ISBN 0 646 33558 8

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An appropriate citation for this paper is:

Productivity Commission 1998, *Impact of Commonwealth Indirect Taxes on Exporters*, AusInfo, Canberra.

Information about the Productivity Commission and its current work program can be found on the World Wide Web at http://www.pc.gov.au

FOREWORD

Much of the present public debate about tax reform is concerned with the taxation of goods and services, or so-called indirect taxation. A particular concern is that the taxation of business inputs detracts from our economic performance and, in the process, penalises our export industries. However, there has been little work done which specifically deals with the impacts of indirect taxes on the export competitiveness of Australian firms.

This study helps to address that gap. It responds to a request from the Treasurer that the Commission undertake a short research study looking at the impact of Commonwealth indirect taxes on exporters, particularly manufacturing exporters. In making its assessments, the Commission drew on information provided by firms, as well as on some economic modelling using the Commonwealth Treasury's PRISMOD model and its own tax model. Being an information exercise, the report does not contain policy recommendations.

The report finds that Commonwealth indirect taxes do impose significant costs on manufacturing and other exports. Moreover, many of these costs occur well back in the production chain and are therefore hidden from exporters.

However, the Commission stresses that the estimated cost penalties should be regarded as indicative rather than definitive. The report also recognises that effects on exporters are just one of the relevant factors in the tax reform debate.

Gary Banks
Chairman
June 1998

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OVERVIEW

Australia's tax system has a pervasive impact on individuals, business and the community more generally. It is therefore vital that the system meet its economic and social objectives effectively. However, there have been longstanding concerns about the efficacy of the system.

At present, much of the debate on tax reform is about the taxation of goods and services — that is, indirect taxation. A particular concern is that many business inputs are subject to indirect tax. The result is a cascading of taxes through the production process, or the so-called 'taxes-on-taxes' problem. This increases business costs, discourages investment and generally detracts from Australia's economic performance. In the process, it penalises our export industries.

This study looks specifically at the impact of Commonwealth indirect taxes on exporters, particularly manufacturing exporters. It does not examine State and Territory indirect taxes or other major revenue raising taxes such as corporate and personal income tax. The purpose of the study is to provide information and thus it contains no policy recommendations.

The study concentrates on the two major Commonwealth indirect taxes — wholesale sales tax (WST) and fuel excise:

- WST is levied on a wide, but incomplete, range of manufactured goods (and not services). The rate of tax varies from 12 to 45 per cent. WST raises over $14 billion a year, or about 11 per cent of total Commonwealth taxation revenue. Despite various exemptions and rebate mechanisms designed to minimise the taxes-on-taxes problem, few businesses escape the WST net on their inputs.
- Excise is levied on most petroleum fuels. It currently raises around $11 billion a year. Virtually all of this is collected on petrol and diesel fuel, mainly used by private road users and in road transport. The Commonwealth component of fuel excise (there is also a State component) is around 35 cents a litre for diesel and unleaded petrol, and around 37 cents a litre for leaded petrol. However, a part of this excise is commonly viewed as a charge for road use rather than a tax.

A key finding of this study is that WST and fuel excise collected on firms' inputs are very much hidden taxes. Because of the way WST is levied and remitted, firms are typically unaware of the tax paid by their immediate suppliers, let alone that paid further back in the production chain. Similarly, the impact of fuel excise on the cost of inputs is not readily visible. Yet it is

estimated that 60 per cent of WST and two-thirds of fuel excise are collected on business inputs. As discussed below, the resulting increases in business costs are substantial.

The hidden nature of these taxes had significant ramifications for the conduct of this study. The reality was that firms were unable to provide the Commission with the information necessary for it to undertake detailed case studies.

Accordingly, the Commission arranged for the Commonwealth Treasury to use its PRISMOD model of input-output price relationships in the economy to estimate the impact of these taxes on input costs. Using this approach, it is possible to estimate the cascading effects of WST and fuel excise through the production chain.

The PRISMOD simulation indicated that WST and just 4 cents a litre of fuel excise increase manufacturing costs by between 2 and 3.2 per cent, depending on the industry involved. In dollar terms, the cost for the manufacturing sector as a whole is close to $6 billion, and for the total economy around $22 billion. The fact that these costs are several times higher than the tax revenue collected on business inputs by the government highlights the significance of the taxes-on-taxes problem.

The implied cost penalties for manufacturing exporters from the current arrangements are similarly very significant:

- For the ‘average’ manufacturing exporter, WST and the small component of fuel excise increase costs by more than $120 000 a year.
- For Goodman Fielder — a major food exporter — the cost on the firm’s exports would be nearly $3 million a year.
- The total cost penalty on manufactured exports is about 2.5 per cent or some $1 billion a year, with the cost for all exports being around $2.4 billion a year.

Moreover, these cost imposts reflect only a small part of fuel excise. This is because the modelling pragmatically assumed most of the excise to be a de facto road user charge. Amcor — a major exporter of paper products — told the Commission that the total impact of WST and all fuel excise on its export costs is probably around 5 per cent. This is double the penalty estimated by the Commission for the wood and paper products sector under its more limiting assumptions. (However, in the event that fuel excise was abolished, some alternative method of funding the costs of road construction and usage would be required. If this took the form of an explicit charge for road use, it would at least partially offset the savings for firms from the abolition of fuel excise).

Manufacturing exporters typically operate in very price sensitive markets in competition with many other international suppliers. In these circumstances, even small increases in costs can have a significant impact on competitiveness and sales volumes. Partly to avoid penalising their exporters, many countries have adopted 'value added tax' regimes in place of sales tax and other taxes on business inputs.

While the costs imposed on manufacturing exporters are an important consideration in the tax reform debate, the overriding issue is whether changes to current arrangements would improve the wellbeing of the community as a whole. Reducing or eliminating WST and fuel excise without changing the overall fiscal outcome would require a cut in government spending, an increase in other taxes, or the introduction of new taxes. The effects of such changes on production, exports, income distribution and the like would need to be considered in assessing the case for reform.

To provide some broader context, the Commission used its tax model to simulate the effects of two changes to Commonwealth indirect tax arrangements:

- The first simulation entailed the replacement of the current WST regime with a WST applying at a uniform rate to virtually all goods and services. This would spread the WST burden more evenly across business, but would not eliminate the taxation of business inputs and, hence, the taxes-on-taxes problem.
- The second involved introducing a New Zealand-style goods and services tax (GST) at a rate of 5 per cent to replace WST and 4 cents a litre of fuel excise. (In combination with the GST, the latter would leave pump prices for final consumers unchanged.) As in New Zealand, the modelling assumed that the GST would apply to virtually all goods and services. However, exports were zero rated and eligible for refunds of tax paid on inputs.

The comparison of the current arrangements with a New Zealand-style GST was consistent with the terms of reference for the study, which suggested New Zealand as a possible benchmark. However, the modelled GST rate of 5 per cent was well below the rate of 12.5 per cent applying in New Zealand and the sort of rates commonly being canvassed in the current tax reform debate in Australia. This is because the scenario modelled by the Commission was fairly limited in comparison to the tax reforms undertaken in New Zealand and featuring in the current domestic debate.

Under both scenarios, the model projected a significant boost in exports, particularly 'non-traditional' manufactured exports. However, at between 6 and

13 per cent, the projected increases in non-traditional manufactured exports under the GST scenario were about double the increases under the uniform WST scenario.

