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TELECOM AUSTRALIA : CROSS-SUBSIDIES AND TAXES

by

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Abstract

Australia has a nation-wide uniform pricing schedule for telecommunication services which supports a rural cross-subsidy. The full economic effects of this rural cross-subsidy are estimated using the ORANI computable general equilibrium model of the Australian economy. The rural sector obviously benefits from the cross-subsidy. However, there is also a tax side to Telecom's Robin Hood role. Industry specific cross-subsidy winners and losers are identified. The short-run general economic effects of Telecom paying taxes (or acting as a federal government revenue-raising agency) is also estimated.

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Next we note that under conditions of full wage indexation, w = cpi (the percentage change in the CPI). Moreover, with real household consumption set exogenously to zero change in these simulations, c = cpi. Thus we obtain

$$(B.2) \qquad c_i = E_i \, cpi + \eta_{ii} \, p_i + \sum_{k \neq i} \eta_{ik} \, p_k \quad .$$

From demand theory we note:

$$(B.3) \qquad -E_i = \sum_{j \neq i} \eta_{ij} + \eta_{ii} \quad .$$

If we also assume that on average, the percentage change of all prices other than communications is equal to cpi, then equation (B.2) may be re-written as:

$$(B.4) \qquad c_{99} = \eta_{99,99} \, (p_{99} - cpi) \quad ,$$

(communications being commodity 99, produced by industry 97). From our ORANI results, we know: $p_{99} = -2.8701$ and $cpi = -0.2162$ (Table 2). From the data base, we read $\eta_{99,99} = -0.75327$. Thus equation (B.4) evaluates to 1.9991, the actual ORANI result being a 1.8915 percentage increase in the demand by households for communications. This translates into a 0.5816 per cent increase in the output of industry 97.

TELECOM AUSTRALIA : CROSS-SUBSIDIES AND TAXES

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Chris W. Blampied*

1 : INTRODUCTION

In its 1980/81 Annual Report, the Australian Telecommunications Commission (Telecom) spelt out its commitment to cross-subsidisation between its various activities. In particular, it indicated that profitable trunk services were necessary to support rural telephone services. At about the same time, the Australian Government (under Prime Minister Fraser) instituted the Committee of Inquiry ([9],[10],[11]) which became known as the Davidson Inquiry, after its chairman. The committee's recommendations included the conversion of Telecom into taxpaying companies, and the end of cross-subsidies designed to achieve social rather than business objectives.

During the run up to the federal elections of March 1983 the recommendations of the Davidson Report were effectively shelved. This remains the case today, except that events may still force the hand of federal planners, contrary to the wishes of Telecom's management and its staff. For example, the introduction of the Aussat satellite is an important event for Australia since for major telecommunications users the satellite provides a potential alternative to Telecom's terrestrial telecommunications network. However, because of the 25 per cent level of (federal government invited) Telecom ownership of Aussat Pty Ltd, and possible controls placed on earth stations[1], the satellite may be an effective Telecom in-house alternative, rather than external competition to Telecom's existing networks.

* This work was initially completed as part of my research training at La Trobe University. I am indebted for comments and guidance to Peter B. Dixon, Brian R. Parmenter and Alan A. Powell and for comments and computing assistance from Philip Adams, Ian Bruce, Peter Higgs, Mark Horridge and Tony Meagher. I am especially indebted to the latter for his generous assistance in providing the NAGA computations reported in Section 4.

1 Australian Financial Review, 1984, 'Satellite Access Row Brewing', June 12th. See also [18].

These propositions will soon be tested. The state of Queensland has proposals in train to interconnect Aussat satellite capacity, government departments and agencies, and through their switchboards, the public switched Telecom network. This would permit the Queensland government to avoid Telecom's long distance charges. Telecom can effectively restrict such satellite usage, however, through punitive public network interconnection fees. There is some evidence that Telecom is attempting to do this[2]. An initial response of Telecom labour union officials has been a call to have the Queensland Telecom network treated as if it were a foreign country's network. Thus, it is argued, Queensland would not enjoy any of the benefits of cross-subsidies from other states[3].

Even apart from the satellite, the extent of Telecom's legislatively protected monopoly is being tested. An example is of two associated television stations in Brisbane and Sydney which have apparently operated (albeit briefly) a privately constructed microwave link. It appears that such a link may be lawful on the basis of constitutionally protected interstate trade[4].

Telecom's monopoly is also straining relations with private suppliers of non-standard terminal equipment (telephone handsets, etc.). Telecom maintains a primary instrument system whereby subscribers are always charged rent for a standard Telecom handset. Whilst alternatives to Telecom's standard range of handsets are now permitted to be Telecom-plug-compatible, suppliers of such equipment must still have their products approved ("permitted") by Telecom. It appears, however, that Telecom is not presently approving attachments

2 Australian Financial Review, 1985, 'The Satellite: Telecom Tries to Charge the Earth', March 19.

3 Australian Financial Review, 1985, 'Communications Policy Shake-Up: [Premier] Joh's Challenge to Telecom Rules', February 19th. Another common user group of concern to Telecom is the Australian Associated Press (AAP). See footnote 2.

4 Sydney Morning Herald, 1984, 'The Federal Government's Monopoly over Telecommunications Faces a High Court Challenge', September 4th.

$$(B.1) \qquad c_i - q = E_i(c - q) + \sum_{k=1}^{g} n_{ik}p_k + \ldots \quad ,$$

where:

- c_i is the percentage change in nominal household consumption of commodity i,
- q is the percentage change in the number of households,
- E_i is the household expenditure elasticity for commodity i,
- c is the percentage change in nominal aggregate consumption by the household,
- n_{ik} are own (i = k) and cross price elasticities ($i \neq k$),
- p_k is the percentage change in the price paid by the household for commodity k, and
- "..." represents missing terms (relating to changes in tastes) which are available for use in ORANI experiments, but which are not relevant to the Telecom experiment reported here.

Equation (B.1) is a simplification of the general form of the ORANI consumer demand equations which reflects the absence of (a) import competition, and (b) retail and wholesale margins, in the case of telecommunications.

In the standard ORANI data base, the elasticities n_{ij} and E_i (which satisfy the usual restrictions of homogeneity, symmetry and Engel's aggregation) have been estimated using the twice extended linear expenditure system. Whilst this standard form has been used in our Telecom experiment, the structural form of ORANI does not preclude alternatives to the linear expenditure system elasticity estimates ([22],[26]).

Applying Equation (B.1) to Industry 97 (Communications):

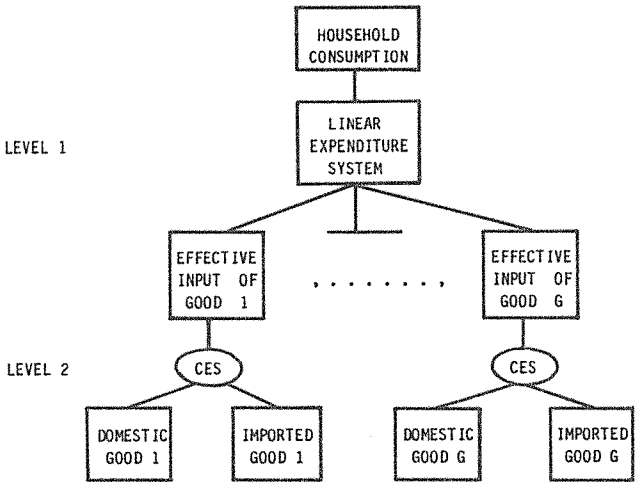
Firstly, as our experiment aims to detect the impact of the communications shock on the demand for this service (not the influence of a growing population thereon) q has been set to zero.

Appendix B

Household Demands in ORANI

ORANI has a single representative household which is assumed to maximise a Klein-Rubin utility function in the selection of its consumption bundle. This means, however, that the marginal utility of commodity i is independent of the consumption of commodity j. Figure B.1 demonstrates these characteristics.

Figure B.1 Specification of Household Consumption in the ORANI Model*



* Source: Higgs [16].

ORANI Household Demand Responses

In percentage terms, changes of the household's consumption of commodity i is given by equation (B.1) (Dixon et al. [13, p. 100]):

which directly compete with the standard range of Telecom products[5].

While Australia's telecommunication system is of a world class technical standard, it is by no means obvious that a federal government monopoly is essential: other nations have such systems with private companies supplying the public switched networks ([1],[19]). It is clear that the pressures for a changed institutional environment in the Australian telecommunications industry are strong. Major changes have recently occurred in the United States of America, and the United Kingdom[6]. The objective of this paper is to explore potential consequences of two possible changes in Australia.

