis of their occupation, source of income, labour force status and demographic characteristics. We wanted to capture these differential effects. Hence, in the following analysis, we concentrate on the size distribution of individual rather than family incomes.

Column I of the top half of Table 11 shows that the terms of trade shock causes higher income losses for the poorer groups in the economy; the mean incomes of those in the first six deciles (the relatively poorer ones) fall by more than of those in the last four deciles. This results in the relatively lower income groups becoming worse off, not just in absolute terms, but in relative terms as well. As shown in the lower half of the table, the share of total income accruing to each of the first six deciles falls, while that of each of the last four deciles rises. This results in a more unequal distribution of income than in the pre-shock economy.

Column II of Table 11 shows that Policy 2 also causes income losses for all deciles, with relatively higher losses for the relatively poorer groups. The corresponding column in the lower half of the table confirms that this policy makes the distribution of income even more unequal than the no-policy stance. The poorest six deciles lose both in absolute and relative terms. While the last four upper-income deciles lose in absolute terms, they all gain in relative terms since their shares of total income go up.

Policies 3 and 4 result in an increase in the mean incomes of persons in the lower income ranges and a decrease in the mean incomes of those in the higher income ranges. These policies improve the position of the lower income groups, not just in absolute terms, but in relative terms as well. As columns III and IV of the table confirm, their shares of total income go up at the expense of the shares of the relatively richer groups.

Policy 5 (column V of Table 11) causes a decline in the mean income of all decile classes. Whether it leads to a more equal or a less equal distribution is, however, not immediately clear. Persons in the two poorest deciles lose their share of total income while persons in the two richest deciles gain. The results for the other deciles are somewhat mixed, with some groups facing small losses while others face small gains.

To sum up, Policy 2 exacerbates the inequalities created by the terms of trade shock and results in an even more unequal distribution of income than if no policy action were taken. Policies 3 and 4, instead, place a relatively higher share of the burden of adjustment on the relatively richer groups in the economy. Thus, they both result in a more equal distribution of income, not only as compared to the distribution under the no-policy stance, but also compared to that in the pre-shock economy. Of all policies, Policy 3 results in the most equal distribution of income; the income gains of each of the first four deciles are larger under this policy than under any of the others.

One result that is evident from examining Table 11 is that the larger is the aggregate employment created by a policy, the more equal is the resulting distribution of income. Thus Policy 3, which creates the highest aggregate employment, is also the most beneficial for the poor; on the other hand Policy 2, which creates the highest aggregate unemployment, is the least beneficial for the poor. Since it is the previously unemployed and non-participating persons who gain from the employment creation, to understand this phenomenon we need to examine the distribution of these persons across income deciles. The IHS data reveal that in the pre-shock economy, 86 per cent of the unemployed and 92 per cent of the non-participants were in the first six deciles on the basis of their post-tax incomes. As these persons find jobs, their average income rises and they move to relatively higher income deciles. Persons in the last four deciles gain relatively less from employment creation since the bulk of them are already employed.

The other major factor which explains the effect of a given policy on the distribution of income between the rich and the poor is the impact it has on income source. Persons belonging to the various deciles differ considerably in the proportion of total income that they derive from various sources. From our analysis we find that a larger fall in wages relative to other forms of income has a less harmful effect on the incomes of the comparatively poorer groups. This is because, by and large, the proportion of total income received as wages and salaries increases with average incomes. The only exceptions are the third and the tenth deciles.

The bulk of the third decile are retired persons (62 per cent of whom are over the age of 60) whose primary source of income is

government benefits. This explains why only 19 per cent of those in this decile are in the workforce. The second decile, in contrast, has a younger population (only 37 per cent of them are over the age of 60) and consequently, a higher labour force participation rate; 34 per cent of this group is in the workforce. One reason why the average income of persons in the second decile is lower, despite a higher proportion of participants, is because almost one-third of these participants are unemployed. In contrast, in the third decile less than one-sixth of the participants are unemployed. The second decile accounts for the largest number of unemployed of all deciles; over a quarter of the unemployed population of the economy is concentrated in this decile. In contrast, the first and third deciles account for only 11 and 8 per cent, respectively, of the total unemployed.