More importantly from the community's point of view, whereas the uniform WST scenario led to little change in total output and national income, the projected gains in GDP and disposable income under the GST scenario were more than $4 billion and $1 billion a year respectively. The main reason for these projected gains is that, by reducing taxes on business inputs, the GST would improve profitability and provide an incentive for investment. At the same time, by reducing taxes on capital and equipment, it would reduce the cost of investment. This result underscores the potential benefits of replacing taxes on business inputs with less distorting ways of raising revenue.

It is important to note that these projected benefits do not allow for any impact of a GST on compliance costs. A GST applying to virtually all goods and services would greatly increase the number of firms required to collect and remit indirect tax to the Commonwealth. Thus, if a GST were simply to replace WST, then total compliance costs would clearly increase. If, however, a GST were to replace a suite of indirect taxes, then compliance costs would be much less of an issue.

Also, the gains reported above do not take account of distributional impacts. However, properly modelling these impacts is a complex task which was not the focus of this study.

1 BACKGROUND TO THE STUDY

This report responds to a request from the Treasurer that the Commission undertake a short research study looking at the impact of Commonwealth indirect taxes on exporters, particularly manufacturing exporters. The Commission was asked to compare the effects of these taxes on one or two typical Australian firms with the effects of the tax regimes applying to equivalent firms in comparable countries, such as New Zealand. The study is an information exercise and does not contain policy recommendations. The full terms of reference are reproduced as appendix A.

1.1 Purpose of the study

Australia's tax system has significant efficiency and equity implications for individuals, business and the community generally. It is therefore imperative that the system meets its economic and social objectives effectively.

However, there have been longstanding concerns about the structure and operation of the system. These include:

- shortcomings in the structure of personal and corporate income tax;
- inefficient and inequitable taxes on goods and services;
- the limited range of taxation measures available to State and Territory governments;
- high compliance costs; and
- the scope for evasion and avoidance.

At present, much of the public debate about tax reform is focusing on the taxation of goods and services, or so-called indirect taxation. A particular concern is that, under the present arrangements, many goods and services used by business as inputs to further production are subject to indirect tax. This gives rise to the problem of 'taxes-on-taxes' and thereby to a less efficient use of resources, including a bias against production for export (see chapter 3). This had led to calls for indirect tax reform, including the introduction of a goods and services tax (GST). By taxing value added, a GST would largely eliminate the cascading effect of indirect taxes through the production chain.

The economy-wide impact of reforms to the indirect tax system has been the subject of some previous modelling work (for example, Chisholm 1993, IC 1994b, Meagher and Parmenter 1993). Other studies have looked at the impact

of the current regime on costs at the firm and sectoral level (for example, ACIL 1992a, 1992b, 1997).

However, there has been little work looking specifically at the impacts of the current regime on the export competitiveness of Australian firms. This study helps fill that gap.

1.2 The Commission's approach

Tax coverage

The study only covers Commonwealth indirect taxes. Thus, it excludes payroll, land and other indirect taxes levied by State, Territory and local governments.

The major Commonwealth indirect taxes are:

- wholesale sales tax (WST);
- excises on fuel, alcoholic beverages and tobacco products; and
- customs duties on imported goods.

In this study, the Commission focused on WST and fuel excise. It ignored the excises on tobacco products and alcohol on the presumption that these have limited impact on manufacturing exporters (although for some service industries, such as air transport, the effects may be more significant). It also excluded customs duties (tariffs) levied on imported goods. While these duties are substantial and raise the cost of business inputs — either directly or by allowing higher prices for competing domestic production — tariff policy is largely separate from the indirect taxation debate. (Revesz 1998 provides a recent estimate of the economy-wide gains of removing tariff protection).

Also excluded were Commonwealth 'taxes' on primary products. These are, in fact, levies which are returned to the industries concerned to fund activity such as export promotion and research and development.

In relation to fuel excise, the Commission excluded the component recently introduced in lieu of State and Territory business franchise fees which a recent High Court decision found to be unconstitutional. In essence, the Commonwealth collects this revenue component on behalf of the States.

The Commission also put to one side the debate about the merits of using fuel excise as a means of charging for the costs of road construction and usage. As discussed in chapter 2, excise has a range of shortcomings as a road user charge. However, because of the complexities of specifying a replacement charging regime, the quantitative analysis in the study assumes that a large part of the

current fuel excise would be retained as a user charge under an alternative indirect tax regime.

As a benchmark for assessing the effects of the taxes in question, the Commission used a GST levied on a similar range of goods and services to that in New Zealand. However, in replacing only WST and a part of fuel excise, the benchmark GST reform has a much smaller revenue-raising requirement than New Zealand's GST which replaced a wide range of indirect taxes as well as funding reductions in personal income tax.

The case studies

The Commission approached a number of peak business groups with a view to arranging case studies. It envisaged that participating firms would be able to estimate the effects on their export costs of replacing WST and some fuel excise with a New Zealand-style GST.

The Commission also sought comment and data on the impacts of Commonwealth indirect taxes from a wider group of firms through the release of an Issues Paper. Those firms and organisations which provided comments and information are listed in appendix B.

While generating some useful general information on problems with the Commonwealth indirect tax regime, these approaches did not provide the detailed information required for conventional case studies. In large measure, the lack of hard data reflects the fact that the impacts of these taxes on business costs are largely hidden. Quite simply, while firms know their inputs are being taxed, typically they do not know to what extent. As Amcor commented:

> Fuel excise and wholesale sales tax are invisible taxes that are absorbed by our suppliers and transferred into our costs and it is near impossible to quantify the amount of taxes embedded in our costs. For example, a wastepaper collector who supplies raw materials to our mills sells his wastepaper to us at a price which covers his costs and allows him a profit margin. We do not pay sales tax on this material. Our supplier has, however, paid fuel excise and sales tax in the course of running his business and this tax impost is in turn recouped by him in his selling price to us.

Similarly, Caltex stated:

> Since sales tax is imposed at the last wholesale point, the purchaser ... is not often aware of the amount of tax included in the price of the item purchased. Further, even where the invoice includes the amount of tax charged, the tax information is not recorded separately, but forms part of the cost of the total item. This is because there is no requirement or need to maintain this information.

To generate some firm-level data, the Commission therefore:

- constructed some hypothetical case studies using manufacturing survey data and estimates of sectoral indirect tax rates emerging from the Commonwealth Treasury's PRISMOD model of input-output price relationships in the economy; and
- approached several major firms for data on their manufactured exports and for their views on the cost penalties imposed by WST and fuel excise on their inputs.

The Commission thanks Amcor Fibre Packaging, Goodman Fielder and Kraft Foods for their assistance in this latter regard.

Providing broader context

This firm-level information provides some important insights into the impacts of Commonwealth indirect taxes on the competitiveness of manufacturing exporters.

However, because it reports impacts for only one sector of the economy, its usefulness as a tool for policy analysis is somewhat limited. While outcomes for manufacturing exporters are an important consideration in the tax reform debate, the overriding issue is whether mooted reforms would improve the wellbeing of the community as a whole. This requires a much broader assessment.

To give some wider context, the Commission supplemented the firm-level information with modelling assessments of the impacts of Commonwealth indirect tax reform on manufacturing exporters and the economy more generally. The modelling provides some insights on the potential wider implications of such tax reforms. However, in common with all modelling exercises, the results should be viewed as illustrative. Thus, they should not be construed as making a definitive case for particular policy approaches.