The first change which we consider is a withdrawal by Telecom of its rural cross-subsidy. Two aspects of Telecom's 'Robin Hood' role are reviewed. In real life, Telecom is less discriminating than Robin Hood, who reportedly robbed only the rich in order to give to the poor. All users of Telecom's profitable services, particularly users of the Melbourne-Sydney trunk route, subsidise the costs of rural telecommunications services. However, because metropolitan Australia also supplies goods and services to rural Australia, the additional cost (the telecommunications rural subsidy) is in part charged back to the rural sector of the Australian economy. In reviewing the effect of Telecom's rural subsidy, an estimate is made of the net effect of these two aspects of Telecom's role in redistributing costs (and incomes) throughout the economy.

A second aim of the paper is to evaluate a proposal for withdrawing Telecom's privileged tax status. The Davidson Committee recommended that Telecom be broken up into two separate companies,

5 Camberra Times, 1984, 'Telecom Faces IAC [Industry Assistance Commission] Criticism', September 21st. See also [30]. The spirit of decisions such as 'Hush-A-Phone' have not reached Australia. Monopoly practices examined in [5] can still be found in Australia.

6 A.T.& T. was dismantled following the settlement of an anti-trust case. The U.K. changes have been a Thatcher Government initiative. See also [23].

but not enjoying the tax exempt, duty exempt status of Telecom. It is difficult to estimate what the net effects of such changes would be. Consultants to the Davidson Committee [11] assessed that, had it been a taxable company, Telecom would have paid about $A333m in various taxes and charges in 1980/81[7].

The economic consequences of changed telecommunication policies have been simulated using the ORANI model [13] of the IMPACT Project[8]. ORANI is a multi-sectoral model of the Australian economy. It has been called a Walras-Johansen model [7]. For the simulations reported here, the Australian Bureau of Statistics (ABS) 1977/78 Input/Output Tables were the primary source of data [2]. We have used a typicalised agricultural sector version of this data base ([3],[6]). Consequently, our analysis is not restricted in scope because of any abnormalities affecting the 1977/78 performance of the agricultural sector. Computing was implemented on the CSIRONET computing network using the Canberra ORANI code [25]. In such ORANI experiments, projections are provided of the Australian economy disaggregated to 112 industry groupings producing 114 'products', whilst employing 10 categories of labour.

The remainder of this paper is structured as follows. In Section 2, the assumptions underlying the ORANI simulations are specified. In Section 3, the effects of removing the rural cross-subsidy are considered. Section 4 contains an examination of the fiscal effects on the federal government of requiring 'Telecom Limited' to pay taxes. Conclusions, and an agenda for further research, are offered in Section 5.

7 Being: Payroll Taxes $A67m, Sales Taxes $A81m, Customs and other Duties $A46m, Motor Vehicle Registration and Insurance $A8m, Rates and Land Taxes $A55m, as well as Income Taxes $A76m. Because of changing taxation rules, the income tax liability of later years could be insignificant [11].

8 IMPACT is an economic and demographic research project conducted by Commonwealth Government agencies in association with the University of Melbourne, the Australian National University and La Trobe University.

We can solve equation (A.1) to find that p_{I25} is 0.2908 per cent. In light of the favourable movement in the CPI, is such a significant increase in p_{I25} reasonable? Industry 25 obtains 55.9 per cent of its intermediate inputs from industry 8 (Poultry). ORANI projects a 0.7143 per cent increase to p_{O8} (caused by industry 8's use of grains from the cost shocked agricultural industries). The change in p_{O8} alone would cause p_{I25} to increase 0.3995 per cent. Assuming that the cost of remaining intermediate inputs used by industry 25 move in proportion with the CPI, then p_{I25} would increase by 0.3042 per cent, a figure quite close to the expected value of 0.2908 per cent.

ORANI Output Response

The consistency of the ORANI projections for export industries can be reviewed using a "back-of-the-envelope" [bote] approach. The short term (percentage) supply response of an industry (say industry j) in ORANI may be written (Dixon et al. [13, p. 309]):

$$(A.1) \qquad z_j = \frac{\sigma(1-S_{Kj})}{S_{Kj}} \left[p_{oj}\frac{1}{S_{Vj}} - p_{Ij}\left(\frac{1}{S_{Vj}} - 1\right) - w \right] ,$$

where:

- z_j is the percentage change in industry j's output,
- σ is the elasticity of substitution between primary factors (assumed to be 0.5 for all industries),
- S_{Kj} is the fixed factor (land and capital) share in industry j's total primary-factor costs,
- S_{Vj} is the share of primary inputs in j's total costs,
- p_{oj} is the percentage change in the basic price of j's total output,
- p_{Ij} is the average percentage change in the prices paid by industry j for intermediate inputs, and
- w is the percentage change in the price of the variable primary factor (labour).

Applying Equation (A.1) to Industry 25 (Other Food Products):

From the ORANI parameter file [3] we can read the export demand elasticity for the products of Industry 25. It has the value -20.0, reflecting a small country assumption. We can also compute $S_{K25} = 0.2793$ and $S_{V25} = 0.1386$. From our ORANI results we find $p_{o25} = 0.1492$ and $z_{25} = -0.6640$ (Table 4). We have set the movement of wages (w) equal to the CPI, thus w = cpi = -0.2162 (Table 2).

2 : ORANI ENVIRONMENT AND ASSUMPTIONS

ORANI projections are completed within the bounds of user selected, macroeconomic environments. For example, ORANI cannot forecast the future role of the centralized wage fixing system. Therefore, the user must decide on a labour market closure of the model (to be discussed presently). Users must also decide whether they are interested in short term or in long term effects. We have selected a short term environment for ORANI. This allows the projections to be interpreted as the economic effects which will have occurred some two years after the introduction of a sustained economic shock[9]. This is the period of time required by industries to fully adjust their demands for labour and other inputs to changes in relative prices. It is long enough for investment plans to be revised in the light of the shock under analysis, for orders for capital goods to be placed and filled, for the new equipment to be installed, but not yet put into service.

We have chosen an environment of wages fully indexed to movements in the consumer price index (CPI). This assumption is an important one. Given full wage indexation, ORANI labour market projections are in terms of changed employment levels, rather than some combination of changes of employment levels and of the real wage rate. An implied assumption of our experiment is also that appropriate labour skills are available, and sufficiently mobile, so as not to impede industry specific structural adjustment. Given the slackness of the Australian labour market over the last decade, this assumption seems reasonable.

ORANI users must also make an assumption about the nominal foreign exchange rate. In these simulations it has been held constant. This is a convenient assumption as it permits the CPI to act as a measure of Australia's competitiveness, compared to the rest of the world. Simulations based on this assumption, however, do not imply literally that the nominal exchange rate must be fixed. In a neoclassically based computable general equilibrium model such as

9 Important recent research has confirmed that the short run in ORANI is correctly interpreted as a period of about two years. See [24].

ORANI, only relative prices influence real magnitudes. Any combinations of assumed rates of inflation and nominal exchange rate adjustments which produce the same change in the real exchange rate (Swiss francs per Australian man-hour of labour, say), will have identical consequences for the projections of all real magnitudes in ORANI.

A further assumption which we have imposed is that total real absorption has been held constant. Absorption (or aggregate demand) is defined as the sum of consumption, investment and government expenditures. The assumption is relaxed in Section 4.

3 : RURAL CROSS-SUBSIDISATION

3.1 Background

In its public submissions to the Davidson Committee, Telecom advised that operating cross-subsidies were of the order of $A290m in 1980/81 [28]. Telecom claimed to be cross-subsidising a number of service areas. An example is public telephones where Telecom reported a loss of $A43.3m. In Volume 3 of the Davidson Report an alternative perspective was given by Coopers & Lybrand Services (consultants to the Davidson Committee), who pointed out that public telephones made a contribution of some $A6.7m towards meeting Telecom's network costs in 1980/81 [11].

It is clear from the consultant's report, that Telecom's "... product accounting system is unreliable for the uses being made of the data externally." The findings of the earlier (1974) Commission of Inquiry [8] were somewhat similar. The conceptual difficulties of allocative accounting, however, are not restricted to Australian telecommunications, as is evident from a very extensive literature (see for example [4],[31]). Whilst it is obvious that Telecom does cross-subsidise the rural consumer, as a consequence of these accounting problems, a universally accepted valuation of the rural cross-subsidy is not available.