Persons in the highest income decile also derive a smaller proportion of their income as wages and salaries than persons in the preceding decile, though now for a different reason. Persons in the tenth decile derive a considerable proportion of their income from owning a business. Thus, the primary source of income for 17 per cent of the persons in this income range is business income, as compared to only 10 per cent in the preceding range.

Except for the third and tenth deciles, however, the higher the average income, the larger the proportion of income derived as wages and salaries. This evidence, though contradictory to commonly held belief, supports Kakwani's (1986) finding that:

> "income from wages and salaries is unevenly distributed over the total income in favor of richer households. It would

> seem, then, that any policy that increases the labor share of the functional distribution may increase rather than decrease the inequality of the size distribution of total income."

Our analysis supports his hypothesis.

The other surprising result of our analysis is that increases in interest and dividend incomes tend to have an equalizing effect on income distribution. We find that almost 80 per cent of persons whose primary source of income is capital ownership belong to the five lowest income ranges. This, again, is contradictory to the commonly held belief that this kind of income is heavily concentrated at the higher income ranges. Kakwani (1986) was also surprised by this finding in his analysis of 1975-76 Australian data. He speculated that this phenomenon was because "a large number of retired persons who receive a sizable proportion of their income from investment belong to the lower income ranges". Again, the empirical evidence from the IHS data supports his speculation. We find that over 70 per cent of those above 60 years of age are in the first four deciles; this proportion rises to about 80 per cent if we include the fifth decile[12]. Thus, one explanation of why Policy 3 results in the most equal distribution of income is that it causes the highest increase in the return to capital relative to other factors. In addition, it should be noted that it is the only policy under which the returns to capital go up in real terms, i.e., relative to the CPI.

Another factor underlying the differences in the distributional effects of the various policies is their differential effect on income from government benefits. While Policies 2 and 3 leave real government benefits unchanged, Policies 4 and 5 involve cuts in

them. Since almost all (92 per cent) of those whose principal source of income is government benefits belong to the first four deciles, any policy that involves a cut in government benefits will, ceteris paribus, have an unequalizing effect on income distribution. It is not surprising, therefore, that Policies 4 and 5 lead to a less equal distribution of income than Policy 3. The unfavourable employment effects of Policy 2 outweigh the favourable effects of full indexation of government benefits, so that the net effect of the policy is to increase rather than decrease the inequality in the distribution of income. Thus, as far as reducing income inequality is concerned, Policy 3 is clearly to be preferred.

If we combine all these factors, we can understand what causes Policy 3 to result in the most equal distribution of income. It leads to the largest increase in aggregate employment; it involves the largest cuts in wages and salaries; it causes the largest increases in the real return to capital; and finally, it does not involve any cuts in government benefits.

6 CONCLUDING REMARKS

At the end of 1985, the Australian Bureau of Statistics released, for the first time, unit record data from its Income and Housing Survey. The release of this data has fostered a significant advance in the analysis of distributional issues in Australia, as evidenced by a number of recent studies on the effects of proposed changes to the tax and transfer system.[13] To employ the IHS data to

elucidate the effects of changes outside the tax/transfer system, however, requires that it be incorporated in, or interfaced with, a more general economic model.

In this paper we have described a method for interfacing the IHS data with the ORANI-NAGA model of the Australian economy, and we have applied it to an analysis of the distributional effects of a decline in the terms of trade. This method, however, is of quite general applicability, and allows the distributional data to be brought to bear on the full range of policy issues that the ORANI-NAGA model can address.

In all, we have considered five simulations representing various short-run policy responses that the government might make to the decline in the terms of trade. The policies vary in the extent to which they rely on demand management or wages policy, and in the extent to which they ostensibly distribute the burden of adjustment across the community. We found that the more a policy succeeds in lowering the pre-tax real wage rate, the higher is the level of employment (especially in the traded sector) that can be sustained without a deterioration in the balance of trade.

For each simulation, we have reported results for employment by occupation and selected demographic group; for real disposable income by occupation, principal source of income, demographic group and income decile; and for income share by income decile. As employment by industry, factor incomes and indexation of government benefits vary considerably across the simulations, so also do the values of the distributional variables. The distributional results have been

discussed in some detail in Section 5, and we shall not attempt a summary here. The important general observation is that there is no community of interest as to how the government ought best to respond to the terms of trade decline, with different groups being clearly favoured by different policies. In that case, the detail of the distributional results becomes important, as it is the detail that identifies the interests of the income groups involved.