1.3 Report outline

The next chapter sets out the key features of the Australian WST and fuel excise arrangements, including a discussion of the mechanisms in place to reduce the taxation of business inputs. It then describes key features of indirect tax arrangements in New Zealand and some other comparable countries.

Chapter 3 details estimates of the impacts of WST and fuel excise on the costs of manufactured (and other) exports at both the firm and sectoral level.

The final chapter uses the PC Tax Model to illustrate the potential economy-wide gains of two specific tax reforms:

- replacing some fuel excise and the non-uniform WST system that applies only to some manufactured goods, with a revenue-neutral, uniform, WST regime applying to virtually all manufactured goods and services; and
- replacing the WST regime and some fuel excise with a revenue-neutral GST applying to virtually all activities in the economy.

The chapter also compares the estimated gains from these reforms with previous estimates of the gains from some other tax and non-tax reforms.

2 INDIRECT TAXATION ARRANGEMENTS

All three levels of government in Australia are involved in tax collection. The system involves a mix of taxes on incomes (personal and business) and consumption expenditure, as well as payroll tax, property taxes, stamp duties, financial transaction taxes and mineral taxation. In total, these taxes raised over $160 billion in 1996–97, equivalent to 32 per cent of GDP (ABS 1997).

Some have suggested that this burden is too high and reduces our competitiveness, particularly against the Asian economies. Pender and Ross (1995) estimated that the share of tax revenue to GDP in most Asian economies was around two-thirds the level in Australia in the early 1990s.

However, such intercountry comparisons are complicated by definitional issues. Further, in terms of the impact on economic performance, the efficiency with which tax revenue is raised and how the money is spent are, in themselves, important considerations.

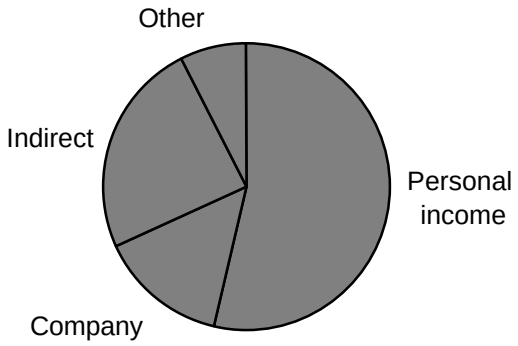
Thus, much of the present tax debate in Australia is about the forms and mix of taxation. In this context, reform of Australia's indirect tax system is very much to the fore. Commonwealth indirect tax — the subject of this study — is a major part of the indirect tax regime.

2.1 The Commonwealth indirect tax system

In 1997–98 the Commonwealth Government will raise around $130 billion in taxation revenue, of which just under $32 billion (or about one-quarter) will come from indirect taxes (figure 2.1).

The major Commonwealth indirect tax is wholesale sales tax (WST) (figure 2.2). WST is levied on a wide range of manufactured goods. It currently raises over $14 billion a year, or about 11 per cent of total Commonwealth taxation revenue. (In comparison, payroll taxes levied by State and Territory governments raise about $8 billion.)

Figure 2.1: **Composition of Commonwealth taxation, 1997–98**



Source: Commonwealth Budget 1998–99.

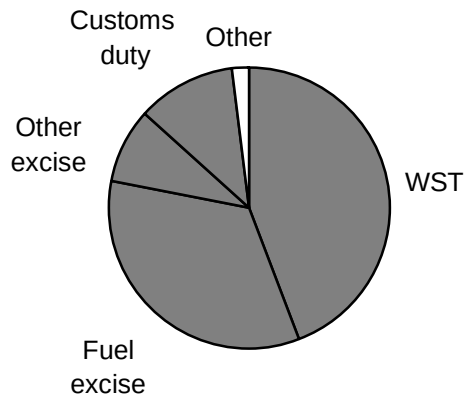
In aggregate, Commonwealth excise duties on petroleum, tobacco and alcoholic beverages (excluding the component in lieu of State business franchise fees) raise almost as much revenue as WST. The excise on petroleum products is by far the most significant. In 1997–98, revenue from fuel excise will be just under $11 billion, or some 80 per cent of total Commonwealth excise and over 8 per cent of total Commonwealth taxation revenue. Petroleum products do not attract WST.

The other significant components of Commonwealth indirect taxation revenue are:

- Customs duties (mainly tariffs) on imported goods ($3.6 billion or nearly 3 per cent of estimated total Commonwealth taxation revenue in 1997–98); and
- levies on primary products, which are returned to the industries concerned to fund activity such as research and development ($610 million).

As discussed in chapter 1, in this study, the Commission has focused on the impact of WST and fuel excise. Together these account for nearly 20 per cent of total Commonwealth taxation revenue and 80 per cent of Commonwealth indirect taxation.

Figure 2.2: **Composition of Commonwealth indirect taxation, 1997–98**



Source: Commonwealth Budget 1998–99.

Wholesale sales tax

The WST is a single-stage tax applying to goods manufactured in, or imported into, Australia. It was introduced in 1930 at a single rate of 2½ per cent. Multiple rates were introduced during World War II to raise additional revenue.

Under the *Sales Tax Assessment Act 1992* and the *Sales Tax Exemptions and Classifications Act 1992*, taxable goods are currently subject to WST rates of between 12 and 45 per cent (on the wholesale value of the goods). For example:

- household furniture and appliances, bathroom fittings, water heaters and confectionery are subject to WST at a rate of 12 per cent;
- standard motor vehicles, computers and commercial furniture are taxed at the 'general rate' of 22 per cent;
- 'luxury goods' such as jewellery, televisions and video recorders attract 32 per cent;
- beer and spirits are taxed at 37 per cent (including a 15 per cent surcharge distributed directly to the States to replace franchise fees);
- wine is subject to WST of 41 per cent (also including the 15 per cent surcharge); and
- luxury motor vehicles are taxed at 45 per cent (on the balance of the wholesale price above the luxury threshold).

The tax is intended to apply once only on the sale of goods immediately before the sale to the end user or final consumer. (It may also be payable on other transactions involving goods, such as leases and rentals.) Usually the tax is levied on the sale by a wholesaler to a retailer, with the wholesaler collecting the tax and sending it to the Tax Office. But manufacturers selling direct to the retailer, and retailers selling through an agent, also incur liability.

Exemptions

A wide range of goods (including most food and clothing, primary products, books and some building materials), and virtually all services, are not subject to WST.

Other goods are exempt from WST on the basis of their end-use — for example, goods for use by government departments and agencies, schools, universities and public benevolent institutions. Goods exported from Australia do not attract WST.

In addition, there is a registration system designed to limit collection of the tax to the wholesale (or equivalent) stage and to prevent 'cascading' or 'tax-on-tax' effects. Under this arrangement, raw material suppliers, manufacturers and wholesalers, amongst others, are able to register in order to purchase inputs tax-free. Manufacturers, the focus of this study, can obtain exemptions for:

- raw materials used in the manufacturing process which become part of the finished goods;
- business inputs used *mainly* (more than 50 per cent) in manufacturing which do not form part of the final product (such as machinery and equipment); and
- goods used in activities which assist in manufacturing (for example, goods used in costing and monitoring manufacturing activities or in repairing goods used in manufacturing).