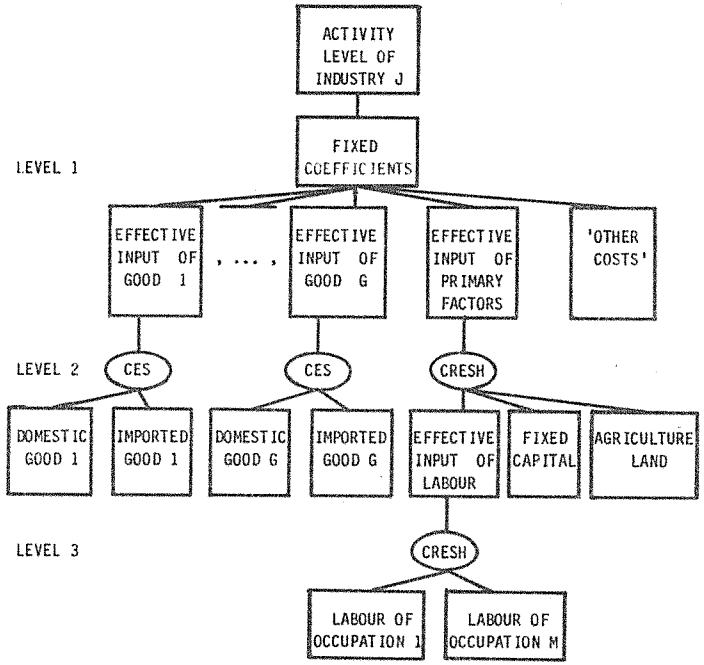
It is also difficult to interpret what is really meant when Telecom makes announcements about 'rural' Australia. Telecom's definition of 'rural' must be deduced from its definition of

Appendix A
Output Response of ORANI Industries

ORANI Technology

ORANI output technology is represented in Figure A.1. At Level 3, labour-labour substitution elasticities are the same for all industries, but are allowed to differ among different pairs of occupations according to a CRESH aggregator function [14]. At Level 2, the elasticity of substitution between capital and labour is assumed to be 0.5 for all industries. In the agricultural-land-using industries, this value is also currently used for the other two pairs of factors -- i.e., (Land, Labour) and (Land, Capital). At the same level, estimated Armington elasticities [6] are used to determine substitution between imported and domestically sourced inputs. When using the 1977/78 data base, there are 114 Commodities (G), 112 Industries and 10 Occupations (M).

Figure A.1 Technology for Current Production in the ORANI Model*



* Source: Higgs [16].

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'metropolitan services' which are services connected to central offices (exchanges)

> "... located within a 40.2 km radius of the Sydney and Melbourne General Post Offices and within a 32.2 km radius of the Brisbane, Adelaide, Perth and Hobart General Post Offices."[29]

However, this means that the regional cities of Wollongong (125,019 telephone services in 1980/81), Newcastle (102,462), and Geelong (65,660), and the national capital of Canberra (92,545), are all 'rural', whilst the state capital of Tasmania, Hobart (60,260) is 'metropolitan'. In many respects, the larger regional cities can be more 'metropolitan' than state capitals. For example, Wollongong as at January 1981 had the highest ratio of telephones to population in all Australia [1][10].

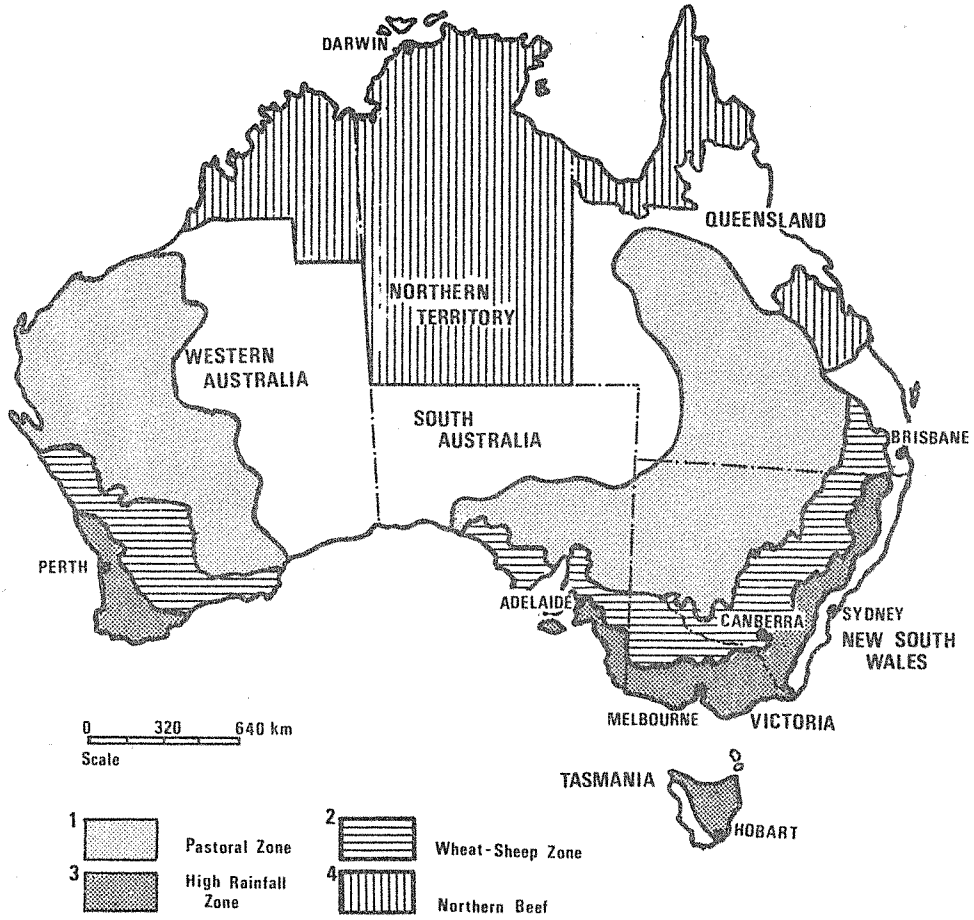
As a consequence of these financial, definitional and measurement problems, the simulations reported here are of a general nature. They record the effects of withdrawing a subsidy of $A100m (1980/81 prices) from the seven agricultural and pastoral industries modelled in ORANI (see Table 1). The ORANI model is well suited to simulate such an event, as four of the rural industries are defined along geographical lines. These regions are indicated in Figure 1. This contrasts with, for example, the Agricultural Services industry, of which only parts are located in rural areas. Moreover, the 1977/78 typicalised data base eliminates from our results the transient effects of drought, pests, etc. [6].

3.2 ORANI Experiment

All ORANI industries face a category of input costs classified as 'other costs'. These costs are normally small compared to total industry costs. We have simulated the loss of a rural telecommunications subsidy, by shocking ORANI with an appropriate increase in rural industries' 'other costs'. In doing so, to account for post 1977/78 inflation, the $A100m of 1980/81 has been discounted by the CPI to $A76.7m (1977/78). This lesser amount has

10 In the August 1985 edition of Telecom's staff-paper Telecom News, an AT&T spokesperson is reported as referring to Perth, Adelaide, Melbourne, Canberra and Sydney as the "golden boomerang", and of saying that "Everything else is rural".

Figure 1 REGIONS OF GEOGRAPHICALLY DEFINED AGRICULTURAL INDUSTRIES IN THE ORANI DATA BASE*



* Source: Higgs [16].

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been distributed between each of the seven ORANI rural industries in proportion to their communication industry cost shares. In the construction of the ORANI model, and its data base, all industries must purchase a fixed real amount of 'other costs' per unit of output. Thus there is no escape, in the model, from the telecommunications cost increase.

The communications industry of the ORANI data base is an aggregation of postal and telecommunication services. As a first approximation it is assumed that the ratio of Telecom costs to total communication costs is constant for each of the rural industries. Similarly, it is assumed that a 12.9 per cent cost shock to the Telecom component of the communications industry is equivalent to a 10 per cent cost shock to the overall 'communications' industry. This ratio is based on the absolute levels of activity of the Australian Postal Service (Australia Post), compared to those of Telecom and the closely allied Overseas Telecommunications Commission (O.T.C.). As O.T.C. operations are not significant compared to Telecom (which retails O.T.C. services), no attempt has been made to isolate an O.T.C. component in this analysis. These assumptions are considered in our agenda for further research.

3.3 Rural Subsidy Removal

The first step in this ORANI experiment is reported in Table 1. Each of the seven rural industries, individually shocked with an increased level of 'other costs', responds with a reduced level of output. The sum of the seven cost shocks is the effect on the rural sector of just the Telecom subsidy being removed. These results should be interpreted as comparisons at a point of time (about two years) between what would have been the case with and without the simulated cost shocks. For example, the Pastoral Zone (Industry 1) would have 0.2906 per cent less output (Table 1, Column 8) than would otherwise have been the case in about two years, if the Telecom rural subsidy had not been removed.

The effects, on employment so far, are worth noting. Australia, with a labour force of approximately six million, is projected to have a decrease of about 0.13 per cent in employment.

