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TAXATION REFORM AND INCOME DISTRIBUTION IN AUSTRALIA

by

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1. INTRODUCTION

In the Draft White Paper (Australian Government, 1985 - hereafter the DWP) prepared for the National Taxation Summit Conference of July, 1985, the Australian Government indicated its preference for a taxation reform (referred to as "Option C" or the "preferred option") which included:

(i) the abolition of the existing wholesale sales tax;

(ii) the introduction of a broad based consumption tax (BBCT) at a rate of 12.5 per cent;

(iii) a broadening of the income tax base via new taxes on capital gains and fringe benefits, and via measures to reduce avoidence and evasion;

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(iv) the application of the additional revenue obtained from these measures to reducing income tax rates, i.e., the policy was to be revenue neutral.

The DWP presented detailed estimates of the distributional consequences of the preferred option, predicated on the assumption that the reform would cause no change in pre-tax prices and incomes. The Government felt that the reductions in income tax rates would be sufficient to induce wage and salary earners to accept "full wage discounting" (i.e., no change in pre-tax nominal wage rates), and that the macroeconomic effects of the reform would then be small enough to be ignored in computing its estimate.

Dixon, Meagher and Parmenter (1985) have recently canvassed some of these issues using the ORANI-NAGA model of the Australian economy. They found that, as expected by the Government, the macroeconomic effects are fairly small under the strict assumptions of the preferred option. However, for alternative plausible scenarios about movements in the wage rate, the effects can become quite significant. Moreover, when pre-tax prices and incomes are allowed to respond to the reform, revenue neutrality no longer implies neutrality with respect to the private sector (as measured by real disposable income), the public sector (as measured by the budget deficit or public sector borrowing requirement), or the foreign sector (as measured by the balance of trade deficit or foreign borrowing requirement). Thus revenue neutrality is no longer an obvious criterion for determining equivalence between the indirect tax increases and the direct tax reductions, and the ORANI-NAGA results indicate that the choice of criterion can be important in conditioning the macroeconomic outcome.

In this paper, we extend the analysis of Dixon, Meagher and Parmenter to address the effects of the tax reform on the distribution of personal incomes. Results from the ORANI-NAGA model are used to update unit record data from the 1981/82 Income and Housing Survey, and the outcomes for various distributional statistics are assessed. We focus particularly on the impact of changes in variables (including pre-tax factor prices and employment levels) which are assumed to remain constant in the DWP. Our primary interest is to evaluate the quantitative importance of this assumption and we do not attempt a systematic review of the welfare implications of the tax reform. Hence we do not consider the distribution of income between income units, families or households.

The remainder of the paper is structured as follows. In section 2, the analysis of Dixon, Meagher and Parmenter is reviewed and new results, based on more recent data, are presented. The methodology used for the distributional analysis is described in section 3 and the results discussed in section 4. Section 5 contains concluding remarks.

2. THE MACROECONOMIC EFFECTS OF A CHANGE IN THE TAX MIX

In this section we begin with a brief introduction to the ORANI-NAGA model and then describe its application to the preferred option and to a number of alternative tax mix packages. The exposition follows Dixon, Meagher and Parmenter (1985), although more recent information has been incorporated in the NAGA data base[1] and the results presented here are correspondingly distinctive.

2.1 The ORANI-NAGA Model

ORANI is a computable general equilibrium model in the tradition of Johansen (1960). Its theory, data requirements and solution procedure are comprehensively documented in Dixon, Parmenter, Sutton and Vincent (1982). A complete listing of the current data base is given in Blampied (1985). The model has been applied to a wide variety of issues in Australian economic policy, a review of that experience being provided in Parmenter and Meagher (1985).

The standard version of ORANI is not well suited to analyzing a change in the tax mix because the income-expenditure loop is not closed. Given some shock to the economy, the model describes the changes that result in the distribution of income between factors, but not between households, the corporate sector and the government. This limitation has been partially overcome through the development of a fiscal model NAGA, which is used in conjunction with ORANI to handle distribution between the public and private sectors. The NAGA model is described in appendices to Meagher and Parmenter (1985) and Dixon, Meagher and Parmenter (1985). Its main data requirement is a base set of national and government accounts like that shown in Table 1. Its

Table 1 National and Government Accounts, 1984/85, $million

i	Category i	Value A_i
	Composition of GDP as income -	
1	Disposable labour income	85897
2	PAYE taxes (net)	23424
3	Payroll taxes	3641
4	VAT (labour inputs)	0
5	Cost of employing labour ($\Sigma_{i=1}^{4} A_i$)	112962
6	Disposable capitalist income	62683
7	Taxes on profits and self employment	11903
8	Gross operating surplus ($A_6 + A_7$)	74586
9	Commodity taxes less subsidies	13135
10	VAT (non-labour inputs)	0
11	Other indirect taxes	9062
12	Total non-labour income ($\Sigma_{i=8}^{11} A_i$)	96783
13	Gross domestic product ($A_5 + A_{12}$)	209745
	Composition of GDP as expenditure -	
14	Private consumption	125967
15	Government consumption	35210
16	Private investment	36499
17	Government investment	16926
18	Total absorption ($\Sigma_{i=14}^{17} A_i$)	214602
19	Exports	34148
20	Imports	39005
21	Balance of trade surplus ($A_{19} - A_{20}$)	-4857
22	Gross domestic product ($A_{18} + A_{21}$)	209745
	Composition of government income -	
23	Taxes on income ($A_2 + A_7$)	35327
24	Payroll taxes (A_3)	3641
25	Commodity taxes	17233
26	VAT ($A_4 + A_{10}$)	0
27	Other indirect taxes (A_{11})	9062
28	Other government income	6154
29	Total government income ($\Sigma_{i=23}^{28} A_i$)	71417
	Composition of government outlays -	
30	Government consumption (A_{15})	35210
31	Government investment (A_{17})	16926
32	Total government expenditure ($A_{30} + A_{31}$)	52136
33	Unemployment benefits	2984
34	Other transfers to persons	18293
35	Other outlays	13122
36	Total government outlays ($\Sigma_{i=32}^{35} A_i$)	86535
	Other categories	
37	Public sector borrowing requirement ($A_{36} - A_{29}$)	15118
38	Net government income ($A_{32} - A_{37}$)	37018
39	Total disposable income ($A_1 + A_6 + A_9 - A_{25} - A_{28} + A_{33} + A_{34} + A_{35}$)	172727

Sources: "Quarterly Estimates of National Income and Expenditure, Australia", March Quarter 1986, Catalogue No. 5206.0 and "Estimates of Expenditure and Receipts of the Commonwealth Public Account 1985-86", Budget Paper No. 5.

main purpose is to compute the deviations from the base accounts that would occur in response to policy changes of interest.

The ORANI-NAGA simulations reported in this paper are short-run in the sense that industry specific land and capital are fixed, and rental rates adjust to ensure that those factors remain fully employed. In the labour market, the wage rate[2] is fixed and labour is assumed to be in excess supply. In the foreign sector, the nominal exchange rate is fixed and adjustments in the real exchange rate appear as adjustments in the domestic price level.[3] The balance of trade is endogenous. Real private absorption and its components (consumption and investment) change in proportion to real private disposable income. Current expenditure by the government is fixed in real terms but capital expenditure varies with real private investment.

2.2 The Preferred Option

The preferred option, as described in the DWP, contains many detailed proposals for changes to both the direct and indirect tax systems. On the indirect tax side, the level of commodity disaggregation in ORANI-NAGA is sufficient to model explicitly almost all of the proposals. On the direct tax side, some of the proposals are not generally amenable to modelling, and certainly not within the broad distributional categories of ORANI-NAGA. Indeed, in terms of disposable income, the model only distinguishes between income from wages and salaries (labour income) and income from profits and self employment (capitalist income). However, a central objective of the tax reform is to direct income tax cuts primarily towards lower and middle income earners, i.e., towards the overburdened PAYE taxpayers. Moreover, the measures designed to broaden the income tax base are likely to impact

most heavily on recipients of capitalist income, i.e., these measures will tend to offset the gains from tax cuts made by this group. Hence, in our simulations, we assume that the average rate of tax collected from capitalist income remains constant. This means that, as far as the direct-tax component is concerned, we can only claim to have modelled the spirit of the preferred option.

The ORANI-NAGA model is linear in the percentage changes of its variables. This means that, for a given choice of exogenous and endogenous variables, results for a combination of shocks can be obtained by simple addition of the results for the separate shocks. We shall employ that property and analyze the indirect and direct components separately, before combining them to assess the effects of the preferred option. Selected results for all three simulations are given in Table 2.

2.2.1 The Indirect Component

An increase in indirect taxes with pre-tax nominal wages held constant causes the disposable income of employed workers to fall. Under the assumptions of the model, real domestic absorption falls in proportion to real disposable income, leading to further reductions in disposable income as workers are retrenched and the profits of capitalists decline. Increases in government transfers (e.g., unemployment benefits) offset the downward trend to some extent, but the net result is a reduction in real disposable income of more than 10 per cent.

As domestic output contracts, so too do the returns to fixed capital, producing a strong downward pressure on costs and prices.

Table 2 Projected Effects of the Preferred Option (a)

Variable \ Simulation	(1) Indirect tax component of preferred option	(2) 10 percent cut in PAYE tax rate	(3) Direct & indirect components of preferred option
Factor cost GDP deflator (FCD)	-5.59	1.52	0.67
Consumer price index (CPI)	1.94	1.63	8.65
Private absorption deflator (PAD)	1.38	1.43	7.27
Government price index (GPI)	-1.39	0.34	0.03
Pre-tax nominal wage rate	0.00	0.00	0.00
Pre-tax real wage rate (CPI deflated)	-1.94	-1.63	-8.65
Pre-tax real wage rate (FCD deflated)	5.59	-1.52	-0.67
PAYE tax rate	0.00	-10.00	-41.25
Post-tax real wage rate (CPI deflated)	-1.94	1.10	2.60
Disposable labour income	-8.85	4.66	10.35
Disposable capitalist income	-14.99	4.20	2.32
Government transfers	4.53	1.06	8.91
Nominal disposable income	-9.49	3.91	6.65
Real disposable income (PAD deflated)	-10.87	2.48	-0.62
Export receipts	3.10	-0.83	-0.31
Import expenditure	-12.46	2.74	-1.17
Balance of trade surplus	2.82	-0.64	0.17
Real gross domestic product	-6.51	1.42	-0.65
Aggregate employment	-8.85	1.93	-0.90
Net government income	12.07	-2.93	0.00
Government expenditure	-4.64	1.28	0.64
Public sector borrowing requirement	-45.58	11.58	2.20

All variables are expressed as percentage changes except the balance of trade surplus, which is expressed as a percentage of gross domestic product.