The range of exemptions for inputs to goods production was significantly broadened in 1992. Additional *activities* exempted ranged from pre-production (for example, research and training) to post-production (for example, manufacturers' storage). The exemptions also covered more *goods* (for example, lubricants, lighting and floor coverings), if used mainly in eligible activities (DPM&C 1991, p. 4.3).

The registration system is complemented by separate provisions which exempt from WST some purchases made by non-registered producers (via sales tax exemption declarations) and a system for obtaining credits or refunds where tax has been overpaid or should not have been paid.

The extent and detailed nature of the exemptions significantly increase the complexity of the WST system. As Caltex commented in its submission:

> The rules for obtaining exemption are complex, depend on the circumstances and the use of the goods, the description of the goods and the Taxation Office's interpretation of the various rules. In addition, ... an exemption may apply to one location and not another, depending on the facts that need to be considered in each particular case. This makes it very difficult to administer.

Moreover, the system of exemptions and rebates is ineffective in preventing the taxation of inputs to manufacturing and other business activities. As Caltex said:

> Although sales tax exemptions apply on business inputs used in the manufacturing process and activities directly related to it, the exemption does not extend to all aspects of manufacturing and distribution, retail and the myriad of supporting activities. Many of our seaboard terminals, our depots and service stations pay tax on most plant and equipment and other goods.

Indeed, no firm escapes paying WST on at least some of its inputs.

- Some goods are not eligible for exemption as business inputs or as goods used to aid in manufacturing — notably most motor vehicles for off-site use, office furniture and computers used for general business functions, consumable items which are not 'manufacturing-related' (such as stationery), goods used in staff amenities, construction equipment and telecommunications equipment.
- Invariably, firms source some inputs from non-exempt suppliers (for example, suppliers of services), who have paid WST on their inputs.
- Other inputs may be purchased from suppliers who, although eligible for exemption, have WST embodied in their prices — because not all inputs qualify for exemption, and because they also purchase from non-exempt suppliers.
- Also, under special arrangements, small firms (with a potential WST liability of $10 000 or less) may elect not to charge WST on their sale of goods to customers, to avoid the administrative costs of participating in the system. But such firms are then ineligible to claim exemptions from WST on their inputs.

Overall, it is estimated that more than 60 per cent of the revenue currently raised from WST falls initially on business (on intermediate inputs and capital goods) (see appendix C).

As noted above, exports are not directly subject to WST, and manufacturing exporters can obtain the same exemptions on inputs that are available to other manufacturers. In addition, a 'drawback' facility provides another avenue for

exporters to receive a refund of WST paid on imported goods used in the local manufacture of other export goods.

But as Amcor commented:

> we remain concerned that we are unable to eliminate indirect tax costs from our export base. ... We are aware that concessions on sales tax and excise are available to manufacturers and exporters. Amcor takes advantage of these concessions but, due to the complexities which exist in the laws that give effect to these concessions, we could not say with certainty that Amcor obtains the full benefit of available concessions. This is due in part to the compliance costs associated with obtaining and claiming these concessions.

Indeed, the taxation of business inputs can be particularly onerous for export and import-competing activities because the higher costs usually cannot be passed on in prices. This concern has been raised by the Chamber of Commerce and Industry of Western Australia:

> Because it cascades through the production process and is embedded in business costs, [WST] affects the competitiveness of Australian exports and businesses competing with imports. (CCIWA 1998, p. 13)

The impact of WST on the cost of exports, including embedded effects, is assessed in chapter 3.

Compliance costs

In addition to its impact on input costs, WST, like all other taxes, imposes compliance costs on firms. These include the costs of staff time and professional fees incurred by business in meeting WST requirements. Around 75 000 firms remit WST to (or obtain refunds from) the Tax Office. (By comparison, over 700 000 employers are registered under the pay-as-you-earn system for collecting personal income tax.)

A recent study by the ATO (1997b) estimated taxpayer compliance costs for the WST (including the effects on cash flow) to be over $500 million in 1994–95, or 4.7 per cent of WST revenue. This compares with the administrative costs of WST to government of 0.5 per cent of the revenue collected (ATO 1997a).

An earlier survey (Pope et al 1991), which estimated the total compliance costs of WST at around 2 per cent of revenue collected, found that liabilities ranged from 24 per cent for the smallest firms to little more than one-tenth of one per cent for the largest firms. However, a study by the Office of Regulation Review (Rimmer and Wilson 1996, p. 25) questioned the reliability of these estimates, particularly given the low survey response rates.

Fuel excise

The Commonwealth levies excise on most petroleum fuels — liquefied petroleum gas is the notable exception. Excise is levied at specific rates per litre, varying according to the type of fuel (table 2.1). The excise rates are indexed to the CPI.

Table 2.1: **Commonwealth component of excise duties on fuel, 1 February 1998 (cents per litre)**

Commodity	*Excise duty*
Motor spirit – leaded	36.872[a]
– unleaded	34.697[a]
Diesel	34.697[a]
Aviation gasoline	17.403[b]
Aviation turbine fuel	1.785[b]
Kerosene, heating and fuel oil	7.200

a From 7 August 1997, the Commonwealth has collected an additional 8.1 cents per litre which is paid to the States and Territories to replace franchise fees.

b The excises on aviation fuels contribute to the funding of various government aviation services and safety regulatory functions.

Source: Commonwealth Budget 1998–99.

Over 98 per cent of fuel excise is raised from petrol and diesel fuel, most of which is used by private road users and in road transport. In this study, the Commission has focused on this component.

There is no general rebate of, or exemption from, fuel excise for petroleum products used in the manufacturing and services sectors. Fuel excise therefore raises input costs in these sectors. (There are, however, some rebates for diesel fuel used in coastal shipping. In addition, ships in international trade are not liable for the excise, except when carrying domestic cargo around the Australian coast.)

In contrast, primary producers and the mining sector are eligible for rebates of excise paid on diesel used primarily for specific off-road uses:

- eligible primary production activities receive a full rebate (almost $620 million in 1997–98); and
- eligible mining operations receive a partial rebate of 32.309 cents a litre (over $815 million in 1997–98).

It is estimated that around two-thirds of the remaining $9 billion raised from Commonwealth fuel excise falls initially on intermediate inputs to business (see appendix C).

While an important objective of fuel excise is to provide government revenue, it is also commonly regarded, in part, as:

- a user charge to fund road construction and maintenance; and
- a means of addressing some of the wider costs of road usage, for example, congestion, accident, noise and air pollution costs.

The efficacy of levying fuel excise to charge for some of these costs has been the subject of much debate (box 2.1). Moreover, the portion that might be viewed as a user charge is also difficult to estimate, particularly given the division of responsibility for funding roads across levels of government. Significantly, New Zealand, which has a system of road user charges, retained fuel excise when it introduced a goods and services tax.

2.2 The New Zealand tax system

As discussed in chapter 1, the benchmark used to assess Australia's WST and fuel excise regime in this study is a New Zealand-style goods and services tax (GST).

New Zealand substantially transformed its taxation system between 1984 and 1990. The reforms involved changes to both income and indirect taxation, and a change in the tax mix:

- Personal income tax rates were lowered (with the top tax bracket progressively falling from 66 per cent to 33 per cent) and the number of tax brackets was reduced. Fringe benefits tax was introduced in 1985. In the late 1980s, dividend imputation was introduced and the level of company tax aligned with the top rate of personal income tax.