Table 1 PERCENTAGE CHANGE EFFECTS ON RURAL INDUSTRY OUTPUT LEVELS AND SELECTED ECONOMIC AGGREGATES OF ADDITIONAL TELECOMMUNICATION COSTS

Industry	Identifier of Rural Industry Losing its Telecom Subsidy[a]							
	1	2	3	4	5	6	7	All Seven
Communication Costs 1977/78[b]	$1.28m	$9.13m	$4.15m	$0.80m	$2.56m	$5.32m	$4.51	$27.76m
Cost Shock[c]	$3.55m	$25.23m	$11.46m	$2.22m	$7.06m	$14.71m	$12.47	$76.70m
1 Pastoral Zone	<u>-0.4808</u>	0.1197	0.1307	0.0080	-0.0301	-0.0120	-0.0261	-0.2906
2 Wheat-Sheep Zone	0.0167	<u>-0.5208</u>	0.0746	-0.0021	-0.0147	-0.0094	-0.0257	-0.4814
3 High Rainfall Zone	0.0406	0.1657	<u>-0.6448</u>	0.0072	-0.0403	-0.0141	-0.0120	-0.4977
4 Northern Beef	0.0122	-0.0250	0.0344	<u>-0.5638</u>	-0.0882	-0.0280	-0.0347	-0.6930
5 Milk Cattle and Pigs	-0.0076	-0.0086	-0.0372	-0.0190	<u>-0.0665</u>	-0.0128	-0.0584	-0.2101
6 Other Farming - Export	-0.0005	-0.0012	-0.0029	-0.0009	-0.0304	<u>-0.6799</u>	-0.1294	-0.8453
7 Other Farming - Import Competing	0.0018	0.0019	0.0240	0.0046	-0.0310	-0.0886	<u>-0.3412</u>	-0.4284
Employment - Rural Workers	-0.0369	-0.1980	-0.1098	-0.0263	-0.0493	-0.1927	-0.1149	-0.7279
Aggregate Employment - Persons	-0.0047	-0.0263	-0.0182	-0.0053	-0.0143	-0.0352	-0.0275	-0.1315
Balance of Trade as a Percentage of GDP	-0.0014	-0.0110	-0.0072	-0.0026	-0.0077	-0.0198	-0.0152	-0.0649
Aggregate Imports	-0.0001	-0.0073	-0.0001	-0.0002	0.0108	-0.0146	0.0279	0.0164
Aggregate Exports	-0.0092	-0.0793	-0.0471	-0.0174	-0.0397	-0.1447	-0.0717	-0.4092
CPI	0.0002	0.0002	0.0019	-0.0002	0.0238	0.0177	0.0516	0.0952

Notes:

a For names of industries, see listing at side of Table.

b The (1977/78 $A) cost of communications in intermediate usage (domestic) costs.

c Sizes (1977/78 $A) of the exogenous increase in 'other costs' used to simulate the subsidy withdrawals.

(b) Specification of Multi-product Technology -- it would be of significant interest to redefine the industry "Telecom" as a multi-product producer. A separate telecommunications module could be imbedded in ORANI using techniques which have ample precedent ([22], [26]).

(c) Specification of Different Household Types -- The introduction of a range of consuming types, differentiated according to patterns of telecommunications usage, would strengthen the usefulness of such a module for Telecom planning purposes, as well as for public policy analysis.

Developments such as these are known to be feasible subject to the availability of the requisite data and a suitable input of skilled manpower. Many contentious policy issues, such as those involving the introduction of new technologies, could be studied with a rigorous economy-wide perspective.

Our analysis demonstrates the likely size of the macroeconomic disadvantages of raising taxes in an inflationary manner. If the Telecom taxing question is viewed only in a short-run macroeconomic light -- if it is taken that additional revenues must somehow be raised -- it then remains an open question as to whether imposing a tax on Telecom has more or fewer short-run macroeconomic disadvantages than other tax options.

Throughout it has been assumed that the effect of the Telecom tax would simply be to shift upwards the supply curve of telecommunications services by the amount of the tax. Other possibilities include an induced reduction in x-inefficiency. It is not known how to model this possibility (if such it be) at present. The focus of the analysis has been short-run, taking as given the real wage rate, and the quantities of industry-specific capital stocks in use. Thus resource-allocational issues have not been considered at all. Given the pervasiveness and non-uniformity of the price distortions operative in the Australian economy, few analytical results are available from the theory of the second best. Long-run simulations with ORANI, however, are possible (Horridge [17]). In its typical long-run configuration ORANI takes as exogenous industry-specific rates of return on capital which are set on the world market (of which Australia is a negligible part). International capital flows then respond endogenously to the shocks under analysis. In this setting it would be possible to explore the long-run impact on sectors and on incomes of different tax options. ORANI seems likely to confirm the quantitative propositions of Harberger [15] concerning the long run incidence of a corporation tax in a small trading economy. That, however, is a story waiting to be written.

Besides long-run allocative issues, there are a number of interesting research directions which can now be taken:

(a) Dissaggregation -- the analysis of the economic role of Telecom in the Australian economy would be enhanced if the industry "Communications" were separated into its component parts: Telecom Australia, the Overseas Telecommunications Commission (OTC) and Australia Post.

This represents a loss of about 7,800 jobs. The burden is felt mainly by rural workers, although, since a rural decline also affects other sectors in the national economy, other classes of workers are adversely affected as well.

It will be seen below that many of the effects of the simulated cross-subsidy removal can be understood by reference to real exchange rate changes, quantified in our experiment as the movement of the CPI[11]. Our CPI story so far is particularly interesting. In Table 1, the projection of seven rural cost shocks are provided complete with the net economy-wide influence on the CPI. In the fourth column, the CPI is projected to decline. How can this be so? Similar CPI projections have been observed in identical types of ORANI simulations for a number of industries[12]. The common elements which these industries share are (i) that they have nil or at most a very minor weighting in the CPI; and (ii) they are closely related, either directly or indirectly, to imports or exports. The latter consideration implies that these industries are essentially price takers, less able to pass extra costs on to their consumers than the producers of non-internationally tradeable commodities.

A cost shock to an industry inter alia has two conflicting general equilibrium effects. Firstly, the industry which is shocked with an increase in costs contracts its outputs. This implies a contraction in that industry's demand for inputs. If the closure of the ORANI model had been one in which aggregate demand were allowed to adjust, the contraction in the demand for intermediate inputs by the industry suffering the cost shock would have been deflationary. In fact, the closure is one in which the level of real aggregate commodity demand is held fixed. Thus the contraction in the demand for commodities by the shocked industry is replaced, in these simulations, by demand expansions elsewhere. The question then becomes: is the general contraction in demand caused by the fall in

11 The nominal exchange rate was chosen in these simulations as the numeraire. Full details of the closure may be found in Higgs [16].

12 When using the 1974/75 data base, they include: 12 Iron, 13: Other Metallic Minerals, 14: Coal, 17: Services to Mining, 25: Food Products n.e.c., 63: Basic Iron and Steel and 64: Other Basic Metals.

the shocked industry's activity level more powerful, in a deflationary sense, than the expansion in demand elsewhere in the economy, is inflationary? The answer to this question depends on the steepness, on average, of the supply curves in the parts of the economy depressed by the loss in demands derived from the activity of the shocked industry, on the extent to which compensating increases in demand spill over into imports, and on the steepness of the supply curves in those parts of the domestic economy (if any) stimulated by the compensating increases in demand. Thus a fairly subtle compositional analysis would be required in the case of each industry shocked to determine the net outcome of the first general equilibrium effect. The second general equilibrium effect is direct, adverse and economy-wide. It is the effect of the industry's cost shock feeding directly into the CPI through that industry increasing its price(s).

Only in one case, that of the cost shock to Northern Beef, does the first, more subtle, general equilibrium effect dominate the second, more straight forward, inflationary effect. In three of the remaining six cases (columns 1, 2 and 3), the nearly exogenous, overseas-market-dominated prices of outputs, mean that the cost increases cannot be passed, to any significant extent, into domestic prices. Thus the impact of these three cost shocks on the CPI is minimal.

An adverse cost shock to each of the first four rural industries does not adversely affect all rural industries. This is particularly easy to explain in the case of industries 1, 2 and 3, where a cost disadvantage to anyone is beneficial to the other two. These three industries are each multi-product in nature, with substantial overlaps in their product mixes (see [13]). Thus we see that a reduction in the output of one industry can create scope for an expansion in the outputs of the other two.