ENDNOTES

1. For a discussion of the development of 'tax-wage bargains' as an instrument of macropolicy in Australia, see Parmenter (1985).

2. For a recent review of this experience, see Powell and Lawson (1986).

3. Note that the ORANI commodity classification is more disaggregated then the one shown in Table 1. Where a number of ORANI commodities are combined to form one commodity of Table 1, we assume that the same price change applies to them all.

4. Note that, in this context, the CPI and other indexes of domestic prices are to be considered as relative prices. They are measured relative to the price of foreign exchange.

5. There are two mechanisms whereby a change in the nominal exchange rate can have important implications for external balance even if the real exchange rate were to remain constant. Firstly, if foreign debt is denominated in foreign currency, a nominal devaluation increases the size of the debt in domestic currency, and increases the real economic adjustment required to stabilize or reduce that debt. Secondly, a change in the nominal exchange rate may affect foreigners' expectations of future movements, and hence the rate of interest that domestic borrowers would be required to pay in foreign financial markets. The change in the rate of interest would then influence the level of domestic real investment. Both these mechanisms are beyond the scope of the present model, but are taken into account in a recent study of Australia's debt problem by Dixon and Parmenter (1987). Their analysis encompasses a time horizon that is longer than ours, and employs an extended version of the ORANI model designed specifically for their task.

6. We have not included increases in income tax rates among the policy instruments because this option has not been much canvassed in the current Australian policy debate. However, our analysis could readily be extended to incorporate tax changes as instruments of demand management or tax-wage bargains.

7. The duration of the ORANI short run has been estimated to be about two years. See Cooper, McLaren and Powell (1985).

8. The government budget deficit is an endogenous variable in our model. The Australian Government, among others, has argued that changes in the deficit will lead to changes in real private investment expenditure:

> "By reducing the Government's call on Australian savings we free up those savings to go where Australia now really needs them, into plant and equipment for export expansion and import replacement". (Keating, 1987, p.3)

Despite recent novel work by Feltenstein (1986), attempts to model crowding out within a general equilibrium framework are still in their infancy. In any case, the effects of a reduced budget deficit on the balance of trade may only eventuate in a longer time frame than we have considered.

9. The inclusion of the absorption function is the main feature which distinguishes our macro results from those reported by Fallon and Thompson (1987). Their simulations were conducted with the standard ORANI model and implicitly assume that the government manipulates income tax rates (or some other unspecified policy instrument) to achieve various scenarios on real private absorption. Their simulations also differ in a number of more detailed respects, but their macro results can be considered as broadly complementary to ours.

10. A meticulous reader may note that the two industries which suffer the largest reduction in output due to the income effect do not appear among the main losers for Simulation I. However, one of them (industry 43 - Furniture and mattresses) lies just outside the set of main losers at rank 23, while the other (industry 35 - Textile floor coverings, etc.) benefits from an increase in its sales to one of the main gainers (industry 68 - Motor vehicles and parts).

11. This was done by first mapping from the 112-industries classification used in ORANI to a 43-industries classification used in the 1981 Census data. Next, a mapping was established between these 43 industries and 67 occupations using 1981 Census data. The methodology for doing this is described fully in Ursi (1986). Finally, these 67 occupations were mapped to the 62 IHS occupations.

12. We recognize, of course, that these numbers do not reflect the higher proportion of home owners among the elderly, and hence, that if a more comprehensive definition of income was used, which included an imputed rental value for housing, a smaller proportion of the elderly would belong to the lower incomes deciles. This is also true for other types of capital. Given the relatively lower levels of taxation on capital gains as compared to those on current incomes during this period, there existed an opportunity to rearrange one's earnings to minimize tax payments. This might have been relatively easier to accomplish for the retired. As a result, the welfare level of the elderly (relative to other groups) is likely to be underestimated if one uses current income as an indicator of welfare rather than some measure of 'permanent income' that includes wealth.

13. See, for example, several papers presented at a Conference on "Australian Tax Reform; in Restrospect and Prospect", Monash University, December 1986.

REFERENCES

Agrawal, N. (1986a), "The ORANI-Income Distribution Model: Labour Market Issues", IMPACT Project Preliminary Working Paper No. IP-29, December.

Agrawal, N. (1986b), "Sources of Inequality Between male and Female Incomes in Australia", IMPACT Project General Paper No. G-73, October.