Against this, the new commodity taxes themselves tend to increase prices in the hands of the purchaser. The factor cost GDP deflator (FCD) reflects only the former influence and falls by 5.59 per cent. The CPI incorporates both influences and rises by 1.94 per cent, indicating that the direct effect (i.e., the effect that would apply in the absence of any economic adjustment to the change) of the tax increase on the CPI is about 7.5 per cent.

The government price index (GPI) adopts an intermediate value. It does not rise like the CPI because most government purchases are exempt from the tax increase. Nor does it fall by nearly as much as the FDC. This is because government purchases tend to be very labour intensive and hence their prices are relatively insensitive to movements in rental rates for capital. The investment price index (not shown in Table 2) moves roughly in line with the GPI and for similar reasons. The private absorption deflator (PAD), therefore, does not rise by as much as the CPI.

Clearly, an important feature of the changes to the indirect-tax system is the large differentials it introduces between the changes in different price indexes. As an example of how these differentials can affect analysis, we observe that employed workers have accepted a reduction of 1.94 per cent in their real wage when it is measured in terms of its purchasing power. In other words, they have made significant concessions on real wage maintenance which might be expected, prima facie, to auger well for employment. But employment drops by 8.85 per cent. The problem is that, from the point of view of the typical employer (who collects no taxes), the relevant deflator for real wages is the FCD, not the CPI. Hence, for him, the real wage has risen by 5.59 per cent.

The fall in factor costs improves the international competitiveness of the economy. Since exports are exempt from most of the tax increases, export prices fall, stimulating demand and increasing export receipts by 3.10 per cent. Imports are taxed at the same rate as the corresponding domestically produced commodities, but import prices are not subject to the deflationary influence of declining capital rentals. Hence some substitution occurs in favour of domestic commodities and imports fall by more than the fall in private absorption. The improvement in the traded sector, together with the assumed constancy of real government expenditure, accounts for the fall in real GDP being somewhat less than the fall in real private absorption (6.51 per cent and 10.87 per cent, respectively).

2.2.2 A Direct Tax Cut

In simulation 2 we consider the effects of an arbitrary 10 per cent cut in the PAYE tax rate. The direct component of the preferred option will be the multiple of simulation 2 which reduces net government income by 12.07 per cent, i.e., the multiple which achieves revenue neutrality when combined with simulation 1.

The tax cut increases the disposable income of employed workers and leads to results that can be broadly understood in the same terms as simulation 1, albeit with the sign reversed. There are two main qualifications to this generalization.

Firstly, since the tax cuts apply only to labour income, the distribution of disposable income shifts in favour of labour even though pre-tax factor incomes shift in favour of capital. Secondly, the difference between the values for the CPI (and the PAD, for that matter) in

the two simulations reflects the difference in the indirect tax system rather than the difference in real disposable income. This must be borne in mind when interpreting differences across simulations between CPI deflated real wage rates and between government transfers to the private sector, a significant part of which is indexed to the CPI.

2.2.3 The Combined Package

The required revenue-neutral change in the tax mix is realized by combining simulation 1 with 4.125 times simulation 2. Results for the combination are given in simulation 3 in Table 2. They show that real disposable income, real GDP and employment all fall, but by less than one per cent. The indirect component of the package introduces a large differential between the FCD and the CPI, and the direct tax component shifts the post-tax distribution in favour of labour. Indeed, all the post-tax real wage rate (CPI deflated) rises by 2.60 per cent. The two components tend to cancel in their effect on international competitiveness, with the balance of trade moving slightly towards surplus. The fiscal impact is also small. Government consumption expenditure is indexed to the GPI which remains almost constant. Hence total government expenditure on goods and services increases by only 0.64 per cent and revenue neutrality also implies relatively little change in the public sector borrowing requirement (PSBR). All these results are consistent with the Government's contention that the preferred option

> "would not be expected to have major macroeconomic effects in the years surrounding the change." (DWP, p. 251.)

2.3 Some Alternative Packages

While the macroeconomic effects of the preferred option seem manageable enough, they are conditional on the successful implementation of full wage discounting. As events at the Tax Summit illustrated, there is strong resistance to this idea in the Australian Trade Union movement, and it is instructive to consider the implications of a leakage of the BBCT into money wages. In simulation 4 of Table 3, we present results for a revenue neutral package in which the pre-tax nominal wage rate increases by 30 per cent of the increase in the CPI. This increase in wage costs erodes the competitiveness of the economy and the balance of trade moves towards a deficit. As the traded sector contracts, jobs are lost and capital rents decline. Hence, although employed workers receive a larger increase in their take home pay (4.40 per cent, compared with 2.60 per cent for the preferred option), real disposable income falls by 1.18 per cent. With real domestic final demand and international competitiveness both in decline, the reduction in aggregate employment more than doubles (2.28 per cent, compared with 0.90 per cent for the preferred option). Note, finally, that the sensitivity of the GPI to changes in wage costs has caused the PSBR to increase by 9.74 per cent, despite the fact that the package remains revenue neutral.

In the DWP, the Government argued that the trade union movement was likely to accept full wage discounting because workers would be compensated for reductions in the purchasing power of their pre-tax wages by direct tax cuts which would maintain and improve the purchasing power of their post-tax wages. This strategy has been referred to in the literature as the "wage-tax bargain" (Corden and Dixon, 1980). In our simulation of the preferred option, the real post-tax wage rate

Table 3 Projected Effects of Alternatives to the Preferred Option[a]

Simulation	(4)	(5)	(6)
	Alternative tax mix packages		
Variable	Revenue neutral; partial wage discounting	Revenue neutral; post-tax real wage rate constant	PSBR constant; post tax real wage rate constant
1. Factor cost GDP deflator (FCD)	2.43	-1.86	-1.31
2. Consumer price index (CPI)	10.12	6.53	7.43
3. Private absorption deflator (PAD)	8.85	5.00	5.58
4. Government price index (GPI)	2.61	-3.68	-5.20
5. Pre-tax nominal wage rate	3.04	-4.38	-6.67
6. Pre-tax real wage rate (CPI deflated)	-7.08	-10.91	-14.10
7. Pre-tax real wage rate (FCD deflated)	0.61	-2.52	-5.36
8. PAYE tax rate	-42.13	-39.98	-51.71
9. Post-tax real wage rate (CPI deflated)	4.40	0.00	0.00
10. Disposable labour income	12.24	7.63	11.97
11. Disposable capitalist income	1.92	2.89	8.39
12. Government transfers	10.79	6.20	6.09
13. Nominal disposable income	7.67	5.19	9.27
14. Real disposable income (PAD deflated)	-1.18	0.19	3.69
15. Export receipts	-2.92	3.44	4.39
16. Import expenditure	-0.80	-1.70	1.41
17. Balance of trade surplus	-0.33	0.88	0.45
18. Real gross domestic product	-1.67	0.82	3.35
19. Aggregate employment	-2.28	1.10	4.54
20. Net government income	0.00	0.00	-3.63
21. Government expenditure	2.82	-2.51	-2.58
22. Public sector borrowing requirement	9.74	-8.66	0.00

(a) All variables are expressed as percentage changes except the balance of trade surplus, which is expressed as a percentage of gross domestic product.

increases by 2.60 per cent, indicating that further scope exists for exploitation of the wage tax bargain idea.

In simulation 5, then, we present results for a package which holds the post-tax real wage rate constant. Comparing this simulation with the preferred option, we see that the pre-tax nominal wage rate now falls, improving competitiveness and increasing aggregate employment. Thus, if workers could be persuaded to pursue their claim for real wage maintenance in terms of post-tax rather than pre-tax wages, the benefits of the tax reform could be directed towards the unemployed rather than those already in employment.

The deflationary impact of the fall in the pre-tax nominal wage rate is also responsible, via the GPI, for a healthy reduction in the PSBR. This contravenes the Government's stated intention (DWP, p. 215) that the tax changes should have no major effect on the budget deficit. As we have seen, this requirement is effectively realized by revenue neutrality when the pre-tax nominal wage rate is constant, but that is not the case when the wage rate falls. Indeed, further tax cuts must be undertaken to reduce revenue so as to match the reductions in the cost of government purchases of goods and services.

Hence, in our final simulation, we consider a package in which the post-tax real wage rate and the PSBR are held constant. The results are quite favourable, with employment increasing by 4.54 per cent. They depend primarily on two factors: the high sensitivity of the GPI to changes in the pre-tax nominal wage rate and the low sensitivity of net government income to changes in the PAYE tax rate.[4] The first means that a fall in the wage rate induces a relatively large reduction in

nominal government expenditure on goods and services, and the second means that relatively large reductions in tax rates are required to rebalance the government's budget. The assumed constancy of the post-tax real wage rate then ensures that the tax cuts are realized as increases in output and employment rather than as domestic inflation.

3. THE DISTRIBUTIONAL EFFECTS OF A CHANGE IN THE TAX MIX: METHODOLOGY

Our analysis of the effects of the change in the tax mix on the distribution of personal incomes proceeds in two stages: unit record data from the 1981/82 Income and Housing Survey (IHS) are updated to incorporate the income changes indicated by the solutions of the ORANI-NAGA model; then the corresponding changes in various distributional statistics, including the Shorrocks I_0 index, are computed and assessed. In this section, the methodologies underlying both parts of the process are discussed in turn.

3.1 Interfacing the ORANI-NAGA Model with the IHS Distributional 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) 62 employment levels, by occupation (ℓ_i, i=1,..,62);

(viii) the number of persons unemployed (n);

(ix) the number of persons not in the labour force (m);

(x) the average rate of income tax (t_D).

These results are used to adjust the IHS data in four 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 transfer payments (including alimony, workers' compensation, superannuation, unemployment benefits and other government benefits) are assumed to be indexed to the consumer price index (ξ), and are adjusted accordingly.

Thirdly, the population weight attached to each person in the IHS data is adjusted to reflect computed changes in the employment of

labour. Thus the weight of an employed person in occupation i is changed by ℓ_i per cent, the weight of an unemployed person by n per cent, and the weight of a person who is not in the labour force by m per cent.

The final adjustment concerns the progressive income tax scale used to compute post-shock (i.e., after the change in the tax mix) post-tax incomes. The scale is derived partly from the "revenue neutral" scale published in the DWP and partly from the change in the average rate of income tax, t_D, obtained from ORANI-NAGA. The DWP scale will not itself produce a revenue neutral result in our calculations for two reasons: firstly, because it is based on 1984/85 income data and secondly, because it assumes no change in pre-tax prices and incomes. Hence, the DWP scale was deflated to 1981/82 income levels and the tax rates for all brackets adjusted to obtain revenue neutrality for the 1981/82 distribution of pre-shock incomes. In post-shock calculations, the tax rates for all brackets are further adjusted by the change t_D.