3.4 Cross-Subsidy Removal

The analysis so far has left undefined the 'tax' side of the story. We shall now resolve this problem. The eighth (summation) column of Table 1 also appears as the first column of Table 2. It is then aggregated with an ORANI projection of a general reduction in

The short term output responses of selected industries are reported in Table 9. The outlook for industry 97 (Communications) is predictably bleak. The input linkages of industries 73 (Electronic Equipment) and 75 (Other Electrical Goods) with industry 97 are again apparent. There is a clear preponderance of non-traded industries among those least affected, and a clear preponderance of trading industries among those most affected by the Telecom tax.

5 : CONCLUSIONS, AGENDA FOR FURTHER RESEARCH

Our first objective was to evaluate the extent of industry adjustment which would result from the termination of Telecom's rural cross-subsidy. Quite expectedly, if agricultural industries faced an increase in costs because the telecommunications subsidy were denied to them, then output and incomes in the sector would fall. Owner-operators of agricultural enterprises and rural workers would suffer. By contrast, the impact on all trading industries, would be favourable. These effects have been evaluated on the basis of a somewhat arbitrary estimate of $A100 million for the 1980/81 cross-subsidy level. Our ORANI results can, however, be easily rescaled.

Apart from adverse rural sector effects, industries which produce rural sector inputs, or which use rural sector outputs as their inputs, are on average also adversely affected. The Services to Agriculture, Chemical Fertilisers and the Agricultural Machinery industries are examples of the first type; whilst the Food, Drink and Tobacco sector (industries 18 to 29) exemplify the second type of input-output linkage.

Our second objective was to evaluate the economic effects of Telecom losing its privileged tax-free status. Using ORANI-NAGA and assuming that Telecom would pass on the extra costs represented by the taxes, in the short-run (i.e., about two years), the economy-wide effects would be adverse: indeed other federal taxes would have to increase to prevent the public sector borrowing requirement from blowing out. These results, like those reported above, are based on fully rigid pre-[income]tax real wage rates, an assumption approximating the actual institutions prevailing in Australia over the last decade.

On the expenditure side, government consumption increases by about $A34.8m (1984/85 prices), which is just sufficient to off-set the rise of 0.0975 per cent in the Government Price Index (recall that real government consumption was set exogenously to zero change). Economy-wide real investment is projected to fall by -0.0470 per cent; under our assumptions, real government investment does likewise. This leads to a drop in nominal government investment of about $A7.2m, whereas a rise of $A7.8m would be required to compensate for the rise of 0.0512 per cent in the investment price index. Unemployment benefits increase by about $A18m, of which about $A16m is due to the increase in the number of unemployed, and $A2m is due to the inflation (in these simulations, all government benefits and taxes are fully indexed to the CPI). 'Other Transfers to Persons' is fully indexed to the CPI, and thus rises by $A12.9m to compensate for inflation. 'Other Outlays' declines more or less proportionately with GDP ($A1.6m).

Table 9 PERCENTAGE CHANGE EFFECTS ON SELECTED INDUSTRY OUTPUT LEVELS OF A $A100m(1980/81) PRODUCTION TAX ON TELECOM

	Industry	Industry Type*	Output Response
	Ten Least Affected Industries		
17	Services to Mining	ER	0.0454
69	Ships and Boats	NT	0.0305
10	Forestry and Logging	NT	0.0082
15	Oil, Gas and Brown Coal	IC	-0.0067
19	Milk Products	NT	-0.0101
107	Education, Libraries, etc	NT	-0.0114
104	Public Administration	NT	-0.0169
23	Bread, Cakes & Biscuits	NT	-0.0184
22	Flour & Cereal Products	E	-0.0309
11	Fishing and Hunting	E	-0.0392
	Ten Worst Affected Industries		
32	Cotton Yarns & Fabrics	IC	-0.1328
43	Furniture & Matresses	NT	-0.1443
68	Motor Vehicles & Parts	IC	-0.1485
35	Textile Floor Overlays	IC	-0.1519
31	Man-made Fibres, Yarns	IC	-0.1731
25	Other Food Products	E	-0.1825
73	Electronic Equipment	IC	-0.2018
76	Agricultural Machinery	ER	-0.2132
75	Other Electrical Goods	IC	-0.2311
97	Communications	NT	-0.6980

* The industry classification is: ER = Export Related, NT = Non-Traded, IC = Import Competing and E = Export. Source: [6].

the cost of communications. Again the device of altering the level of 'other costs' has been used, but this time only for the industry 'communications'. The effect of this cut in communications costs is felt by all of Telecom's customers, including those whose costs were raised by the loss of the rural subsidy. Thus, after the general telecommunications cost reduction is taken into account, the net increase in costs affecting industries 1 - 7 in Table 1 are significantly reduced. This is seen by comparing the first and third columns of Table 2. Column three ("Combined Effects") records the effects of removing Telecom's cross-subsidy to rural industries. Using six million again as the approximate size of the Australian labour force, the net loss of jobs from the dismantling of Telecom's rural cross-subsidy, is about 170 (a negligible number).

Table 2 PERCENTAGE CHANGE EFFECTS ON RURAL INDUSTRY OUTPUT LEVELS AND SELECTED ECONOMIC AGGREGATES OF REMOVING TELECOM'S CROSS-SUBSIDY TO RURAL INDUSTRIES

	Industry	Increased Rural Industry Costs	Decreased Telecommunication Costs	Combined Effects
	Cost Shock	$76.7m(77/78)[a]	$76.7m(77/78)[b]	$0
1	Pastoral Zone	-0.2906	0.2156	-0.0750
2	Wheat-Sheep Zone	-0.4814	0.1806	-0.3008
3	High Rainfall Zone	-0.4977	0.2650	-0.2327
4	Northern Beef	-0.6930	0.4191	-0.2739
5	Milk Cattle and Pigs	-0.2101	0.1445	-0.0656
6	Other Farming - Export	-0.8453	0.4055	-0.4398
7	Other Farming - Import Competing	-0.4284	0.1327	-0.2957
	Employment - Rural Workers	-0.7279	0.3466	-0.3813
	Aggregate Employment - Persons	-0.1315	0.1287	-0.0028
	Balance of Trade as a Percentage of GDP	-0.0649	0.0717	0.0068
	Aggregate Imports	0.0164	-0.1334	-0.1170
	Aggregate Exports	-0.4092	0.3347	-0.0745
	CPI	0.0952	-0.3114	-0.2162

Notes:

a Aggregate size of the exogenous increase in 'other costs' jointly used to simulate the removal of Telecom's rural subsidy. For more detail, see the second row of Table 1.

b Size of the exogenous decrease in 'other costs' of industry 97 (Communications), used to simulate the community-wide reduction in costs of telecommunications resulting from Telecom's not funding the rural subsidy.

3.5 Economy-Wide Effects

ORANI users are always encouraged to complete "back of the envelope" [bote] computations to verify the mechanisms which lie behind the projections [13]. As the cross-subsidy removal involves fourteen direct cost and indirect [economy-wide] CPI effects on ten agricultural commodities, along with the economy-wide, direct cost and indirect CPI effects of a reduced cost of communications in all 112 industries, the "envelope" required for a satisfactory "bote" is too large to report here. Thus, a qualitative rather than a quantitative explanation of the cross-subsidy removal is provided. Table 3 indicates the general nature of the results we might expect to find, given a CPI decline. The basic idea is that among internationally trading industries, the net effect will be bad for agriculture, of unknown sign for agriculturally linked industries, whilst being good elsewhere. With aggregate absorption fixed, and therefore relatively little role for Australia's international competitiveness in the determination of the activity levels of non-tradeables, we would expect only slight effects (of indeterminate sign) on industries producing the latter commodities.

Table 3 EXPECTED SECTORAL INCIDENCE OF REMOVAL OF TELECOM'S CROSS-SUBSIDY TO RURAL INDUSTRIES

		RURAL SUBSIDY REMOVAL	TELECOM'S "TAX" REMOVAL	COMBINED EFFECTS of CROSS-SUBSIDY REMOVAL
AGRICULTURALLY INDUSTRIES	EXPORTING & EXPORT RELATED	very bad	good	bad
	IMPORT COMPETING	very bad	good	bad
AGRICULTURALLY LINKED INDUSTRIES	EXPORTING & EXPORT RELATED	bad	good	?
	IMPORT COMPETING	bad	good	?
	NON-TRADED	bad	good	?
NON-AGRICULTURALLY LINKED INDUSTRIES	EXPORTING & EXPORT RELATED	bad	good	good
	IMPORT COMPETING	bad	good	good
	NON-TRADED	bad	good	?

'Other Government Income' of $A85.69m; this item includes the $A135m[18] Telecom tax, which has been partially offset by declines in its other components. In fact, with the fall in the incomes of labour and capital, the entire tax base contracts, causing revenues other than the Telecom tax to fall by about $A78m.