Blampied, C.W. (1985), "A Listing of the 1977-78 Balanced ORANI Data Base with the Typical-Year Agricultural Sector Implemented", IMPACT Project Research Memorandum mimeo, 401 pp.

Cooper, R.J., K.R. McLaren, and A.A. Powell (1985), "Short-Run Macroeconomic Closure in Applied General Equilibrium Modelling: Experience from ORANI and Agenda for Further Research", in Piggot, J. and J. Whalley (eds), New Developments in Applied General Equilibrium Analysis, Cambridge University Press, Cambridge.

Dixon, P.B., G.A. Meagher and B.R. Parmenter (1985), "Analysing the Effects of Change in the Structure of Taxation via the ORANI-NAGA Model of the Australian Economy", paper presented to the Ninety-Eighth Annual Meeting of the American Economic Association, New York.

Dixon, P.B., B.R. Parmeter, J. Sutton, and D.P. Vincent (1982), ORANI: A Multisectoral Model of the Australian Economy, North Hollland Publishing Company, Amsterdam.

Dixon, P.B. and B.R. Parmeter (1987), "Foreign Debt Stabilization and the Terms of Trade: Implications for Australia, end-1984 to end-1990", paper presented at a public seminar on the Debt Crisis, sponsored by Business Review Weekly and The Australian Mining Industry Council, in Sydney on 15th May, 1987.

Duff, I.S. (1977), "MA28 - A Set of FORTRAN Subroutines for Sparse Unsymmetric Systems of Linear Equations", Report R.8730, AERE Harwell, HMSO, London.

Fallon, J. and L. Thompson (1987), "An Analysis of the Effects of Recent Changes in the Exchange Rate and the Terms of Trade on the Level and Composition of Economic Activity", Australian Economic Review, 2nd Quarter, 24-36.

Feltenstein, A. (1986), "An Intertemporal General Equilibrium Analysis of Financial Crowding Out: A Policy Model and an Application to Australia", Journal of Public Economics 31, 79-104.

Gregory, R.G. (1984), "Labour Force Participation -- The Way Ahead: An Applied Economist's Perspective", in A.J. Kaspura (ed.), Labour Force Participation in Australia: The Proceedings of a Conference, Bureau of Labour Market Research Monograph series No. 1, AGPS, Canberra.

Kakwani, N. (1986), Analyzing Redistribution Policies: A Study Using Australian Data, Cambridge University Press.

Keating, P.J. (1987), "1987-88 Budget Initial Measures, May 1987", statement delivered on 13 May, 1987, AGPS, Canberra.

Meagher, G.A. and N. Agrawal (1986) "Taxation Reform and Income Distribution in Australia", Australian Economic Review, 3rd Quarter, 33-56.

Meagher, G.A. and B.R. Parmenter (1985), "Some Short Run Effects of Shifts from Direct to Indirect Taxation", IAESR Working Paper No. 10/1985, University of Melbourne.

Meagher, G.A. and B.R. Parmenter (1987), "The Short-Run Macroeconomic Effects of Tax-Mix Changes: Option C Reconsidered," IAESR Working Paper No. 1/1987, University of Melbourne.

Parmenter, B.R. (1985), "Taxes, Wages and Employment", IAESR Working Paper No. 12/1985, University of Melbourne, October.

Pearson, K.R. (1986), "Automating the Computation of Solutions of Large Economic Models", IMPACT Project Preliminary Working Paper No. IP-27, March.

Peters, R.W. and A. Petridis (1985), "Employment, the Labour Force and Unemployment in Australia: A Disaggregated Approach", Australian Economic Review, 4th Quarter, 51-67.

Powell, A.A. and A. Lawson (1986), "A Decade of Applied General Equilibrium Modelling for Policy Work", IMPACT Project General Paper No. G-69, August.

Ursi, V. (1986), "Matrices of Employment by Occupation: Australia, 1971, 1976 and 1981" IAESR Working Paper No. 8/1986, University of Melbourne, September.

Withers, G. (1984), Comments on B.P. Stewart and L.S. Williams, "Towards an Aggregate Theory of Labour Supply and the Labour Market", in A.J. Kaspura (ed.), Labour Force Participation in Australia: The Proceedings of a Conference, Bureau of Labour Market Research Monograph Series No. 1, AGPS, Canberra.