3.2 The Shorrocks I_0 Index and Its Application[5]

To illustrate our use of distributional statistics, we shall consider the population of all income recipients and its component groups of males and females. Statistics for this population derived from the IHS data are set out in Tables 4 and 5.

A table (such as Table 5) of income deciles and income shares is a commonly used and comprehensive representation of distributional information. It is not, however, a convenient device for comparing inequality across distributions or for discussing the contributions to the total inequality in a population of inequality in particular sub-

Table 4 Summary Statistics for All Income Recipients
Pre-shock Post-tax Incomes

Statistic	Males	Females	Persons
Number (thousands)	5052	4837	9890
Mean income ($)	10962	5719	8397
Shorrocks I_0 index	0.199	0.474	0.385
Decomposition of Shorrocks I_0 index -			
Within groups			0.333
Between groups			0.052

Table 5 Income Deciles for All Income Recipients
Pre-shock Post-tax Incomes

Decile class	Males		Females		Persons	
	Mean income $	Income share %	Mean income $	Income share %	Mean income $	Income share %
Lowest	2534	2.31	299	0.52	552	0.66
2nd	4251	3.88	896	1.57	2561	3.05
3rd	6152	5.61	2410	4.22	3798	4.52
4th	8271	7.55	3549	6.21	4832	5.75
5th	10042	9.16	4193	7.33	6530	7.78
6th	11447	10.44	5190	9.08	8446	10.06
7th	12874	11.75	6655	11.64	10262	12.22
8th	14564	13.29	8452	14.78	12099	14.41
9th	16611	15.15	10431	18.24	14536	17.31
Highest	22864	20.86	15110	26.42	20353	24.24

populations. For these purposes, the Shorrocks I_0 index is better suited.

The I_0 index measures inequality according to a formula which takes account of the ratio of each person's income to the mean income of the population. If all these ratios are one (i.e., if there is no inequality), then I_0 has the value zero. Otherwise, I_0 will be positive with higher values indicating increasingly unequal distributions.

Table 6 shows values of the Shorrocks I_0 index and the better known Gini coefficient for a series of hypothetical two-person populations. This table can be used as an aid to interpreting the Shorrocks indices calculated from real populations. For example, the value of I_0 for the distribution of incomes of all income recipients is given in Table 4 as 0.385. Table 6 shows that this level of inequality is equivalent to the level which would exist in a two-person population in which the richer person had about 86.6 per cent of the total income.

For male income recipients, the I_0 value given in Table 4, implies a level of inequality equivalent to that in a two-person society in which income is shared in the ratio 78.7 to 21.3. For female income recipients, the equivalent ratio is 89.2 to 10.8. The plausibility of this very high ratio for females can be checked by glancing at Table 5. Notice that the top 50 per cent of female income recipients had 80.2 per cent of total female income. If the incomes of all females in this top 50 per cent were equalized at the mean income of their group, while the incomes of all members of the bottom 50 per cent were equalized at their mean income, then the inequality in the resulting distribution would be the same as that in a two-person distribution in which total income was shared in the ratio 80.2 to 19.8. This ratio is an underestimate of the

Table 6 An Aid for Interpreting the Shorrocks I_0 Index and the Gini Coefficient[a]

(1) Richer Person's Share (%)	(2) I_0 Index	(3) Gini Coef.	(1) Richer Person's Share (%)	(2) I_0 Index	(3) Gini Coef.	(1) Richer Person's Share (%)	(2) I_0 Index	(3) Gini Coef.	(1) Richer Person's Share (%)	(2) I_0 Index	(3) Gini Coef.	(1) Richer Person's Share (%)	(2) I_0 Index	(3) Gini Coef.
50.0	0.0000	0.000	60.0	0.0204	0.100	70.0	0.0872	0.200	80.0	0.2231	0.300	90.0	0.5108	n.a.
50.5	0.0001	0.005	60.5	0.0226	0.105	70.5	0.0920	0.205	80.5	0.2327	0.305	90.5	0.5337	n.a.
51.0	0.0002	0.010	61.0	0.0248	0.110	71.0	0.0970	0.210	81.0	0.2426	0.310	91.0	0.5580	n.a.
51.5	0.0005	0.015	61.5	0.0272	0.115	71.5	0.1022	0.215	81.5	0.2528	0.315	91.5	0.5838	n.a.
52.0	0.0008	0.020	62.0	0.0297	0.120	72.0	0.1076	0.220	82.0	0.2635	0.320	92.0	0.6114	n.a.
52.5	0.0013	0.025	62.5	0.0323	0.125	72.5	0.1131	0.225	82.5	0.2745	0.325	92.5	0.6410	n.a.
53.0	0.0018	0.030	63.0	0.0350	0.130	73.0	0.1189	0.230	83.0	0.2860	0.330	93.0	0.6728	n.a.
53.5	0.0025	0.035	63.5	0.0378	0.135	73.5	0.1248	0.235	83.5	0.2979	0.335	93.5	0.7071	n.a.
54.0	0.0032	0.040	64.0	0.0408	0.140	74.0	0.1309	0.240	84.0	0.3130	0.340	94.0	0.7445	n.a.
54.5	0.0041	0.045	64.5	0.0439	0.145	74.5	0.1373	0.245	84.5	0.3232	0.345	94.5	0.7853	n.a.
55.0	0.0050	0.050	65.0	0.0472	0.150	75.0	0.1438	0.250	85.0	0.3367	0.350	95.0	0.8304	n.a.
55.5	0.0061	0.055	65.5	0.0505	0.155	75.5	0.1506	0.255	85.5	0.3507	0.355	95.5	0.8804	n.a.
56.0	0.0073	0.060	66.0	0.0540	0.160	76.0	0.1576	0.260	86.0	0.3653	0.360	96.0	0.9367	n.a.
56.5	0.0085	0.065	66.5	0.0576	0.165	76.5	0.1649	0.265	86.5	0.3806	0.365	96.5	1.0009	n.a.
57.0	0.0099	0.070	67.0	0.0614	0.170	77.0	0.1724	0.270	87.0	0.3966	0.370	97.0	1.0754	n.a.
57.5	0.0114	0.075	67.5	0.0653	0.175	77.5	0.1801	0.275	87.5	0.4133	0.375	97.5	1.1639	n.a.
58.0	0.0130	0.080	68.0	0.0694	0.180	78.0	0.1881	0.280	88.0	0.4309	0.380	98.0	1.2730	n.a.
58.5	0.0147	0.085	68.5	0.0736	0.185	78.5	0.1964	0.285	88.5	0.4493	0.385	98.5	1.4142	n.a.
59.0	0.0165	0.090	69.0	0.0780	0.190	79.0	0.2050	0.290	89.0	0.4688	0.390	99.0	1.6144	n.a.
59.5	0.0184	0.095	69.5	0.0825	0.195	79.5	0.2139	0.295	89.5	0.4892	0.395	99.5	1.9585	n.a.

(a) This table shows the values of the Shorrocks I_0 index and the Gini coefficient for a population of two people in which the richer person's share of total income is that shown in column (1). For example, if the richer person has 69 per cent of total income, then the Shorrocks I_0 index is 0.078 and the Gini coefficient is 0.19.

In a two person population, the maximum value of the Gini coefficient is 1/2. The relevant formula is:

$$G = (2y - 1)/2 ,$$

where y is the share of the richer person in total income. As the population gets larger, the maximum possible value of G approaches 1. Hence, our two person example cannot be considered a reliable guide in interpreting Gini coefficients of more than about 0.4 calculated from large populations. In the table this is indicated by n.a. (not applicable).

two-person-equivalent inequality in the initial distribution: in the initial distribution, inequalities among the incomes of members of the top 50 per cent remain as do those among the incomes of the bottom 50 per cent.

An important property of Shorrocks indices (but not the Gini coefficient) is that they can be decomposed into measures of the contributions to total inequality of "between-group" inequality and "within-group" inequality. In Table 4 the population is divided into two groups: males and females. A natural measure of the contribution to inequality in the population of inequality between these two groups is obtained by calculating the I_0 index which would apply if all male incomes were equalized at the male mean and all female incomes were equalized at the female mean. In this situation, the only inequality remaining in the population would be that between the two groups. When we make this calculation (with all male incomes set at $10,962 and all female incomes set at $5,719) we obtain $I_0 = 0.052$. This figure is shown in Table 4 as the between-group contribution to total inequality.

A natural measure of the contribution to total inequality (measured by I_0 for the population) of inequality within groups is a weighted average (using population weights) of the I_0s for the groups.

In Table 4 this gives -

$$\text{Within group contribution} = \text{Contribution of inequality among males} + \text{Contribution of inequality among females}$$

$$= 0.199 \times \frac{5052}{9890} + 0.474 \times \frac{4837}{9890}$$

$$= 0.1016 + 0.2318$$

$$= 0.333 .$$

According to this decomposition, therefore, inequality among males explains 26.4 per cent (0.1016/0.385) of the total inequality among income recipients, inequality among females explains 60.2 per cent and inequality between the sexes explains 13.4 per cent. In other words, if inequality among the incomes of males were eliminated, overall inequality would be reduced by 26.4 per cent. If inequality among female incomes were eliminated, overall inequality would be reduced by 60.2 per cent. The elimination of male/female income inequality would have the comparatively minor effect on total inequality of reducing it by 13.4 per cent.

Having decomposed the inequality within the population of all income recipients according to sex, further characteristics can be nominated to decompose the inequality within the subpopulations of male and female income recipients. In this way a hierarchy of populations can be generated, the residual "within groups" inequality being progressively reduced as the population size decreases. To the extent that the "between groups" inequality accounts for a large share of the total at any level of the hierarchy, the decomposition characteristic can be con-

sidered an important source of inequality for the corresponding population.

The structure of the decomposition analysis undertaken in this paper is indicated by the population hierarchy set out in Figure 1. As just reported, inequality within the population of all income recipients is explained in terms of sex. For the populations of males and females at the second level of the hierarchy, three different decomposition characteristics are employed: principal source of income, employment status, and labour force participation. At the third level, the residual inequality within the groups of male and female full-year, full-time workers is decomposed according to occupation. This particular hierarchy has been chosen to highlight likely changes in the importance of various sources of inequality as a result of a change in the tax mix. More specifically, the decomposition characteristics correspond closely to the variables of the ORANI-NAGA model used to update the IHS income data.