Table 8 FISCAL EFFECTS OF A $A100m (1980/81) PRODUCTION TAX ON TELECOM*

Variable	Projected Change Per Cent	Projected Change $A 1984/85
		(million)
Tax Rates		
Income Tax Rate	0.0156	
Payroll Tax Rate	0.0000[a]	
Government Revenue		
PAYE Taxes (Net)	-0.0358	-8.277
Payroll Taxes	-0.0514	-1.568
Taxes on Profits and Self-employed	-0.0525	-6.315
Commodity Taxes less Subsidies	-0.0719	-11.260
Other Indirect Taxes	0.9175	85.687
Other Government Income	-0.0140	-1.311
TOTAL GOVERNMENT INCOME	0.0785	56.956
Government Expenditure		
Consumption	0.0975	34.779
Investment	-0.0470	-7.197
Unemployment Benefits	0.5915	18.063
Other Transfers to Persons	0.0676	12.931
Other Outlays	-0.0130	-1.620
TOTAL GOVERNMENT OUTLAYS	0.0665	56.956
Other		
Public Sector Borrowing Requirement	0.0000[a]	0.000[a]

Notes:

* The dollar magnitudes in this table are obtained multiplying projected proportional changes by the appropriate items in a set of national accounts forecast for 1984/85 in [21].

a No change by assumption.

18 The $A100m shock imposed was in 1980/81 prices.

terms) falls by 0.0557 per cent. This result can be partitioned as follows:

	per cent
due to fall in employment:	-0.1190
due to fall in post-[income]tax real wage rate:	-0.0043
due to rise in CPI:	0.0676
total change in nominal disposable labour income:	-0.0557 .

The reason for the fall in real take-home wage rates is that, as will be discussed below, the imposition of the Telecom tax causes pressure on the government's budget to increase; consequently income tax rates have to rise marginally (by 0.0156 per cent or 0.0034 percentage points) to preserve the exogenous level of the public sector borrowing requirement. The general contraction in economic activity is reflected in a decline in non-labour income. In these short-run simulations the capital stock is exogenous, and so there is no quantity component of this decline analogous to the fall in employment; post-tax nominal returns to capital fall by 0.0712 per cent, of which 0.0680 per cent is due to the fall in pre-tax rentals on capital, and 0.0032 per cent to the higher rate of income tax.

In the absence of strong terms-of-trade effects (and therefore, of arguments in favour of welfare-improving taxes on trade), in an open trading economy the imposition of any measure which leads to a general rise in costs is unambiguously unfavourable at the aggregate level. In ORANI, export demand curves do slope downwards, but with elasticities which are high in absolute value; terms-of-trade effects, while not zero, hence are small. Competitiveness of the domestic economy suffers from the projected 0.0676 per cent rise in consumer prices and in the nominal pre-[income]tax wage rate. One might have hoped that these unfavourable effects could have been offset by the removal or lowering of other taxes. Unfortunately, unemployment and unemployment benefits (see Table 8) increase, and the income tax rate actually has to rise to keep the public sector borrowing requirement from blowing out.

Government revenue and expenditure are constrained to change by the same amount in these simulations. The projected nominal change is a rise of $A56.96m (1984/85 prices) in each of these variables. On the revenue side the only plus is an increase of

If the rural cross-subsidy were removed, then as expected, the rural sector would be a significant loser. It should be fairly clear that the increased cost of rural communications could not be offset by the combination of direct effects of generally reduced communication prices and the indirect beneficial CPI effects of the Telecom tax removal. This was demonstrated in Table 2.

3.5.1 Export Industries

The position of export and export related industries is presented in Table 4 (with the net effect of dismantling Telecom's cross-subsidy to rural industries being reported in the last column). The mining sector would clearly benefit from the cross-subsidy being dismantled[13]. Recall that the ORANI closure we have selected allows the CPI to be interpreted as a measure of Australia's international competitiveness (i.e., the real exchange rate). As the CPI is projected to fall by 0.2162 per cent (Table 2 - Combined Effects), it is not surprising that the mining sector is projected to expand.

An unexpected result which is reported in column one of Table 4 is that of export related industry 17 (Services to Mining) which expands when the rural subsidy is removed, even if this removal is not offset by column two. Recall that aggregate investment has been held constant, and that it is allocated on the basis of relative profitabilities in the model's solution. Although profitability in mining falls under the shock administered in column one, this fall is less than the average for the economy, and mining's share of the investment budget expands. Increased investment expenditure by mining industries 12 to 16 directly accounts for a 0.2121 per cent expansion in the output of industry 17. The relatively high level of industry 17 intra-industry sales (32.37 per cent) then accounts for the overall net expansion of 0.3040 per cent.

Industry 11 (Fishing and Hunting) is not directly linked with the shocked agricultural industries, yet the removal of

13 Mining industries in Australia are often in very remote locations. If Telecom's pricing to these industries is subsidised (of which we have no evidence) then our ORANI simulation would need to be re-specified and the favourable projection for the mining industries could be overturned.

Telecom's rural cross-subsidy is projected to cause its contraction. This is because industry 11 sells 83.9 per cent of its output to industries 18 (Meat Products) and 25 (Other Food Products) both of which are directly and strongly linked with the agricultural industries. Under ORANI's specification of technology, all material inputs are used in fixed proportions. The cost increases encountered by Meat Products and Other Food Products causes their prices to rise, and output to contract. When the output of the latter industries fall, the sales of Fishing and Hunting then contract accordingly.

Excluding the rural industries 1 to 7, two of the three largest projected output responses are for export or export related industries. (The other is Industry 97, Communications, which is reported in Table 6.) A concentration of adversity is experienced by industry 76 (Agricultural Machinery). The explanation lies mainly in reduced investment expenditure by the seven agricultural industries. About 66.5 per cent of the output of agricultural machinery industry

Table 4 PERCENTAGE CHANGE EFFECTS ON EXPORT AND EXPORT RELATED INDUSTRY OUTPUT LEVELS CAUSED BY REMOVING TELECOM'S CROSS-SUBSIDY TO RURAL INDUSTRIES*

	Exporting and Export Related Industries [a]	Effects of Rural Subsidy Removal	Effects of General Decrease in Telecommunication Costs	Combined Effects
8[b]	Poultry	-0.3108	0.2119	-0.0989
9[b]	Services to Agriculture	-0.4113	0.1846	-0.2267
11	Fishing and Hunting	-0.1430	0.0831	-0.0599
12	Ferrous Metal Ores	-0.0585	0.2205	0.1620
13	Non-Ferrous Metal Ores	-0.0818	0.3117	0.2299
14	Black Coal	-0.1044	0.3791	0.2747
17[b]	Services to Mining	0.3040	0.0211	0.3251
18	Meat Products	-0.5842	0.3998	-0.1844
22	Flour & Cereal Products	-0.0976	0.0635	-0.0341
25	Other Food Products	-1.3701	0.7061	-0.6640
30	Cotton Ginning etc.	-0.6790	0.3852	-0.2938
49[b]	Chemical Fertilisers	-0.4467	0.2236	-0.2231
64	Other Basic Metals	-0.0957	0.3728	0.2771
76[b]	Agricultural Machinery	-2.7448	1.0640	-1.6808
93[b]	Road Transport	-0.1262	0.0987	-0.0275
94	Rail & Other Transport	-0.1328	0.1237	-0.0091

Notes:

* See also Table 2 for details of industries 1, 2, 3, 4 and 6, which are exporting or export related.

a Source: Bruce [6].

b An Export Related Industry.

Table 7 MACRO EFFECTS OF A $A100m (1980/81) PRODUCTION TAX ON TELECOM*

Variable	Projected Change Per Cent	Projected Change $A 1984/85 (million)
Private Sector Income		
Pre-tax Real Wage[a] Rate	0.0000[b]	
Post-tax Real Wage[a] Rate	-0.0043	
Disposable Labour Income	-0.0557	-46.376
Disposable Non-Labour Income	-0.0172	-41.585
Private Sector Expenditure		
Private Consumption	-0.0306	-37.525
Private Investment	-0.0470	-14.827
International Trade		
Export Revenue	-0.0709	-22.085
Import Expenditure	-0.0553	-18.326
Balance of Trade	0.1891	-3.760
Prices		
Consumer Price Index	0.0676	
Investment Price Index	0.0512	
Government Price Index	0.0975	
Other		
Gross Domestic Product	-0.0140	-28.518
Employment (Persons)	-0.1221	
Employment (Efficiency Units)[c]	-0.1190	

Notes:

* The dollar magnitudes in this table are obtained multiplying projected proportional changes by the appropriate items in a set of national accounts forecast for 1984/85 in [21].

a The real wage rate is defined as the ratio of the nominal wage (pre-[income]tax or post-[income]tax, as the case may be) to the CPI.

b No change by assumption.

c Equivalent to a weighted average of persons employed, with weights proportional to occupation-specific wage rates.