Box 2.1: **Fuel excise as a user charge**

While the IC (1994b, p. 259) considered that the 'predominant reason for taxes on petroleum products is to raise revenue', fuel excise has also been regarded partly as a charge for road construction and maintenance and as a means of addressing externalities.

The IAC (1986) concluded that fuel-based charges provide poor signals for the use and supply of roads. In particular, they significantly under-charge heavy vehicles, which do the most damage to roads. Chisholm (1993) reached a similar conclusion.

However, a much stronger relationship exists between axle loading, distance travelled and road costs. During the mid-1990s, all States and Territories moved their charging regimes in this direction using a schedule developed by the National Road Transport Commission. This comprises lump sum annual registration fees for each type of heavy vehicle, plus a *notional* 18 cents a litre from the existing excise on diesel fuel. This system essentially distributes road expenditure among different heavy vehicle classes according to *average* mass and *average* distance travelled, rather than charging individual vehicles based on their masses and *actual* distances travelled (BTCE 1997).

As well as being an inefficient way of charging for road wear and tear, fuel-based charges are not particularly efficient at allocating scarce road space. Congestion varies with location and time, variables unrelated to fuel purchases. The IC (1994a) recommended the gradual introduction of electronic road pricing to address the high cost of congestion in metropolitan areas (up to $4 billion a year in Sydney and Melbourne), with equivalent reductions in fuel excise to preserve revenue neutrality. Electronic pricing would allow charges to vary according to location and time.

There are also problems in using fuel excise to promote environmental objectives. Apart from the uncertainty which exists about the costs of pollution from vehicle emissions, fuel excise does not differentiate between areas with low pollution levels and those where pollution levels are high.

But, despite the inadequacies of fuel excise as a user charge, practical constraints remain to the widespread adoption of alternatives. As Docwra and Kolsen (1993, p. 119) commented, 'There are better methods requiring sophisticated equipment, but these are not available for immediate and effective application.' As an example of the difficulties, they argued that: 'The private car may cause little road "damage", but contributes significantly to congestion and pollution. The distance meter will not, however, with current technology, provide information about where and when the road was used'. And, the Australian Society of Certified Practicing Accountant's (1998) tax reform agenda noted: '... the argument for continuation of excises under a reformed system is strong.'

- A GST was introduced in 1986 at a rate of 10 per cent. It replaced a multi-rate wholesale sales tax (ranging from 10 to 50 per cent) — which had exempted 60 per cent of goods and all services (Bollard 1992) — and a range of small indirect taxes (such as Film Hire Tax, International Departure Tax and Domestic Air Travel Tax). The GST also financed the cuts in personal income tax and other changes to family support (Stevens 1993). The GST rate was increased to its current level of 12.5 per cent in 1989. The GST now collects around one-quarter of the New Zealand Government's total tax revenue, compared with around 12 per cent previously collected from sales tax.

In introducing a GST, New Zealand retained excise duties on alcoholic beverages, tobacco and fuel, partly on externality grounds. New Zealand also levies a road user charge, in the form of a weight-distance tax, on diesel-fuelled heavy vehicles.

An important component of tax reform in New Zealand was the provision of compensation to those lower income groups disadvantaged by the changes. This was achieved through the income tax and welfare benefits system rather than by complicating the indirect tax system:

> This is a key feature of the reform that was central to the stability and relative administrative simplicity of the GST. Where countries have tried to provide protection for low income earners through base exemptions, it has led to many of the same problems [Australia has] with the WST — administrative costs escalate dramatically with multiple rates, and there are costly arguments over the scope and nature of exemptions.
>
> Not only that, but providing exemptions is also an ineffective way of protecting the poor. In New Zealand, it was estimated that the bottom 20 per cent of households would have received only 15 per cent of the aggregate benefit of an exemption on food. (Ryan 1998)

New Zealand's GST

New Zealand's GST is often put forward as a 'model' indirect tax system. It is a broad based consumption tax, applying to services as well as goods. It is similar to the value added taxes (or VATs) which apply in Europe and many other countries (see section 2.3). A simple comparison of the GST with Australia's WST is provided in table 2.2.

Table 2.2: **WST and GST compared**

Feature	*WST (Australia)*	*GST (New Zealand)*
Coverage	Goods only — many exemptions	Goods and services — very few exemptions
Rate	Five rates — from 12% to 45%	Single rate — all 12.5%
Value base	Wholesale price	Retail price (ultimately) — collected progressively on value added at each production/distribution stage
Collection points	One (in principle) — wholesale	Multiple — each production/distribution stage

The GST is levied at a single rate of 12.5 per cent and has few significant exemptions:

- financial services are exempt — bank fees do not reflect value added because much of the cost of the service is recouped from interest margins;
- life insurance is exempt because of its savings element;
- residential rents (for leases greater than 4 weeks) are exempt to provide equality of treatment with owner-occupiers;
- sales of existing houses are exempt (but new houses built by a GST-registered builder are subject to the tax);
- second-hand goods transactions between private individuals are exempt (but sales by businesses dealing in second-hand goods are not);
- non-profit organisations are not liable for GST on sales of goods received as donations; and
- central and local government services (including local rates) are subject to GST (Bollard 1992).

The GST is collected at each stage in the production (and distribution) process and a credit is given to businesses for the GST paid on inputs. This avoids the cascading effect of the WST, without the need for special exemption systems. The GST is therefore essentially a tax on ‘value added’ at each stage of the production process, with the final price to consumers reflecting the full amount of tax paid, but not the imposition of ‘taxes-on-taxes’.

Small businesses normally submit GST returns on a six-monthly basis. One and two month periods apply to larger businesses. All firms can, however, apply to submit on a monthly basis. Exporters, for example, may prefer monthly returns in order to claim regular refunds of input taxes.

The operation of New Zealand's GST can be illustrated by a simplified, hypothetical example (of the production and sale of a briefcase), assuming a 10 per cent GST (table 2.3). In the example, the farmer sells cattle to an abattoir for $10 plus 10 per cent GST ($1). The abattoir therefore pays $11 to the farmer. When the farmer compiles his GST return, he deducts the GST paid on farm inputs (in this case assumed to be $0) from the GST collected on sales ($1) and remits the balance ($1) to the Inland Revenue Department. A similar process occurs through the production chain. Ultimately, the retailer sells the briefcase to a consumer for $100 plus 10 per cent GST ($10), making the final selling price $110. The retailer subtracts the GST paid to the manufacturer for the briefcase ($8) from the GST collected on the sale to the consumer ($10) and sends the difference ($2) to Inland Revenue.

Table 2.3: **Illustrative production chain under a 10 per cent GST**[a]

Producer	*Product*	*Net selling price*	*GST on output*	*Gross selling price*	*GST on inputs*[b]	*GST remitted*	*Cumulative GST collected*
		$	*$*	*$*	*$*	*$*	*$*
Farmer	Cattle	10	1	11	0	1	1
Abattoir	Cow hide	20	2	22	1	1	2
Tanner	Leather	40	4	44	2	2	4
Manufacturer	Briefcase	80	8	88	4	4	8
Retailer	Briefcase	100	**10**	110	8	2	**10**

a The 10 per cent tax rate is used for simplicity. New Zealand's GST is now 12.5 per cent.

b The example abstracts from other inputs into the production chain (for example, inputs to farming), joint products (for example, the meat from the cattle) and other stages of production (for example, wholesaling).