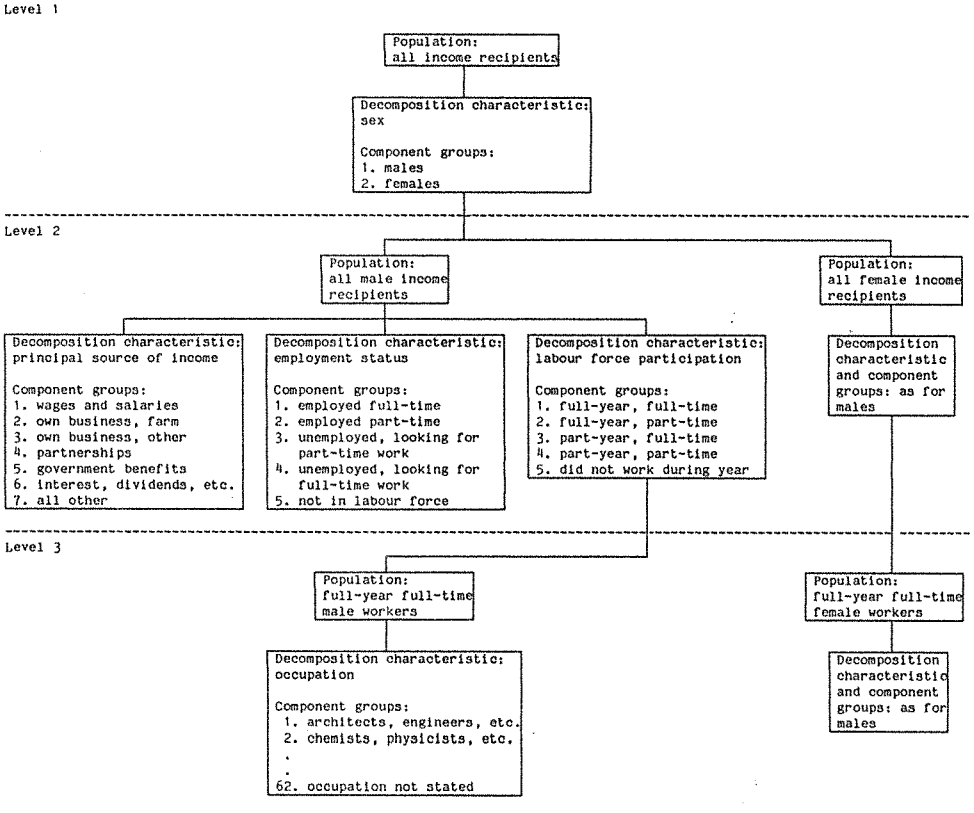

Figure 1: The Hierarchy of Populations for the Analysis of the Distribution of Income between Individual Income Recipients (see Appendix A for a complete list of occupations)

4. THE DISTRIBUTIONAL EFFECTS OF A CHANGE IN THE TAX MIX: RESULTS

Analyses of the distributional impact of a change in the tax mix often abstract from the effects of the change on pre-tax prices and incomes. The DWP contains one recent example, as we have previously noted; another can be found in Warren (1985). By using a macroeconomic model (i.e., ORANI-NAGA) in conjunction with the IHS income statistics we are able to incorporate the effects in question, and hence to assess their relative importance in moderating the distribution of income. With this end in mind, we shall restrict our attention in this section to only one of the four tax mix simulations discussed in section 2. Specifically, we consider the package in which the post-tax real wage rate (CPI deflated) and the public sector borrowing requirement are held constant, as the macroeconomic effects of that package are clearly the largest.

In Table 7, we reintroduce the macroeconomic results for the package, this time in the form in which they impact on the income statistics. The effect of the package on the progressive income tax scale is indicated in Table 8. Our main distributional results, arranged according to the population hierarchy of Figure 1, are presented in Table 9 (for pre-shock incomes) and Table 10 (for post-shock incomes). To provide a context for our subsequent analysis, we begin with a brief description of the structure of inequality prior to the implementation of the tax reform.

The first level of the hierarchy has already been dealt with in our discussion of Table 4. At the second level, all three decomposition characteristics are significant sources of inequality for both males and females, the between-groups contribution never falling below

Table 7 Projected Effects of Alternative Tax Mix Package with Constant PSBR and Constant Post-tax Real Wage Rate

Variable	Symbol	Percentage change
1. Pre-tax nominal wage rate	w	-6.67
2. Rent, ownership of dwellings	π_D	24.43
3. Return to primary factors, agriculture	y_A	-1.04
4. Return to primary factors, excluding agriculture and ownership of dwellings	y_O	-4.17
5. Return to non-labour primary factors, excluding agriculture and ownership of dwellings	π	5.53
6. Consumer price index	ξ	7.43
7. Persons employed	ℓ	4.54
8. Persons unemployed	n	-9.53
9. Persons not in labour force	m	-5.78
10. Average rate of income tax	t_D	-34.28

Table 8 Income Tax Scales

Pre-shock incomes		Post-shock incomes	
Taxable income ($)	Marginal tax rate (cents per dollar)	Taxable income ($)	Marginal tax rate (cents per dollar)
0-4195	0	0-4752	0
4196-17983	32	4753-14742	19.0
17984-35787	46	14743-21168	33.2
35788 and over	60	21169-26460	38.0
		26461 and over	47.5

TABLE 9
DECOMPOSITION OF INEQUALITY
PRE-SHOCK POST-TAX INCOMES

LEVEL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	MEAN INCOME ($)	NUMBER (000'S)	SHORROCKS INDEX	CONTRIBUTION (PER CENT)
1	ALL INDIVIDUAL INCOME RECIPIENTS	SEX	MALES	10971	5052	0.179	26.38
			FEMALES	5721	4837	0.474	60.17
			WITHIN GROUPS			0.334	86.56
			BETWEEN GROUPS			0.052	13.44
			POPULATION	8403	9890	0.336	100.00
2	ALL MALE INCOME RECIPIENTS	PRINCIPAL SOURCE OF INCOME	WAGES AND SALARIES	12799	3293	0.091	29.38
			OWN BUSINESS, FARM	11586	43	0.245	1.05
			OWN BUSINESS, OTHER	12304	276	0.201	5.53
			PARTNERSHIPS	10670	380	0.204	7.72
			GOVERNMENT BENEFITS	4115	777	0.073	5.62
			INTEREST, DIVIDENDS, ETC.	7141	156	0.321	12.70
			ALL OTHER	8017	127	0.310	3.91
			WITHIN GROUPS			0.132	66.40
			BETWEEN GROUPS			0.067	33.60
			POPULATION	10971	5052	0.199	100.00
		EMPLOYMENT STATUS	EMPLOYED FULL-TIME	12793	3658	0.124	45.34
			EMPLOYED PART-TIME	8114	157	0.247	3.86
			UNEMPLOYED, LOOKING FOR F-T WORK	6664	268	0.231	6.14
			UNEMPLOYED, LOOKING FOR P-T WORK	5952	9	0.161	0.14
			NOT IN LABOUR FORCE	5749	961	0.214	20.43
			WITHIN GROUPS			0.151	75.52
			BETWEEN GROUPS			0.049	24.38
			POPULATION	10971	5052	0.199	100.00
		LABOUR FORCE PARTICIPATION	FULL-YEAR, FULL-TIME	13247	3274	0.107	34.71
			FULL-YEAR, PART-TIME	8638	67	0.269	1.81
			PART-YEAR, FULL-TIME	9197	696	0.171	11.85
			PART-YEAR, PART-TIME	5605	109	0.238	2.58
			DID NOT WORK DURING YEAR	4929	906	0.192	17.27
			WITHIN GROUPS			0.136	68.21
			BETWEEN GROUPS			0.063	31.79
			POPULATION	10971	5052	0.199	100.00
2	ALL FEMALE INCOME RECIPIENTS	PRINCIPAL SOURCE OF INCOME	WAGES AND SALARIES	8377	1958	0.153	13.02
			OWN BUSINESS, FARM	8527	8	0.204	0.08
			OWN BUSINESS, OTHER	8474	94	0.229	0.94
			PARTNERSHIPS	8833	301	0.191	2.50
			GOVERNMENT BENEFITS	2792	1959	0.431	36.82
			INTEREST, DIVIDENDS, ETC.	4052	422	0.978	17.99
			ALL OTHER	5792	94	0.304	1.25
			WITHIN GROUPS			0.344	72.61
			BETWEEN GROUPS			0.130	27.39
			POPULATION	5721	4837	0.474	100.00
		EMPLOYMENT STATUS	EMPLOYED FULL-TIME	9667	1307	0.143	8.15
			EMPLOYED PART-TIME	6484	818	0.262	9.36
			UNEMPLOYED, LOOKING FOR F-T WORK	4190	119	0.375	1.95
			UNEMPLOYED, LOOKING FOR P-T WORK	3101	38	0.502	0.83
			NOT IN LABOUR FORCE	3568	2555	0.529	58.36
			WITHIN GROUPS			0.375	79.14
			BETWEEN GROUPS			0.099	20.86
			POPULATION	5721	4837	0.474	100.00
		LABOUR FORCE PARTICIPATION	FULL-YEAR, FULL-TIME	10380	1114	0.098	4.74
			FULL-YEAR, PART-TIME	7370	474	0.192	3.98
			PART-YEAR, FULL-TIME	6441	449	0.198	3.86
			PART-YEAR, PART-TIME	4720	455	0.263	5.22
			DID NOT WORK DURING YEAR	3230	2345	0.552	56.45
			WITHIN GROUPS			0.352	74.24
			BETWEEN GROUPS			0.122	25.76
			POPULATION	5721	4837	0.474	100.00

TABLE 9 (CONTINUED)