Whilst the NAGA module is extremely flexible in the range of government policy objectives which users may chose, we have restricted our analysis to just one alternative. We assume that the government will keep its real current spending ('government consumption') constant, and will maintain its pre-existing share of the national real investment budget. We ask the following question: Under full indexation of pre-tax wage rates, what would be the economic effects if the government required Telecom to pay a production tax in an environment where variations in the average income tax rate are used to ensure that there is no net change in the public sector borrowing requirement?

Our wage indexation assumption keeps this new tax experiment consistent with those reported in Section 3. Given our assumption of zero change in the public sector borrowing requirement, we expect NAGA to project changes in income-tax rates and the levels of private absorption and investment. We expect that any increase in the CPI (again a measure of Australia's international competitiveness) will be adverse to exporting, export related and import competing industries.

The macroeconomic effects of a tax on Telecom (which approximates collection of $A100m 1980/81 in a full year) are set out in Table 7. The imposition of the tax is projected by NAGA to be inflationary, with the CPI increasing in the short term (about two years) by 0.0676 per cent[17]. There is, however, no harmony between the change in the CPI and other indexes. The government price index increases 0.0975 per cent whilst the investment price index increases by 0.0512 per cent. The government would face a greater increase in the level of its costs, relative to either investors or households. The tax on Telecom introduces additional costs which are adverse to exporters and import competitors, although with a slight net move (equivalent to 0.002 per cent of GDP) towards an increased deficit in the balance of trade. Employment, incomes, consumption, investment and GDP all contract as a result of the decline in international competitiveness. Disposable labour income (nominal

17 The assumptions which we have chosen, which are for one of six standard NAGA alternatives [21], has the least impact on the CPI.

is purchased by the seven agricultural industries, 83.5 per cent being for investment, the remainder being used as intermediate inputs to current production. The declining profitability of the agricultural industries necessarily results in the Agricultural Machinery industry faring considerably worse than any of the individual agricultural industries.

The Other Food Products industry (25) uses the sugar cane produced by industry 6 (Other Farming - Export) as an intermediate input. The output of industry 6 is projected to decrease by 0.4398 per cent (Table 2), whilst its price is projected to increase by 0.1492 per cent. This increases the costs of idustry 25. Being an exporter (28.2 per cent of its output is exported), industry 25 is forced to contract. In fact, in the short term, industry 25 contracts more than any of the directly shocked agricultural industries. (ORANI industry output responses, using industry 25 as an example, are considered in Appendix A.)

3.5.2 Import Competing and Non-Traded Industries

The short term response of Import Competing industries, again in terms of percentage change in output levels, is presented in Table 5. Similar information, for Non-Traded industries is presented in Table 6. Whilst the expectations of Table 3 are generally realised in Tables 5 and 6, there are a number of exceptions. In the short term import competing industries 69 (Ships and Boats) and 71 (Aircraft) respond opposite to general expectations for both parts of the cross-subsidy experiment. It is not a coincidence that both these industries sell to real capital formation. As previously noted, the fixed economy-wide investment budget in our simulations is allocated across industries according to their relative profitabilities in the model's solution. It transpires that certain non-traded industries, which are least affected by increased costs, have investment profiles which, on average, are relatively intensive in their use of the outputs of industries 69 and 71. When these non-traded industries capture a

Table 5 PERCENTAGE CHANGE EFFECTS ON IMPORT-COMPETING INDUSTRY OUTPUT LEVELS CAUSED BY REMOVING TELECOM'S CROSS-SUBSIDY TO RURAL INDUSTRIES*

	Import Competing Industries [a]	Effects Of Rural Subsidy Removal	Effects Of General Decrease in Telecommunication Costs	Combined Effects
15	Oil, Gas and Brown Coal	-0.0085	0.0279	0.0194
21	Margarine, Oils & Fats	-0.1066	0.0876	-0.0190
24	Confectionery & Cocoa	-0.0198	0.0266	0.0068
28	Other Alcoholic Drinks	-0.1856	0.0663	-0.1193
29	Tobacco Products	-0.0271	0.0101	-0.0170
31	Man-made Fibres, Yarns	-0.1606	0.4935	0.3329
32	Cotton Yarns & Fabrics	-0.1187	0.3725	0.2538
33	Worsted & Woolen Yarn	-0.0716	0.0992	0.0276
34	Textile Finishing	-0.0283	0.0761	0.0478
35	Textile Floor Overlays	-0.0182	0.0575	0.0393
36	Other Textile Products	-0.0772	0.1039	0.0267
37	Knitting Mills	-0.0267	0.0780	0.0513
38	Clothing	-0.0215	0.0710	0.0495
39	Footwear	-0.1002	0.3180	0.2178
40	Sawmill Products	-0.0398	0.1265	0.0867
41	Veneers & Boards	0.0078	0.0495	0.0573
44	Pulp Paper Paperboard	-0.1075	0.1658	0.0583
46	Paper Products nec	-0.0640	0.0705	0.0065
47	Newspapers & Books	-0.0497	0.0964	0.0467
50	Other Basic Chemicals	-0.0910	0.2401	0.1491
52	Pharmaceutical Products	-0.1024	0.0967	-0.0057
54	Cosmetics & Toiletries	-0.0060	0.0159	0.0099
55	Other Chemical Products	-0.0742	0.1548	0.0806
56[b]	Petroleum & Coal Products	-0.0638	0.0512	-0.0126
57	Glass & Glass Products	-0.0632	0.0941	0.0309
62	Non-Metallic Other Goods	-0.0140	0.0344	0.0204
63	Basic Iron and Steel	-0.0469	0.0984	0.0515
67	Other Metal Products	-0.0153	0.1169	0.1016
68	Motor Vehicles & Parts	-0.0850	0.2769	0.1919
69	Ships and Boats	0.1986	-0.1090	0.0896
71	Aircraft	0.1373	-0.0343	0.1030
72	Scientific Equipment	0.0007	0.0166	0.0173
73	Electronic Equipment	0.0211	0.1679	0.1890
74	Household Appliances	-0.0216	0.0198	-0.0018
75	Other Electrical Goods	0.0905	0.1594	0.2499
77	Construction Machinery	0.2692	0.0137	0.2829
78	Oth Machinery & Equipment	0.0918	0.0156	0.1074
79	Leather Products	-0.0884	0.2068	0.1184
80	Rubber Products	-0.0739	0.1554	0.0815
81	Plastic Products etc.	-0.1144	0.1632	0.0488
82	Signs, Writing Equipment	-0.0518	0.1107	0.0589
83	Other Manufacturing	-0.0318	0.1011	0.0693
96	Air Transport	-0.0369	0.0780	0.0411

Notes: * See also Table 2 for details of industries 5 and 7, which are import competing.

a Source: Bruce [6].

b Industry 56 is not classified by Bruce. It imports and exports.

4 : TELECOM LIMITED

If Telecom had been subject in 1980/81 to taxes, duties, etc., then it would have had to pay about $A333m in such charges [11]. Changes in tax laws between different financial years could greatly change a Telecom Limited's tax position. For example, whilst it operated profitably in 1981/82, Telecom would probably have not had to pay income tax even if it were so liable [11][15]. However, our purpose is not to measure precise tax levels or tax mixes, but rather, to measure the general economic effects of a changed tax status. Thus, and also in order to simplify the experiment, we have chosen to impose a production tax on Telecom, equal to $A100m (1980/81). The tax rate is struck such that in the base period, if there were no other price or demand effects, the tax would raise $A100m. However, as the price of communications would increase, demand would fall and the actual tax collected would be marginally less than $A100m.

We have used the ORANI National And Government Accounts module (NAGA), which was developed by Meagher [20], and by Meagher and Parmenter [21] and used by them to analyse the economic consequences of possible changes in the mix of direct and indirect taxes. The NAGA module explicitly models fiscal variables within an ORANI consistent framework. (It is merely a matter of computer programming convenience that NAGA works as an add-on module, rather than as an integrated part of the ORANI solution.) In our use of NAGA, the 1977/78 typicalised data base has again been used [6], whilst reported percentage changes to national accounts measures, use as a base, a forecasted level of the 1984/85 national accounts [21]. The same environment as detailed in Section 2 has been applied, except that rather than holding absorption constant, private consumption and investment have each been made proportional to disposable income[16].

15 See footnote 7. A small portion of Telecom's present profitability is achieved through its charging 'as if' taxes on some of its sales. That is, to avoid the possible monopolization of some market areas (e.g., sales of terminal equipment), Telecom inflates its prices to take account of the level of taxes and charges that its competitors have to pay. Telecom retains the 'as if' taxes as extra income [28].