The illustration shows that taxes do not cascade through the system as 'taxes-on-taxes'. Nor are taxes from preceding stages embodied in prices, because each producer in the chain receives full credit for the taxes paid on inputs, effectively purchasing inputs tax-free. In the end, the consumer pays the full 10 per cent GST on the retail price of the briefcase, with $10 of GST revenue being collected. (This abstracts from any absorption of the tax by suppliers resulting from market conditions.)

Under the New Zealand GST regime, an important distinction arises between 'exempt' goods and services and 'zero-rated' exports.

Exempt goods and services do not have GST levied on their outputs, but are ineligible for a credit or refund of GST on their inputs. This means that some GST falls on inputs into exempt items such as residential rents and financial

services. That is, the exemption effectively only applies to the value added by the final stage, not the value added earlier in the production chain. Another minor complication is that small traders (with an annual turnover under NZ$30 000) do not have to register, but are unable to claim back any GST on inputs if they do not.

In contrast, for 'zero-rated' exports, businesses receive a rebate of the GST paid on the inputs used (other than for exempt inputs such as financial services). The value added in the chain is therefore, for the most part, tax-free if the product is exported.

Collection and compliance costs

The Inland Revenue Department has estimated the administrative costs to government of New Zealand's GST at over 1 per cent of revenue collected in 1996–97. This is more than double that for Australia's WST.

For firms, a detailed survey estimated the compliance costs of the GST at over NZ$450 million in 1990–91 (Sandford and Hasseldine 1992). This represented an average of over 7 per cent of GST revenue, somewhat higher than estimates for Australia's WST. The compliance cost ratio varied considerably depending on firm size — ranging from 28 per cent for firms just above the compulsory registration threshold (NZ$30 000 turnover) to only 0.3 per cent for firms with more than NZ$10 million of turnover. This appears similar to the pattern under Australia's WST regime.

Offsetting these costs, the overall cash flow benefit to firms from the timing of GST collections and remittances was estimated at around NZ$180 million in 1990–91. While the cash flow benefit was not a saving for the economy as a whole, it would have reduced the total compliance costs of GST *for firms* by almost 40 per cent (Sandford and Hasseldine 1992). Indeed, for larger firms the cash flow benefit was, on average, estimated to exceed the cost of compliance — though the distribution of the benefit depended very much on credit terms and whether a firm was selling in the domestic or export market.

More recently, a study commissioned by Inland Revenue (BRC 1994) concluded that compliance costs had been significantly overstated by the earlier study. It found that total compliance costs across a range of business taxes were over one-third lower than previously estimated. Further, changes in management and accounting systems made necessary by the GST in New Zealand — which are included in the estimates of compliance costs — may have provided wider benefits to firms:

> The GST called for improved accounting systems, improved record keeping, and in some cases additional skilled administrative staff. Cash flow consequences also

> had to be planned for ... Having said that, many businesses in New Zealand found that their record keeping assisted them in making better use of their own resources and business planning. There can also be cash flow advantages depending on the accounting option used. (Ryan 1998)

2.3 Other systems

General consumption taxes — value added taxes (VAT), sales taxes and 'multi-stage cumulative' taxes — account on average for nearly 20 per cent of tax revenues in OECD countries. In 1993, Japan, the United States, Australia and Switzerland were the only OECD countries where these taxes raised less than 10 per cent of total taxation revenue. In Canada, the proportion was almost 15 per cent and, for most European countries, the range was from 15 to 20 per cent. New Zealand and Turkey (just under 25 per cent) and Iceland (over 30 per cent) topped the list. (OECD 1995)

Among OECD countries, only Australia and the United States do not currently have a value added based consumption tax. Over the past decade, VATs have been adopted by Japan (1989), Canada (1991) and Switzerland (1995).

Most of the former socialist states also now have a VAT (for example, Russia, Poland, Hungary, Estonia, Bulgaria and the Czech and Slovak Republics) (OECD 1995), as have many Asian countries:

> Amongst these [Asian] countries, only Malaysia does not make use of a VAT. Indonesia introduced a 10 per cent GST as part of its extensive 1984 tax reforms, Singapore introduced a three per cent GST in April 1994, South Korea a 10 per cent VAT in 1977, Taiwan a five per cent VAT in 1986 and Thailand a seven per cent VAT in 1991. The Malaysian Government has announced its intention to consider widening the sales and service tax. (Pender and Ross 1995, p. 6)

The following section briefly describes the systems applying in the OECD. It is based largely on information from OECD (1995).

Consumption taxes in the OECD

While nearly all OECD countries operate VAT-type taxes, there are many differences in coverage, the treatment of particular goods and services, and the structure of the rates. Relative to other OECD countries, the New Zealand system described in section 2.2 is comprehensive and more uniform in its application.

Of those OECD countries with VATs, notable *tax rate* features include:

- variations in the general VAT rate, from 5 per cent in Japan to 25 per cent in Denmark and Sweden;
- only four have a single general rate (Denmark, Finland, Japan and New Zealand);
- five have four or more VAT rates (Belgium, Ireland, Italy, Luxembourg and Turkey);
- those which have implemented VATs most recently have adopted single, or at most two, rates to minimise administrative and compliance costs;
- within the European Union, rates above the standard rate have been removed — the higher rates generally applied to luxury goods; and
- zero rates are widely used (in Canada, Ireland, Mexico and the United Kingdom) and rates below the standard rate are common, often for 'necessities' or 'merit' goods.

As for the *goods and services covered* by VATs in the OECD:

- banking and financial services are virtually always exempted, and insurance is often exempted;
- predominantly 'public sector' services, such as health, education and postal services are often exempt, as are cultural services, gambling and rental payments;
- while owner-occupied housing is generally exempt, most countries impose VAT on the sale of newly constructed housing;
- zero-rating often applies to books and newspapers;
- food is taxed below the general rate in 18 of the 23 countries;
- domestic energy (fuel), public transport and pharmaceuticals are taxed below the general rate in around half of the group, and children's clothing is taxed at concessional rates in two countries; and
- most countries have measures designed to avoid double taxation of second-hand goods.

Most OECD countries also provide concessions to small business under their VAT systems. These include optional registration below a threshold, reducing the tax payable and easing the compliance burden through special administrative arrangements.

As noted above, apart from Australia, the United States is the only OECD country which does not operate a VAT-style tax. Instead, US State governments operate a Retail Sales Tax (RST):

> A RST is essentially a *suspensive* system: primary producers, wholesalers and retailers are generally required to be registered and are accountable for tax on sales

> of goods to non-registered persons (usually consumers) but may buy and sell between themselves without liability to tax, provided that such goods are not for their own private use. Accordingly, payment of tax is suspended until the final stage — when the goods are sold by registered traders to unregistered traders or consumers. (OECD 1995, p. 12)

Theoretically, VAT and RST can have identical impacts in terms of avoiding taxes on business inputs. The RST applying in the United States has many of the advantages of a VAT. But, according to the OECD, the general movement towards VATs rather than RSTs reflects the practical differences in collecting the tax (for example, verifying end-use) and the advantages of VATs in reducing tax evasion.

Canada's move to a GST

Amongst OECD countries, Canada's adoption of a GST is relatively recent, with a 7 per cent GST introduced in 1991. The Canadian Government introduced the GST in place of the manufacturer's sales tax (MST) which was essentially a single-stage sales tax at the manufacturing level. Revenue from the MST had declined in importance over time, to only 10 per cent of federal government revenue in 1985. (A single-stage retail sales tax is also levied at the provincial level.)