LEVEL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	MEAN INCOME ($)	NUMBER (000'S)	SHORROCKS INDEX	CONTRIBUTION (PER CENT)
3	FULL-YEAR, FULL-TIME MALE WORKERS	OCCUPATION	1 ARCHITECTS,ENGINEERS, ETC.	19495	58	0.042	0.69
			2 PHYSICAL SCIENTISTS	19686	10	0.021	0.06
			3 MEDICAL PRACTITIONERS, DENTISTS	25731	18	0.086	0.46
			4 NURSES	13835	8	0.024	0.06
			5 MEDICAL WORKERS N.E.C.	16703	12	0.135	0.45
			6 TEACHERS	17541	112	0.026	0.32
			7 LAW PROFESSIONALS	20620	11	0.202	0.64
			8 ARTISTS, ENTERTAINERS, ETC.	14778	20	0.095	0.53
			9 DRAFTSMEN, TECHNICIANS N.E.C.	14725	85	0.036	0.38
			10 OTHER PROFESSIONAL WORKERS	16379	93	0.081	2.16
			11 ADMINISTRATIVE, EXECUTIVE	17130	12	0.056	0.20
			12 EMPLOYERS, DIRECTORS N.E.C.	16089	361	0.129	13.30
			13 BOOK-KEEPERS, CASHIERS	13298	30	0.050	0.43
			14 STENOGRAPHERS, TYPISTS	17112	1	0.030	0.01
			15 OTHER CLERICAL WORKERS	13636	249	0.034	2.40
			16 INSURANCE, REAL ESTATE	13326	28	0.080	0.65
			17 COMMERCIAL TRAVELLERS	13362	38	0.033	0.36
			18 PROPRIETORS, SHOPKEEPERS	10933	110	0.119	3.74
			19 FARMERS, FARM MANAGERS	10354	168	0.324	15.62
			20 FARM WORKERS	9252	77	0.138	3.04
			21 OTHER RURAL WORKERS	11879	15	0.213	0.93
			22 MINERS AND RELATED WORKERS	16385	32	0.090	0.33
			23 PILOTS, NAVIGATORS, ETC.	22354	6	0.044	0.08
			24 RAILWAY FIREMEN AND DRIVERS	14251	12	0.008	0.03
			25 POSTMASTERS	14152	2	0.010	0.01
			26 POSTMEN AND MESSENGERS	12547	18	0.022	0.12
			27 ROAD DRIVERS	11338	153	0.089	3.92
			28 RAILWAY GUARDS, CONDUCTORS	15430	7	0.008	0.02
			29 STATIONMASTERS, ETC.	15451	5	0.005	0.01
			30 OTHER RAILWAY WORKERS	14881	17	0.052	0.26
			31 TELECOMMUNICATION WORKERS	15763	4	0.021	0.02
			32 TRANSPORT, COMMUNICATION N.E.C.	15124	11	0.057	0.17
			33 TEXTILE WORKERS	11004	8	0.043	0.10
			34 TAILORS, CUTTERS, ETC.	8503	11	0.274	0.85
			35 LEATHER WORKERS	8676	5	0.042	0.06
			36 FURNACEMEN, ETC.	13128	19	0.044	0.24
			37 WATCHMAKERS, JEWELLERS	12532	19	0.236	1.30
			38 MECHANICS, PLUMBERS, ETC.	11968	381	0.072	7.31
			39 ELECTRICIANS, ETC.	13387	132	0.048	1.83
			40 METAL WORKERS	11591	47	0.195	2.63
			41 CARPENTERS, ETC.	10796	104	0.104	3.08
			42 PAINTERS, DECORATORS	10410	35	0.062	0.62
			43 BRICKLAYERS, ETC.	11072	101	0.099	2.87
			44 COMPOSITORS, ETC.	13038	26	0.043	0.32
			45 MILLERS, BAKERS, ETC.	12103	59	0.101	1.71
			46 TOBACCO WORKERS, ETC.	14407	21	0.039	0.24
			47 RUBBER, PLASTIC WORKERS, ETC.	11449	34	0.063	0.61
			48 PACKERS, WRAPPERS, LABELLERS	12522	10	0.030	0.09
			49 LIFTING EQUIPMENT OPERATORS	13221	85	0.041	0.99
			50 STOREMEN, FREIGHT HANDLERS	11201	106	0.038	1.15
			51 LABORERS N.E.C.	11647	107	0.039	1.21
			52 PROTECTIVE SERVICES WORKERS	15685	50	0.023	0.33
			53 HOUSEKEEPERS, COOKS, ETC.	10888	24	0.190	1.29
			54 WAITERS, BARTENDERS	11339	9	0.014	0.06
			55 CARETAKERS, CLEANERS	10426	31	0.044	0.39
			56 BARBERS, BEAUTICIANS	7784	4	0.062	0.06
			57 LAUNDERERS, ETC.	8562	3	0.279	0.23
			58 ATHLETES, UNDERTAKERS	12637	6	0.096	0.16
			59 PHOTOGRAPHERS	13213	5	0.040	0.06
			60 SERVICE WORKERS N.E.C.	12209	23	0.032	0.21
			61 MEMBERS OF ARMED SERVICES	15029	25	0.022	0.15
			62 OCCUPATION NOT CLEAR	17440	0	0.000	0.00
			WITHIN GROUPS			0.089	83.50
			BETWEEN GROUPS			0.018	16.50
			POPULATION	13247	3274	0.107	100.00

TABLE 9 (CONTINUED)

LEVEL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	MEAN INCOME ($)	NUMBER ('000'S)	SHORROCKS INDEX	CONTRIBUTION (PER CENT)
3	FULL-YEAR, FULL-TIME FEMALE WORKERS	OCCUPATION	1 ARCHITECTS,ENGINEERS, ETC.	16112	1	0.009	0.01
			2 PHYSICAL SCIENTISTS	14326	4	0.014	0.05
			3 MEDICAL PRACTITIONERS, DENTISTS	17586	2	0.095	0.22
			4 NURSES	12116	64	0.036	2.14
			5 MEDICAL WORKERS N.E.C.	11555	5	0.035	0.16
			6 TEACHERS	14651	97	0.030	2.70
			7 LAW PROFESSIONALS	16150	1	0.036	0.03
			8 ARTISTS, ENTERTAINERS, ETC.	14241	7	0.081	0.55
			9 DRAFTSMEN, TECHNICIANS N.E.C.	11361	15	0.040	0.55
			10 OTHER PROFESSIONAL WORKERS	13732	25	0.051	1.17
			11 ADMINISTRATIVE, EXECUTIVE	0	0	0.000	0.00
			12 EMPLOYERS, DIRECTORS N.E.C.	11301	46	0.255	10.83
			13 BOOK-KEEPERS, CASHIERS	10116	50	0.073	3.37
			14 STENOGRAPHERS, TYPISTS	10182	97	0.032	2.52
			15 OTHER CLERICAL WORKERS	10347	288	0.045	12.35
			16 INSURANCE, REAL ESTATE	10080	2	0.082	0.14
			17 COMMERCIAL TRAVELLERS	11471	3	0.063	0.15
			18 PROPRIETORS, SHOPKEEPERS	8085	98	0.103	9.29
			19 FARMERS, FARM MANAGERS	6416	36	0.576	19.35
			20 FARM WORKERS	6022	8	0.226	1.66
			21 OTHER RURAL WORKERS	8708	0	0.000	0.00
			22 MINERS AND RELATED WORKERS	0	0	0.000	0.00
			23 PILOTS, NAVIGATORS, ETC.	0	0	0.000	0.00
			24 RAILWAY FIREMEN AND DRIVERS	0	0	0.000	0.00
			25 POSTMASTERS	8579	1	0.079	0.05
			26 POSTMEN AND MESSENGERS	10508	6	0.020	0.10
			27 ROAD DRIVERS	10028	3	0.040	0.09
			28 RAILWAY GUARDS, CONDUCTORS	0	0	0.000	0.00
			29 STATIONMASTERS, ETC.	12215	0	0.000	0.00
			30 OTHER RAILWAY WORKERS	11863	1	0.011	0.01
			31 TELECOMMUNICATION WORKERS	10401	11	0.035	0.37
			32 TRANSPORT, COMMUNICATION N.E.C.	9970	0	0.000	0.00
			33 TEXTILE WORKERS	9312	5	0.050	0.24
			34 TAILORS, CUTTERS, ETC.	8344	29	0.035	0.93
			35 LEATHER WORKERS	8123	5	0.334	1.60
			36 FURNACEMEN, ETC.	17238	0	0.000	0.00
			37 WATCHMAKERS, JEWELLERS	10212	1	0.004	0.00
			38 MECHANICS, PLUMBERS, ETC.	8689	7	0.019	0.12
			39 ELECTRICIANS, ETC.	9236	1	0.005	0.01
			40 METAL WORKERS	9232	12	0.023	0.26
			41 CARPENTERS, ETC.	9706	2	0.015	0.02
			42 PAINTERS, DECORATORS	6588	1	0.025	0.03
			43 BRICKLAYERS, ETC.	6254	1	0.014	0.02
			44 COMPOSITORS, ETC.	9576	7	0.031	0.20
			45 MILLERS, BAKERS, ETC.	9730	9	0.036	0.28
			46 TOBACCO WORKERS, ETC.	9429	3	0.017	0.04
			47 RUBBER, PLASTIC WORKERS, ETC.	8629	9	0.026	0.21
			48 PACKERS, WRAPPERS, LABELLERS	9124	15	0.024	0.32
			49 LIFTING EQUIPMENT OPERATORS	16522	0	0.000	0.00
			50 STOREMEN, FREIGHT HANDLERS	9606	7	0.014	0.09
			51 LABOURERS N.E.C.	10031	4	0.021	0.08
			52 PROTECTIVE SERVICES WORKERS	16771	3	0.023	0.06
			53 HOUSEKEEPERS, COOKS, ETC.	9254	56	0.078	4.01
			54 WAITERS, BARTENDERS	9295	10	0.032	0.29
			55 CARETAKERS, CLEANERS	9779	13	0.029	0.34
			56 BARBERS, BEAUTICIANS	7560	12	0.081	0.89
			57 LAUNDERERS, ETC.	8476	6	0.104	0.60
			58 ATHLETES, UNDERTAKERS	1003	1	0.736	0.55
			59 PHOTOGRAPHERS	15948	0	0.000	0.00
			60 SERVICE WORKERS N.E.C.	9198	22	0.052	1.03
			61 MEMBERS OF ARMED SERVICES	13220	1	0.036	0.04
			62 OCCUPATION NOT CLEAR	9715	0	0.000	0.00
			WITHIN GROUPS			0.078	79.82
			BETWEEN GROUPS			0.020	20.18
			POPULATION	10380	1114	0.098	100.00

20 per cent. For males, the within-groups contributions for the first characteristic are dominated by the group whose principal source of income is wages and salaries. This dominance derives from the size of the group (it accounts for more than 65 per cent of the relevant population), the amount of inequality within the group actually being less than for all the others. For similar reasons, the groups of full-time employed workers and full-year, full-time workers make the major within-groups contributions for employment status and labour force participation, respectively.

For females, the component group with the largest size also has a large amount of within-group inequality, and hence contributes an even greater share of total inequality. For each characteristic, this group contains a large number of recipients whose only independent income is a small government benefit, as well as a substantial number of recipients with much larger incomes, either from government benefits or other sources. For the same reason the between-groups contributions to total inequality are smaller for females than for males even though the values of the between-groups Shorrocks index are larger.

The third level of the hierarchy is concerned with inequality within populations of males and females who enjoy full-year full-time employment. Each population is divided into 62 component groups (some of which are empty) by occupation. A complete list of the occupations is given in Appendix A. For males the between-groups contribution is only about 16.5 per cent of the total, i.e., occupation is not a particularly significant source of inequality. The main within-groups contributions come from "Employers, workers on own account, directors, managers n.e.c." and "Farmers and farm managers". Both these groups are large and incorporate significant inequality. They are also important

contributors to inequality for females, along with "Other clerical workers". The last is relatively much larger for females than for males.