16 We have set the percentage change in c_R (real private consumption) equal to i_R (percentage change in real private investment). See [21].

The simulations, as reported, therefore only correctly mirror the removal of the subsidy on rural producers. Since the size of the estimated cross-subsidy ($A100m, 1980/81 prices) is in any event conjectural, and since no breakdown of the actual subsidy between rural households and rural businesses is available, this does not seem to be a major additional impediment; as remarked earlier, rescaling is possible. Moreover, the only mechanism through which increased rural household telecommunications charges could impact on the model is via consumption of telecommunications services. To the extent that the price elasticity of demand by rural households is low, the problem is of second order importance.

3.6 Summary

In summary it can be noted that in the short term, the removal of Telecom's cross-subsidy to rural industries would be beneficial to a significant number of Australian industries. It is clear, however, that even though there would be many potential winners if Telecom's cross-subsidy were dismantled, the big losers would undoubtedly be rural and related industries. The effects on aggregate employment would be negligible, although there would be compositional changes, with rural workers being adversely affected.

As an aside, it is interesting to note that the recently established Prices Surveillance Authority held its first inquiry into proposed Telecom prices rises in 1984 [27]. The Authority approved the rises for effect in early 1985. If the second half of our cross-subsidy experiment (that of reducing the cost of communications for all users to a total of $A100m 1980/81) is multiplied by minus one, it then records the approximate effects which will have occurred after about two years, as a result of the price rises implemented by Telecom. Consequently, if appropriately transformed, the second part of our experiment has application to current events.

Table 6 PERCENTAGE CHANGE EFFECTS ON NON-TRADED INDUSTRY OUTPUT LEVELS CAUSED BY REMOVING TELECOM'S CROSS-SUBSIDY TO RURAL INDUSTRIES

	Non-traded Industries [a] [b]	Effects Of Rural Subsidy Removal	Effects Of General Decrease in Telecommunication Costs	Combined Effects
10	Forestry and Logging	0.3548	-0.1446	0.2102
16	Other Minerals	-0.0388	0.0822	0.0434
19	Milk Products	-0.0234	0.0095	-0.0139
20	Fruit and Vegetables	-0.0584	0.0104	-0.0480
23	Bread, Cakes & Biscuits	-0.0108	0.0067	-0.0041
26	Soft Drinks & Cordials	-0.0231	0.0171	-0.0060
27	Beer and Malt	-0.0065	-0.0050	-0.0115
42	Joinery & Wood Products	0.0129	0.0197	0.0326
43	Furniture & Matresses	0.0442	0.0035	0.0477
45	Bags, Fibreboard, Boxes	-0.1560	0.1076	-0.0484
48	Commercial Printing	-0.0558	0.0602	0.0044
51	Paints and Varnishes	-0.0309	0.0907	0.0598
53	Soap and Detergents	-0.0419	0.0339	-0.0080
58	Clay Products, Refract's	-0.0272	0.0766	0.0494
59	Cement	-0.0148	0.0204	0.0056
60	Ready-mixed Concrete	-0.0112	0.0106	-0.0006
61	Concrete Products	-0.0093	0.0102	0.0009
65	Structural & Metal Goods	-0.0060	0.0342	0.0282
66	Sheet Metal Products	-0.0507	0.0625	0.0118
70	Locomotives	-0.0694	0.0800	0.0106
84	Electricity	-0.0434	0.0437	0.0003
85	Gas	-0.0210	0.0163	-0.0047
86	Water, Sewers & Drains	-0.0569	0.0385	-0.0184
87[c]	Residential Buildings	0.0000	0.0000	0.0000
88	Other Construction	-0.0174	0.0158	-0.0016
89	Wholesale Trade	-0.1351	0.0972	-0.0379
90	Retail Trade	-0.0024	-0.0244	-0.0268
91	Mechanical Repairs	-0.0410	0.0240	-0.0170
92	Other Repairs	-0.0366	0.0204	-0.0162
95	Water Transport	-0.0592	0.1036	0.0444
97	Communications	-0.0423	0.6451	0.6028
98	Banking	-0.0349	0.0374	0.0025
99	Non-Bank Finance	-0.0414	0.0409	-0.0005
100	Investment & Services	-0.0171	0.0174	0.0003
101	Insurance & Services	-0.0344	0.0459	0.0115
102	Other Business Services	-0.0554	0.0450	-0.0104
103[c]	Ownership of Dwellings	0.0000	0.0000	0.0000
104	Public Administration	-0.0122	0.0119	-0.0003
105[c]	Defence	0.0000	0.0000	0.0000
106	Health	-0.0026	-0.0047	-0.0073
107	Education, Libraries etc.	-0.0008	-0.0004	-0.0012
108	Welfare & Religious	-0.0136	0.0167	0.0031
109	Entertainment & Leisure	-0.0269	0.0157	-0.0112
110	Restaurants & Hotels	-0.0188	0.0028	-0.0160
111	Personal Services	-0.0116	-0.0064	-0.0180

Notes: a Source: Bruce [6].

b Industry 112 (Non-Competing Imports) has not been reported.

c This industry activity level has been exogenously set to zero change.

large share of this fixed economy-wide investment budget, the outputs of the producer goods industries supplying them are stimulated. The short term output response of industry 10 (Forestry and Logging - Table 6), which also has unexpected signs, is again generated by an increase in investment[14]. The strength of the response of industry 10 reflects its dependence upon itself as a supplier of investment goods.

The expansion of investment by the mining and metals sectors substantially explains the favourable output responses of import competing industries 75 (Other Electrical Goods), 77 (Construction Machinery) and 78 (Other Machinery and Equipment). Industry 75 also supplies an increased level of output for increased investment by industry 97 (Communications). For industry 78, there are also strong links with favourably affected non-traded industries 42 (Joinery and Wood Products) and 43 (Furniture and Mattresses). Industry 41 (Veneers and Boards) also expands, mainly because it supplies intermediate inputs for the expanding industry 43. In turn, the behaviour of industries 42 and 43 can be traced to increased investment, for industry 42 by non-traded industry 88 (Other Construction), and for industry 43 by non-traded industries 102 (Other Business Services) and 110 (Restaurants and Hotels). The increased investment expenditure by industry 97 (Communications), noted above, generates the marginal increase in output of import competing industry 73 (Electronic Equipment).

Industries 21 (Margarine, Oils & Fats), 28 (Other Alcoholic Drinks), and 29 (Tobacco Products) have direct input linkages with the agricultural sector, and are projected to contract in the short term if Telecom's cross-subsidy to rural industries is dismantled. Output linkages with the agricultural sector (and adversely affected industries which process agricultural products) account for the contraction of import competing industries 52 (Pharmaceutical Products) and 56 (Petroleum and Coal Products).

14 Industry 10 probably benefits directly from Telecom's rural cross-subsidy. If the present ORANI experiment were re-specified with some estimate of the value of this subsidy, then the favourable output response would almost certainly be overturned. However, because of the extent of intra-industry sales and the relative smallness of the industry, the reported projection has had little impact elsewhere in the economy.

3.5.3 Changed Household Demands

The explanation of the remaining output responses which are not consistent with the general expectations of Table 3, may be found in projected changes of household consumption. (The modelling of household demands in ORANI is reviewed in Appendix B.) Whilst aggregate consumption has remained constant, on balance, compositional changes have an unfavourable effect upon margin industry 90 (Retail Trade) when just the rural subsidy is removed. When the cost of communications alone is decreased, and household demand for communications increases, the activity level of Retail Trade declines by 0.0244 per cent. The explanation is that communications are sold direct to households; shocks which bias consumption towards (away from) communications, therefore, also bias it away from (towards) Retail Trade. Increased household consumption of Scientific Equipment (purchased from Industry 72) accounts for a 0.0019 per cent output expansion of that industry when just the rural subsidy is removed. Presumably this small increase in household purchases from industry 72 is due to relative price effects. The remaining exceptional (negatively signed) results in column two of Table 6 are associated with reduced household consumption, which accounts for the negative output responses projected for non-traded industries 27 (Beer and Malt), 106 (Health), 107 (Education, Libraries, etc.) and 111 (Personal Services).

We now return to a consideration of the impact of the two shocks comprising the dismantling of the cross-subsidy. Increased household consumption accounts for the expansion of the Communications industry. Contracting industries are responsible for a 0.0173 per cent reduction of demand for communications which is only partly offset by increased demand from expanding industries. Household demand alone accounts for a 0.5816 per cent increase in the output of industry 97 (see Appendix B for a back-of-the-envelope calculation rationalizing this result).

One shortcoming of our ORANI simulations is that they do not capture the effects of increasing the communications costs paid by rural households (as distinct from productive enterprises). Such households in Australia are approximately 15 per cent of the total.