The MST had a number of deficiencies which are similar to Australia's WST. In particular, it:

- was levied on a narrow base which excluded most value added in the agriculture, mining and services sectors; and
- taxed business inputs (Brooks 1992).

Some of the basic features of the Canadian GST are similar to New Zealand's GST. As in New Zealand, exports are zero-rated and financial services, residential rents and sales of existing housing are exempt.

However, the Canadian GST exempts or zero-rates a far wider range of goods and services than in New Zealand:

- The most contentious and largest category of zero-rated goods is basic groceries, encompassing most food intended for consumption at home. This has led to arbitrary distinctions between zero-rated and taxable items (for example, salted peanuts are taxable as snack food, but unsalted peanuts are zero-rated as an ingredient to be used in the preparation of other food). Restaurant meals, takeaway meals, snack foods, some carbonated and non-carbonated beverages and alcoholic beverages are subject to the 7 per cent GST.

- Prescription drugs, some non prescription drugs and many medical devices are zero-rated.
- Education and most health services, some childcare services and services provided under legal aid are exempt.

The treatment of food and the exclusion of other items from the GST base is reported to have added complexity and arbitrariness to the system. It has also resulted in a higher GST rate than otherwise. One study reported that comprehensive application could have reduced the rate to 5 per cent and avoided some of the complexities of the tax which are now a permanent part of the system (Poddar and English 1993).

3 IMPACT ON MANUFACTURING EXPORTERS

The impacts of WST and other indirect taxes on business costs have been the subject of several previous studies. These have included studies looking at the effects on the automotive (ACIL 1992b) and agri-food (ACIL 1997) industries, and on farmers (ACIL 1992a). Other studies have included analysis of the extent to which WST and other indirect taxes fall on business inputs and exports as a whole (Chisholm 1993, Johnson et al 1998) (see section 3.3).

This chapter focuses on the impacts of WST and fuel excise on the export competitiveness of Australian manufacturing firms.

3.1 Approach to the analysis

The Commission initially approached a number of peak business groups with a view to arranging case studies of individual firms. It also sought comment and data on the impacts of Commonwealth indirect taxes from a wider group of firms.

Specifically, firms were asked to provide information on:

- the cost burden on their export activities from WST and the Commonwealth component of fuel excise;
- the savings under an alternative New Zealand-style GST regime which reduced taxes on business inputs; and
- the impacts of those savings on export volumes, employment and profitability.

However, these avenues did not generate the detailed information necessary for 'conventional' case studies. In large part, this reflects the fact that firms are typically unaware of the magnitude of the increase in input costs resulting from WST and fuel excise. The hidden nature of these taxes on inputs is an important insight from this study.

Given the lack of firm-specific information, the Commission used other means to quantify the effects of WST and fuel excise on the competitiveness of manufacturing exporters. This involved applying sectoral tax rate estimates derived from the Commonwealth Treasury's PRISMOD model to data on exports provided by some major Australian manufacturers and from a recent survey of manufacturing firms (IC and DIST 1997). (The PRISMOD model is an input-output price model that traces the direct and indirect effects of price

changes through the production chain, on the assumption that the price effects are passed on fully at each stage.)

3.2 Cost impacts

While exports are not subject to WST, tax collected along the production chain feeds into the cost of exports in much the same way as for goods produced for the domestic market. Moreover, diesel fuel rebates aside, the cost of fuel used in export activities or embedded in non-fuel inputs for exports is inflated by excise.

ABS input-output data and the PRISMOD database provide estimates of the 'first round' effects of WST and fuel excise on business costs (see appendix C). These first round effects comprise WST paid by immediate suppliers to firms and excise paid on fuel purchased by the firms. While these databases do not distinguish between taxes on inputs used in goods for export and those for sale domestically, an estimate of the cost imposed on exports can be obtained by assuming that the incidence is the same. Several previous studies have focused on these first round effects (see section 3.3).

However, a major drawback with this approach is that it does not pick up the indirect cost of WST paid further back in the production chain, or the cost of fuel excise embedded in non-fuel inputs used by firms. Hence, estimates using this approach will understate, possibly substantially, the cost penalties imposed on exporters.

To obtain an estimate of the total impacts, the Commission therefore arranged for the Commonwealth Treasury to use its PRISMOD model to simulate the price effects of introducing a New Zealand-style GST to replace WST and (some) fuel excise (see below). The GST regime simulated would virtually eliminate the cascading effect of WST through the production chain, and reduce the cascading effect of fuel excise. Thus, the projected reductions in firms' production costs provide an estimate of the total (direct and indirect) input cost penalty arising from these taxes.

To render the scenario consistent with the scenario modelled by the Commission using the PC Tax Model in chapter 4, the simulated reduction in fuel excise, in combination with the GST, was designed to be revenue-neutral in the first instance and to leave the price of fuel to final consumers largely unchanged. This would require a GST of around 5 per cent and a reduction in fuel excise of 4 to 5 cents a litre.

The Commission acknowledges that this treatment of fuel excise is conservative. Had the simulation instead involved the abolition of fuel excise,

the estimated cost savings projected for firms would have been higher. However, such a simulation would have also introduced the additional complexity of specifying a road user charging regime to replace the notional road user component of fuel excise (see chapter 4).

PRISMOD results

Across the economy as a whole, WST and the 4 to 5 cents a litre component of fuel excise are estimated to raise input costs by an amount equivalent to 2.4 per cent of the value of production (table 3.1). As discussed above, this cost increase, or implied tax rate, includes the indirect as well as the direct effects of these taxes. For example, WST paid on agricultural machinery not only inflates agricultural costs at the point of revenue collection, but also inflates the cost of agricultural products used in food processing. Similarly, fuel excise collected on mining not only inflates mining costs at the point of revenue collection, but can also inflate the metal ore costs of minerals processing industries, the sheet metal costs of metal fabrication industries and the fabricated metal costs of machinery and equipment industries. In turn, this can further inflate the costs of mining and other industries using such equipment.

At the sectoral level, the implied tax rate is highest for mining (3.3 per cent) and lowest for agriculture (2 per cent). While the costs imposed on the services sector as a whole (2.2 per cent) are below average, for some services the implied tax rate is much higher (for example, 3.9 per cent for communication services).

The impact on the cost of inputs to manufacturing is slightly higher than the economy-wide average, with the implied tax rate being 2.6 per cent.

However, there are considerable variations in the rates for individual manufacturing industries. For example, at 3.2 per cent, the tax rate for non-metallic mineral products is over one and a half times that for the textile, clothing and footwear industries.

But it is the dollar values in table 3.1 that best demonstrate the cascading effect of WST and fuel excise. For the economy as a whole, the total impact on production costs is nearly $22 billion, more than double the revenue collected from WST on business inputs. For the manufacturing sector, at just under $6 billion, the total effect on industry costs is almost four times the revenue raised (see appendix C). The higher multiplier for the manufacturing sector reflects the relatively dense web of inter-industry linkages in the sector, with many layers of transactions between different companies at different points in the production chain, all of which may become a target for an input tax. Indeed,

for industries such as textiles, clothing and footwear, the costs imposed are almost totally driven by the indirect effects.