Turning now to a comparison of Tables 9 and 10, the following general observations about the effects of the tax reform can be made: at the first level of the hierarchy, inequality tends to fall; at lower levels, between-groups inequality falls but within-groups inequality tends to rise; the magnitude of the changes are small, rarely exceeding an amount equivalent to one percentage point in the richer person's share in a two person distribution. Our task in the remainder of this section is to interpret these observations, drawing out particularly the role of changes in pre-tax prices and incomes.

In our calculation, the tax reform can be considered to impinge on the distribution of post-tax incomes in three ways:

(i) through the changes in the tax scale;
(ii) through the changes in pre-tax factor prices; and
(iii) through the changes in employment levels for labour.

In Table 11, we present more detailed results for the Shorrocks index which enable us to identify the effects of each of those mechanisms separately. For our current purpose, it is sufficient to consider only the first two levels of the population hierarchy. The first column of the table simply reproduces the values of the I_0 index for pre-shock incomes from Table 9; it is included for purposes of comparison. The second column records the values of the Shorrocks index for a distribution in which only the income tax scale has been changed. In the third and fourth columns, factor prices and employment levels,

TABLE 10
DECOMPOSITION OF INEQUALITY
POST-SHOCK POST-TAX INCOMES

LEVEL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	MEAN INCOME ($)	NUMBER (000'S)	SHORROCKS INDEX	CONTRIBUTION (PER CENT)
1	ALL INDIVIDUAL INCOME RECIPIENTS	SEX	MALES	11750	5152	0.199	27.27
			FEMALES	6163	4764	0.470	59.40
			WITHIN GROUPS			0.329	86.67
			BETWEEN GROUPS			0.051	13.33
			POPULATION	9066	9915	0.380	100.00
2	ALL MALE INCOME RECIPIENTS	PRINCIPAL SOURCE OF INCOME	WAGES AND SALARIES	13449	3414	0.096	31.92
			OWN BUSINESS, FARM	12811	46	0.273	1.22
			OWN BUSINESS, OTHER	13242	287	0.219	6.12
			PARTNERSHIPS	11551	398	0.227	8.81
			GOVERNMENT BENEFITS	4439	733	0.075	5.36
			INTEREST, DIVIDENDS, ETC.	8282	152	0.980	13.32
			ALL OTHER	9156	121	0.334	3.93
			WITHIN GROUPS			0.140	70.39
			BETWEEN GROUPS			0.059	29.61
			POPULATION	11750	5152	0.199	100.00
		EMPLOYMENT STATUS	EMPLOYED FULL-TIME	13485	3833	0.131	48.72
			EMPLOYED PART-TIME	8611	164	0.270	4.31
			UNEMPLOYED, LOOKING FOR F-T WORK	7008	242	0.237	5.58
			UNEMPLOYED, LOOKING FOR P-T WORK	6279	8	0.170	0.13
			NOT IN LABOUR FORCE	6287	905	0.226	19.91
			WITHIN GROUPS			0.157	78.67
			BETWEEN GROUPS			0.043	21.33
			POPULATION	11750	5152	0.199	100.00
		LABOUR FORCE PARTICIPATION	FULL-YEAR, FULL-TIME	13971	3419	0.113	37.52
			FULL-YEAR, PART-TIME	9210	70	0.295	2.01
			PART-YEAR, FULL-TIME	9729	703	0.185	12.62
			PART-YEAR, PART-TIME	5921	109	0.260	2.75
			DID NOT WORK DURING YEAR	5452	851	0.208	17.26
			WITHIN GROUPS			0.144	72.16
			BETWEEN GROUPS			0.056	27.84
			POPULATION	11750	5152	0.199	100.00
2	ALL FEMALE INCOME RECIPIENTS	PRINCIPAL SOURCE OF INCOME	WAGES AND SALARIES	8715	2008	0.165	14.79
			OWN BUSINESS, FARM	9266	9	0.232	0.09
			OWN BUSINESS, OTHER	8974	97	0.252	1.09
			PARTNERSHIPS	9434	304	0.212	2.38
			GOVERNMENT BENEFITS	3003	1853	0.435	35.98
			INTEREST, DIVIDENDS, ETC.	4691	403	1.016	18.27
			ALL OTHER	6462	90	0.333	1.34
			WITHIN GROUPS			0.350	74.44
			BETWEEN GROUPS			0.120	25.56
			POPULATION	6163	4764	0.470	100.00
		EMPLOYMENT STATUS	EMPLOYED FULL-TIME	10098	1362	0.150	9.14
			EMPLOYED PART-TIME	6750	853	0.230	10.67
			UNEMPLOYED, LOOKING FOR F-T WORK	4322	108	0.374	1.30
			UNEMPLOYED, LOOKING FOR P-T WORK	3226	34	0.504	0.77
			NOT IN LABOUR FORCE	3852	2407	0.539	57.90
			WITHIN GROUPS			0.377	80.28
			BETWEEN GROUPS			0.093	19.72
			POPULATION	6163	4764	0.470	100.00
		LABOUR FORCE PARTICIPATION	FULL-YEAR, FULL-TIME	10870	1156	0.103	5.33
			FULL-YEAR, PART-TIME	7709	492	0.211	4.53
			PART-YEAR, FULL-TIME	6669	448	0.212	4.25
			PART-YEAR, PART-TIME	4876	458	0.282	5.78
			DID NOT WORK DURING YEAR	3520	2210	0.565	55.74
			WITHIN GROUPS			0.356	75.73
			BETWEEN GROUPS			0.114	24.27
			POPULATION	6163	4764	0.470	100.00

TABLE 10 (CONTINUED)

LEVEL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	MEAN INCOME ($)	NUMBER ('000'S)	SHORROCKS INDEX	CONTRIBUTION (PER CENT)
3	FULL-YEAR, FULL-TIME MALE WORKERS	OCCUPATION	1 ARCHITECTS,ENGINEERS, ETC.	20661	61	0.043	0.68
			2 PHYSICAL SCIENTISTS	20673	10	0.022	0.06
			3 MEDICAL PRACTITIONERS, DENTISTS	28230	19	0.097	0.48
			4 NURSES	14499	9	0.024	0.05
			5 MEDICAL WORKERS N.E.C.	17848	12	0.148	0.46
			6 TEACHERS	18431	113	0.027	0.80
			7 LAW PROFESSIONALS	22509	12	0.221	0.67
			8 ARTISTS, ENTERTAINERS, ETC.	15585	20	0.100	0.53
			9 DRAFTSMEN, TECHNICIANS N.E.C.	15499	88	0.038	0.97
			10 OTHER PROFESSIONAL WORKERS	17330	96	0.036	2.14
			11 ADMINISTRATIVE, EXECUTIVE	18038	12	0.059	0.19
			12 EMPLOYERS, DIRECTORS N.E.C.	17109	379	0.135	13.29
			13 BOOK-KEEPERS, CASHIERS	13987	32	0.052	0.43
			14 STENOGRAPHERS, TYPISTS	17963	1	0.030	0.01
			15 OTHER CLERICAL WORKERS	14324	260	0.035	2.34
			16 INSURANCE, REAL ESTATE	14101	30	0.092	0.64
			17 COMMERCIAL TRAVELLERS	14055	40	0.035	0.36
			18 PROPRIETORS, SHOPKEEPERS	11540	115	0.125	3.73
			19 FARMERS, FARM MANAGERS	11368	179	0.348	16.20
			20 FARM WORKERS	9670	81	0.147	3.39
			21 OTHER RURAL WORKERS	12663	16	0.226	0.92
			22 MINERS AND RELATED WORKERS	17238	34	0.086	0.77
			23 PILOTS, NAVIGATORS, ETC.	23585	7	0.047	0.28
			24 RAILWAY FIREMEN AND DRIVERS	14990	12	0.008	0.02
			25 POSTMASTERS	14846	2	0.010	0.01
			26 POSTMEN AND MESSENGERS	13145	19	0.022	0.11
			27 ROAD DRIVERS	11929	158	0.094	3.86
			28 RAILWAY GUARDS, CONDUCTORS	16185	7	0.007	0.01
			29 STATIONMASTERS, ETC.	16177	5	0.004	0.01
			30 OTHER RAILWAY WORKERS	15586	18	0.052	0.24
			31 TELECOMMUNICATION WORKERS	16561	4	0.022	0.02
			32 TRANSPORT, COMMUNICATION N.E.C.	15849	11	0.057	0.16
			33 TEXTILE WORKERS	11544	9	0.048	0.11
			34 TAILORS, CUTTERS, ETC.	8283	11	0.235	0.34
			35 LEATHER WORKERS	9002	5	0.045	0.06
			36 FURNACEMEN, ETC.	13795	20	0.047	0.24
			37 WATCHMAKERS, JEWELLERS	13181	20	0.240	1.25
			38 MECHANICS, PLUMBERS, ETC.	12535	400	0.076	7.92
			39 ELECTRICIANS, ETC.	14076	139	0.050	1.79
			40 METAL WORKERS	12142	49	0.216	2.75
			41 CARPENTERS, ETC.	11335	109	0.111	3.12
			42 PAINTERS, DECORATORS	10969	36	0.070	0.66
			43 BRICKLAYERS, ETC.	11657	105	0.109	2.97
			44 COMPOSITORS, ETC.	13699	27	0.045	0.32
			45 MILLERS, BAKERS, ETC.	12750	62	0.105	1.67
			46 TOBACCO WORKERS, ETC.	15133	22	0.041	0.24
			47 RUBBER, PLASTIC WORKERS, ETC.	12021	35	0.066	0.61
			48 PACKERS, WRAPPERS, LABELLERS	13165	11	0.031	0.09
			49 LIFTING EQUIPMENT OPERATORS	13376	89	0.041	0.95
			50 STOREMEN, FREIGHT HANDLERS	11741	110	0.041	1.16
			51 LABORERS N.E.C.	12199	111	0.042	1.21
			52 PROTECTIVE SERVICES WORKERS	16515	51	0.024	0.31
			53 HOUSEKEEPERS, COOKS, ETC.	11433	25	0.201	1.28
			54 WAITERS, BARTENDERS	11888	10	0.015	0.04
			55 CARETAKERS, CLEANERS	10902	32	0.050	0.41
			56 BARBERS, BEAUTICIANS	8079	4	0.073	0.07
			57 LAUNDERERS, ETC.	9011	3	0.258	0.19
			58 ATHELETES, UNDERTAKERS	13454	6	0.108	0.18
			59 PHOTOGRAPHERS	13899	5	0.040	0.05
			60 SERVICE WORKERS N.E.C.	12827	23	0.034	0.20
			61 MEMBERS OF ARMED SERVICES	15732	25	0.022	0.14
			62 OCCUPATION NOT CLEAR	18440	0	0.000	0.00
			WITHIN GROUPS			0.095	84.05
			BETWEEN GROUPS			0.018	15.95
			POPULATION	13971	3419	0.113	100.00

TABLE 10 (CONTINUED)

EL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	MEAN INCOME ($)	NUMBER (000'S)	SHORROCKS INDEX	CONTRI-BUTION (PER CENT)
	FULL-YEAR, FULL-TIME FEMALE WORKERS	OCCUPATION	1 ARCHITECTS,ENGINEERS, ETC.	17005	1	0.009	0.01
			2 PHYSICAL SCIENTISTS	15167	4	0.015	0.05
			3 MEDICAL PRACTITIONERS, DENTISTS	18713	3	0.098	0.21
			4 NURSES	12735	66	0.038	2.12
			5 MEDICAL WORKERS N.E.C.	12101	5	0.037	0.15
			6 TEACHERS	15422	98	0.031	2.52
			7 LAW PROFESSIONALS	17143	1	0.037	0.03
			8 ARTISTS, ENTERTAINERS, ETC.	15073	8	0.085	0.54
			9 DRAFTSMEN, TECHNICIANS N.E.C.	11930	16	0.043	0.56
			10 OTHER PROFESSIONAL WORKERS	14480	26	0.053	1.15
			11 ADMINISTRATIVE, EXECUTIVE	0	0	0.000	0.00
			12 EMPLOYERS, DIRECTORS N.E.C.	12036	48	0.265	10.73
			13 BOOK-KEEPERS, CASHIERS	10557	53	0.078	3.43
			14 STENOGRAPHERS, TYPISTS	10663	101	0.035	2.97
			15 OTHER CLERICAL WORKERS	10843	300	0.050	12.43
			16 INSURANCE, REAL ESTATE	10450	2	0.095	0.16
			17 COMMERCIAL TRAVELLERS	11970	3	0.069	0.16
			18 PROPRIETORS, SHOPKEEPERS	8400	102	0.109	9.34
			19 FARMERS, FARM MANAGERS	7006	38	0.605	19.30
			20 FARM WORKERS	6213	8	0.234	1.64
			21 OTHER RURAL WORKERS	9102	0	0.000	0.00
			22 MINERS AND RELATED WORKERS	0	0	0.000	0.00
			23 PILOTS, NAVIGATORS, ETC.	0	0	0.000	0.00
			24 RAILWAY FIREMEN AND DRIVERS	0	0	0.000	0.00
			25 POSTMASTERS	8944	1	0.093	0.06
			26 POSTMEN AND MESSENGERS	10997	6	0.021	0.11
			27 ROAD DRIVERS	10590	3	0.042	0.09
			28 RAILWAY GUARDS, CONDUCTORS	0	0	0.000	0.00
			29 STATIONMASTERS, ETC.	12908	0	0.000	0.00
			30 OTHER RAILWAY WORKERS	12413	1	0.011	0.01
			31 TELECOMMUNICATION WORKERS	10905	12	0.039	0.39
			32 TRANSPORT, COMMUNICATION N.E.C.	10387	0	0.000	0.00
			33 TEXTILE WORKERS	9655	6	0.057	0.26
			34 TAILORS, CUTTERS, ETC.	8655	30	0.038	0.95
			35 LEATHER WORKERS	8470	5	0.347	1.57
			36 FURNACEMEN, ETC.	18233	1	0.000	0.00
			37 WATCHMAKERS, JEWELLERS	10717	1	0.005	0.00
			38 MECHANICS, PLUMBERS, ETC.	8992	7	0.022	0.13
			39 ELECTRICIANS, ETC.	9590	2	0.005	0.01
			40 METAL WORKERS	9611	13	0.027	0.30
			41 CARPENTERS, ETC.	10185	2	0.016	0.02
			42 PAINTERS, DECORATORS	6754	1	0.029	0.03
			43 BRICKLAYERS, ETC.	6454	1	0.017	0.02
			44 COMPOSITORS, ETC.	10053	7	0.035	0.22
			45 MILLERS, BAKERS, ETC.	10141	9	0.040	0.30
			46 TOBACCO WORKERS, ETC.	9817	3	0.019	0.05
			47 RUBBER, PLASTIC WORKERS, ETC.	8967	9	0.029	0.23
			48 PACKERS, WRAPPERS, LABELLERS	9520	15	0.027	0.34
			49 LIFTING EQUIPMENT OPERATORS	17220	0	0.000	0.00
			50 STOREMEN, FREIGHT HANDLERS	10055	7	0.016	0.09
			51 LABORERS N.E.C.	10520	4	0.024	0.08
			52 PROTECTIVE SERVICES WORKERS	17733	3	0.027	0.07
			53 HOUSEKEEPERS, COOKS, ETC.	9578	58	0.083	4.04
			54 WAITERS, BARTENDERS	9675	10	0.036	0.31
			55 CARETAKERS, CLEANERS	10227	13	0.032	0.35
			56 BARBERS, BEAUTICIANS	7799	12	0.090	0.94
			57 LAUNDERERS, ETC.	8844	6	0.097	0.52
			58 ATHELETES, UNDERTAKERS	973	1	0.680	0.48
			59 PHOTOGRAPHERS	16987	0	0.000	0.00
			60 SERVICE WORKERS N.E.C.	9574	22	0.060	1.13
			61 MEMBERS OF ARMED SERVICES	13876	1	0.038	0.04
			62 OCCUPATION NOT CLEAR	10102	0	0.000	0.00
			WITHIN GROUPS			0.083	80.65
			BETWEEN GROUPS			0.020	19.35
			POPULATION	10870	1156	0.103	100.00

TABLE 11
VALUES OF THE SHORROCKS INDEX
POST-TAX INCOMES

LEVEL	POPULATION	DECOMPOSITION CHARACTERISTIC	COMPONENT GROUPS	PRE-SHOCK INCOMES (1)	POST-SHOCK INCOMES (*) (2)	(3)	(4)	(5)
1	ALL INDIVIDUAL INCOME RECIPIENTS	SEX	MALES	0.199	0.217	0.204	0.211	0.199
			FEMALES	0.474	0.506	0.479	0.497	0.470
			WITHIN GROUPS	0.334	0.358	0.339	0.349	0.329
			BETWEEN GROUPS	0.052	0.056	0.052	0.054	0.051
			POPULATION	0.386	0.414	0.391	0.402	0.380
2	ALL MALE INCOME RECIPIENTS	PRINCIPAL SOURCE OF INCOME	WAGES AND SALARIES	0.091	0.096	0.097	0.095	0.096
			OWN BUSINESS, FARM	0.245	0.271	0.273	0.271	0.273
			OWN BUSINESS, OTHER	0.201	0.218	0.220	0.217	0.219
			PARTNERSHIPS	0.204	0.225	0.227	0.225	0.227
			GOVERNMENT BENEFITS	0.073	0.076	0.075	0.076	0.075
			INTEREST, DIVIDENDS, ETC.	0.821	0.859	0.857	0.882	0.880
			ALL OTHER	0.310	0.336	0.333	0.337	0.334
			WITHIN GROUPS	0.132	0.141	0.141	0.140	0.140
			BETWEEN GROUPS	0.067	0.076	0.063	0.072	0.059
			POPULATION	0.199	0.217	0.204	0.211	0.199
		EMPLOYMENT STATUS	EMPLOYED FULL-TIME	0.124	0.131	0.131	0.131	0.131
			EMPLOYED PART-TIME	0.247	0.273	0.270	0.273	0.270
			UNEMPLOYED, LOOKING FOR F-T WORK	0.231	0.255	0.237	0.255	0.237
			UNEMPLOYED, LOOKING FOR P-T WORK	0.161	0.181	0.170	0.181	0.170
			NOT IN LABOUR FORCE	0.214	0.239	0.226	0.239	0.226
			WITHIN GROUPS	0.151	0.163	0.159	0.160	0.157
			BETWEEN GROUPS	0.049	0.054	0.045	0.051	0.043
			POPULATION	0.199	0.217	0.204	0.211	0.199
		LABOUR FORCE PARTICIPATION	FULL-YEAR, FULL-TIME	0.107	0.112	0.112	0.113	0.113
			FULL-YEAR, PART-TIME	0.269	0.297	0.295	0.297	0.295
			PART-YEAR, FULL-TIME	0.171	0.188	0.185	0.187	0.185
			PART-YEAR, PART-TIME	0.238	0.261	0.263	0.258	0.260
			DID NOT WORK DURING YEAR	0.192	0.211	0.208	0.211	0.208
			WITHIN GROUPS	0.136	0.146	0.145	0.145	0.144
			BETWEEN GROUPS	0.063	0.071	0.059	0.067	0.056
			POPULATION	0.199	0.217	0.204	0.211	0.199
2	ALL FEMALE INCOME RECIPIENTS	PRINCIPAL SOURCE OF INCOME	WAGES AND SALARIES	0.153	0.169	0.168	0.166	0.165
			OWN BUSINESS, FARM	0.204	0.230	0.232	0.230	0.232
			OWN BUSINESS, OTHER	0.229	0.252	0.252	0.252	0.252
			PARTNERSHIPS	0.191	0.211	0.211	0.211	0.212
			GOVERNMENT BENEFITS	0.431	0.434	0.434	0.435	0.435
			INTEREST, DIVIDENDS, ETC.	0.978	1.020	1.017	1.019	1.016
			ALL OTHER	0.304	0.334	0.332	0.335	0.333
			WITHIN GROUPS	0.344	0.358	0.357	0.351	0.350
			BETWEEN GROUPS	0.130	0.148	0.121	0.146	0.120
			POPULATION	0.474	0.506	0.479	0.497	0.470
		EMPLOYMENT STATUS	EMPLOYED FULL-TIME	0.143	0.154	0.151	0.154	0.150
			EMPLOYED PART-TIME	0.262	0.285	0.281	0.284	0.280
			UNEMPLOYED, LOOKING FOR F-T WORK	0.375	0.399	0.373	0.399	0.374
			UNEMPLOYED, LOOKING FOR P-T WORK	0.502	0.520	0.504	0.520	0.504
			NOT IN LABOUR FORCE	0.529	0.551	0.539	0.551	0.539
			WITHIN GROUPS	0.375	0.395	0.386	0.386	0.377
			BETWEEN GROUPS	0.099	0.112	0.093	0.111	0.093
			POPULATION	0.474	0.506	0.479	0.497	0.470
		LABOUR FORCE PARTICIPATION	FULL-YEAR, FULL-TIME	0.098	0.104	0.103	0.105	0.103
			FULL-YEAR, PART-TIME	0.192	0.211	0.211	0.211	0.211
			PART-YEAR, FULL-TIME	0.198	0.218	0.214	0.216	0.212
			PART-YEAR, PART-TIME	0.263	0.285	0.284	0.283	0.282
			DID NOT WORK DURING YEAR	0.552	0.571	0.564	0.571	0.565
			WITHIN GROUPS	0.352	0.368	0.365	0.360	0.356
			BETWEEN GROUPS	0.122	0.138	0.114	0.137	0.114
			POPULATION	0.474	0.506	0.479	0.497	0.470

* DESCRIPTION OF SHOCKS -
COLUMN 2 : CHANGES TO INCOME TAX SCALE ONLY
COLUMN 3 : CHANGES TO INCOME TAX SCALE AND FACTOR PRICES
COLUMN 3 : CHANGES TO INCOME TAX SCALE AND EMPLOYMENT LEVELS
COLUMN 4 : CHANGES TO INCOME TAX SCALE, FACTOR PRICES AND EMPLOYMENT LEVELS

respectively, have been changed in addition to the tax scale. The final column represents the distribution after the full tax reform and is reproduced from Table 10.

The effect of the changes in the tax scale on the distribution of income is unambiguous: it increases the value of every Shorrocks index in the table. The underlying reason for this result is that low-income recipients with taxable incomes of less than $4753 do not benefit from the change. The effect tends to be smaller than average in groups which do not contain many such recipients (e.g., males whose principal source of income is wages and salaries) or in groups which contain mostly such recipients (e.g., females whose principal source of income is government benefits).

The additional effect of the changes in factor prices (ascertained by comparing columns 2 and 3) is, by and large, to lower inequality. The tax reform operates to reduce pre-tax income per unit of employment from wages and salaries, and, to a lesser extent, from own businesses and partnerships (see Table 7). But individuals in higher decile classes tend to receive a greater share of their income from these sources than individuals in lower decile classes; hence inequality generally falls, both within and between groups. The pattern is not so consistent for groups differentiated by principal source of income. In these groups, individuals in high and low deciles tend to receive less of their income from wages and salaries than the average. The high income earners rely relatively more on income from interest, dividends, bonds, etc., and the low income earners on income from government benefits. Hence, depending on the particular distribution for the group, inequality may rise or fall.

The additional effect of the changes in employment (ascertained by comparing columns 2 and 4) is also to reduce inequality at the first level, albeit to a lesser extent than the changes in factor prices. At the second level, the reduction is largely restricted to between-groups inequality, with only very small changes in within-groups inequality. This reflects in part the increase in the numbers of individuals whose principal source of income is wages and salaries, whose employment status is employed full-time, and whose labour force participation is full-year, full-time. These groups are all numerically strong and have relatively equitable within-groups income distributions. The decrease in the values of the between-groups index at the second level also reflects the decrease in the numbers of unemployed persons and persons not in the labour force; both tend to belong to groups with low mean incomes.

If we now return to the total effect of the tax reform, Table 11 shows that the tendency for within-groups inequality to increase at the second level of the population hierarchy is largely explained by the changes in the income tax scale. However, the changes in factor prices and employment levels also make significant contributions to the changes in between-groups inequality at the second level. Both changes tend to reduce inequality and together they outweigh the effect of the tax scale on between-groups inequality. The net effect on population inequality at the second level is close to zero for males and a slight reduction for females.

These considerations are reflected at the first level of the hierarchy where the opposing tendencies also combine to produce a slight reduction in the population inequality. Changes in inequality at the third level of the hierarchy can be understood in similar terms.

While it is possible, with patient analysis, to trace the origins of the changes in inequality at various levels of the population hierarchy, it should not be forgotten that those changes are generally quite small - perhaps surprisingly small. One might have expected, for example, that an increase in aggregate employment of 4.5 per cent would substantially reduce the between-groups inequality in a population decomposed into groups of different employment status. In fact, the reductions in the relevant Shorrocks index are typically small for both males and females, representing falls of less than one percentage point in the richer person's share in a two person distribution.

The explanation is tied up with the duration of unemployment and can be comprehended in part from the income deciles for male income recipients given in Table 12. Note, for example, that the mean income for the top decile of the group "Unemployed, looking for full time work" exceeds the mean income of the seventh decile for the group "Employed full time". This data indicates that unemployment is not the lot of the same group of people throughout the year, but is shared around among a much larger group. Hence unemployment throughout the year produces a spread in the incomes of both the employed and the unemployed at a particular point in time. If the change in the tax mix provides jobs for the currently unemployed regardless of the duration of their unemployment, as we have assumed, it will increase the incomes of many whose income is already quite large, as well as those of many whose income is small. Thus the expected substantial fall in inequality does not eventuate.

Table 12 Income Deciles: All Male Income Recipients, Pre-shock Post-tax Incomes

Decile class	Employed full-time		Employed part-time		Unemployed, looking for full-time work		Unemployed, looking for part-time work		Not in labour force	
	Mean income $	Income share %	Mean income $	Income share %	Mean income $	Income share %	Mean income $	Income share %	Mean income $	Income share %
Lowest	4197	3.28	1635	2.02	1426	2.14	1460	2.45	1825	3.18
2nd	7477	5.85	3196	3.94	2930	4.40	2789	4.68	3168	5.51
3rd	9366	7.33	4160	5.13	3156	4.74	3671	6.16	3375	5.87
4th	10647	8.33	4828	5.95	4207	6.32	4175	7.01	3723	6.48
5th	11739	9.19	5759	7.10	5742	8.62	5251	8.81	4041	7.03
6th	12885	10.08	7296	9.00	6853	10.29	6877	11.54	4418	7.69
7th	14228	11.13	8773	10.82	7671	11.52	7252	12.17	5134	8.93
8th	15524	12.15	10990	13.55	8887	13.34	8094	13.59	6620	11.52
9th	17664	13.82	13880	17.12	10765	16.16	9177	15.40	9209	16.02
Highest	24073	18.84	20567	25.36	14976	22.48	10717	17.99	15956	27.76

5. CONCLUSIONS

We conclude that the change in the tax mix is not likely to substantially alter the magnitude or relative importance of the identified sources of inequality. In particular, the macroeconomic implications of the tax reform, as manifested in changes in pre-tax prices and incomes, are not of crucial concern for the distribution of income, as they tend to impinge relatively uniformly on the incomes of groups that already contain a substantial amount of income inequality.

On the other hand, to the extent that it is important to know the direction of small changes in income inequality, the contribution of changes in pre-tax prices and incomes cannot always be neglected in comparison to changes in the income tax scale. For example, inclusion of the macroeconomic effects reverses the sign of the changes in inequality within the population of all income recipients and within its component group of all female income recipients. It also reduces the change in inequality within the group of all male income recipients to a negligible amount, and reverses the sign of the change in inequality between the groups of males and females.

END NOTES

1. In particular, Dixon, Meagher and Parmenter (1985), employ forecasts for the 1984/85 national and government accounts presented in Table 1. These forecasts have now been replaced with historical data.

2. The wage rate that is assumed to be fixed is sometimes nominal and sometimes real, sometimes pre-tax (representing wages as a cost) and sometimes post-tax (representing wages as an income).

3. Note that, apart from the mix of the changes in the nominal exchange rate and the domestic price level that go into determining the change in the real exchange rate, our results are not sensitive to the assumption that the nominal exchange rate is fixed.

4. This insensitivity arises because increases in the tax rate reduce the tax base and vice versa. See Dixon, Meagher and Parmenter (1985) for a full discussion.

5. The exposition in this subsection follows Bonnell, Dixon and Meagher (1985) and Meagher and Dixon (1986). The properties of Shorrocks indices are derived in Shorrocks (1980) and selectively summarized in appendices to the two papers just cited.

Appendix A. Classification of Occupations

01	Architects,Engineers,Surveyors,Professional
02	Chemists,Physicists,Geologists & Other Physical Scientists
03	Medical Pratitioners & Dentists
04	Nurses, including Probationers and Trainees
05	Professional Medical Workers n.e.c.
06	Teachers
07	Law Professionals
08	Artists,Entertainers,Writers & Related Workers
09	Draftsmen and Technicians, n.e.c.
10	Other Professional,Technical and Related Workers
11	Administrative and Executive Officials, Government, n.e.c.
12	Employers,Workers and own Account,Directors,Managers, n.e.c.
13	Book-keepers and Cashiers
14	Stenographers and Typists
15	Other Clerical Workers
16	Insurance,Real Estate Salesmen,Auctioneers and Valuers
17	Commercial Travellers and Manufacturers Agents
18	Proprietors,Shopkeepers,Trade,Salesmen,Shop Assistants etc
19	Farmers and Farm Managers
20	Farm workers including Farm Foremen
21	Other Rural Workers
22	Miners, Mineral Prospectors, Quarrymen & Related Workers
23	Pilots, Navigators and Ships Officers
24	Railway Firemen and Drivers
25	Postmasters
26	Postmen & Messengers
27	Road Drivers
28	Guards and conductors, Railway
29	Stationmasters, Inspectors and Supervisors, Transport
30	Other Railway Workers and Traffic Controllers
31	Telecommunication Workers
32	Other Transport & Communication Workers
33	Spinners,Weavers,Knitters,Dyers and Related Workers
34	Tailors,Cutters,Furriers and Related Workers
35	Leather Cutters,Sewers & Related Workers
36	Furnacemen,Rollers,Drawers & Related Workers
37	Watchmakers,Jewellers & Related Workers
38	Mechanics,Plumbers,Metal Machinists & Related Metal Workers
39	Electricians & Related Electrical & Electronic Workers
40	Metal Workers,Metal & Electrical Production-Process Workers
41	Carpenters,Cabinet Makers & Related Workers
42	Painters & Decorators
43	Bricklayers,Plasterers and Construction Workers n.e.c.
44	Compositors,Printing Machinists, Engravers & Related Workers
45	Millers,Bakers,Butchers,Brewers & Related Workers
46	Potters,Tabacco, Chemical,Sugar & Paper Production Workers
47	Paper Products,Rubber,Plastic and Production Workers
48	Packers,Wrappers & Labellers
49	Stationary Engines,Excavating & Lifting Equipment Operators
50	Storemen & Freight Handlers
51	Labourers n.e.c.
52	Fire Brigade,Police & Other Protective Service Workers
53	Housekeepers,Cooks,Maids & Related Workers
54	Waiters,Bartenders
55	Caretakers,Cleaners,Buildings
56	Barbers,Hairdressers & Beauticians
57	Launderers,Dry Cleaners & Pressers
58	Athletes, Sportspersons and Undertakers
59	Photographers
60	Service,Sport,Recreation Workers n.e.c.
61	Members of Armed Services in Australia
62	Occupation inadequately described, not stated

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