Table 3.1: **Total effect of WST and a component of fuel excise[a] on production costs, by sector, 1996–97**

	Total cost increase	*Implied tax rate[b]*
	$ million	*%*
Agriculture	**622**	**2.0**
Mining	**1 614**	**3.3**
Food, beverages & tobacco	1 176	2.4
Textiles, clothing & footwear	252	2.0
Wood & paper products	291	2.5
Printing & publishing	364	2.7
Petroleum, coal & chemical products	1 193	2.9
Non-metallic mineral products	292	3.2
Metal products	1 013	2.9
Machinery & equipment	1 039	2.6
Other manufacturing	138	2.2
Total Manufacturing	**5 759**	**2.6**
Electricity, gas and water	499	2.6
Construction	2 269	3.6
Wholesale trade	1 053	2.4
Retail trade	1 773	2.8
Accommodation, cafes & restaurants	469	2.0
Transport & storage	1 457	2.9
Communication services	784	3.9
Finance & insurance	523	1.2
Ownership of dwellings	1 045	1.9
Property & business services	1 652	2.1
Administration & defence	582	1.3
Education	107	0.4
Health & community services	495	1.1
Cultural & recreational services	529	2.9
Personal & other services	457	2.3
Total Services	**13 694**	**2.2**
TOTAL	**21 689**	**2.4**

a WST and 4 to 5 cents a litre of fuel excise.

b Total cost increase as a percentage of the total production cost of the taxed industry.

Source: PRISMOD, Commission estimates.

Reporting cost penalties in this way may seem to involve an element of double counting.

However, it is the cost penalties for individual industries, not the total tax collected, which is relevant to an assessment of the economy-wide impacts of

these taxes. That is, firms' decisions and competitiveness are determined by the prices they face, not by the overall amount of revenue raised.

Cost impact on manufactured exports

The PRISMOD modelling also evaluates how the increases in production costs resulting from the imposition of WST and fuel excise on business inputs affect the aggregate cost of manufactured (and other) exports. In doing so, it takes into account all of the additional costs of transporting manufactured goods from the factory through to the point of export.

The simulation suggests that WST and 4 to 5 cents a litre of fuel excise add $1 billion (directly and indirectly) to the cost of manufactured exports. This represents over 40 per cent of the estimated $2.4 billion total cost imposed on exports across all sectors.

The implied tax rate on manufactured exports, at around 2.5 per cent of the value of those exports, is marginally lower than the rate for manufacturing production as a whole. This is due to compositional effects. That is, those industries which are the most export-oriented have lower implied tax rates.

Impact on typical manufacturing exporters

To paint a picture of the impacts of WST and fuel excise on individual manufacturing exporters, the Commission assumed that the industry-level tax rates reported in table 3.1 are a reasonable approximation of the tax on exports by these industries. It then applied these tax rates to the 'typical' exporting firm in each two-digit manufacturing industry. The export data were obtained from the 1995 business longitudinal survey (IC and DIST 1997). The results are reported in table 3.2.

For the manufacturing sector as a whole, WST and 4 to 5 cents a litre of fuel excise are estimated to add over $120 000 a year to the cost of a typical exporter. Within the sector, typical exporters in the metal products industry ($371 000) incur the highest average cost burden, while those in the 'other' manufacturing category ($11 000) and the printing and publishing industry ($19 000) incur the lowest. The cost penalty on the typical exporter in the food, beverages and tobacco industry is also high — over $300 000.

Table 3.2: **Total impact of Commonwealth indirect taxes[a] on the export costs of typical manufacturing firms, 1996–97**

	Exports by the typical firm	*Implied tax rate[b]*	*Cost impost on exports*
	$'000	*%*	*$'000*
Food, beverages & tobacco	12 732	2.4	305
Textiles, clothing & footwear	6 702	2.0	134
Wood & paper products	5 786	2.5	145
Printing & publishing	689	2.7	19
Petroleum, coal & chemical products	3 850	2.9	112
Non-metallic mineral products	1 458	3.2	47
Metal products	12 780	2.9	371
Machinery & equipment	1 987	2.6	52
Other manufacturing	502	2.2	11
Manufacturing average	**4 766**	**2.6**	**124**

a WST and 4 to 5 cents a litre of fuel excise.

b Total cost increase as a percentage of the total production cost of the taxed industry.

Source: IC and DIST (1997), Commission estimates.

Impact on major firms

To complement the above estimates, the Commission approached several major firms for data on their manufactured exports and for their views on the cost penalties imposed by WST and fuel excise on their inputs. Three firms — Amcor, Goodman Fielder and Kraft Foods provided such information. (In addition, Caltex estimated that WST adds over $2 million a year to the cost of inputs across its manufacturing and distribution activities. It did not, however, separately identify the impact on exports.)

Kraft Foods estimated that the *direct* cost of WST on inputs to its head office administration, and excise incorporated in its fuel purchases and freight costs, was equivalent to 0.3 per cent of its total revenue. Applying this percentage to its annual exports of $108 million, Kraft estimated the direct cost penalty on its exports at $325 000 a year.

Amcor suggested that, taking account of embedded effects further back in the production chain, the total *(direct and indirect)* impact of WST and all fuel excise on its export costs was probably around 5 per cent. Amcor currently exports paper products worth around $175 million a year, implying a cost penalty on those exports of nearly $9 million. (Amcor's estimate of a 5 per cent

cost penalty is broadly comparable with the Commission's estimate of a 2.5 per cent cost penalty from WST and the small component of fuel excise).

Goodman Fielder did not provide a precise estimate of the tax rate on its inputs. However, applying the cost penalty of 2.4 per cent for the food, beverages and tobacco industry in table 3.1, to the company's exports of $116 million a year, would give a penalty of close to $3 million.

Manufacturing exporters are typically operating in very price sensitive export markets where even small increases in costs can have a significant impact on sales' volumes. Thus, Amcor commented that:

> ... over recent years, based on our cost base which is impacted by the indirect tax burden, we have walked away from potential sales and markets and taken activity shuts on production units.

3.3 The Commission's assessment

There are three key findings emerging from the above analysis:

- WST and fuel excise on inputs are very much hidden taxes. Firms are typically unaware of the tax paid by their immediate suppliers, let alone that paid further back in the production chain.
- When account is taken of the cascading effects of these taxes through the production chain, it is clear that the cost penalties for exports are significant. Indeed, simulations using the PRISMOD model suggest that the penalty from WST and just 4 to 5 cents a litre of fuel excise may be as high as $1 billion a year for manufacturing exporters and $2.4 billion for exporters from all sectors.
- Costs are also raised across Australia's much more extensive domestic production base, a substantial proportion of which faces competition from imports. Thus, in an economy-wide sense, WST and fuel excise collected on inputs are a very significant burden on business.

Comparing these findings with the results of earlier studies (box 3.1) is not a simple exercise. Other studies also encountered difficulties in assessing impacts because of the hidden nature of these taxes. Where estimates of the cost impacts have been provided, the precise coverage — for example, whether effects further back in the production chain are included — is not always clear.

Box 3.1: **Results of previous studies**

A study of the effects of taxation on the ***automotive industry*** by ACIL (1992b) cited industry estimates that WST paid on inputs added from $100 to $200 to the cost of each

car. (This estimate was ostensibly derived from detailed accounting data on automotive producers' costs and pro rata estimates for their suppliers.) ACIL also referred to input-output studies which suggested an average increase in costs of about 1 per cent. In addition, the study quoted industry estimates of the *direct and indirect* benefits of the abolition of fuel excise in the range of $40 to $70 per car. Allowing for the introduction of a road user charge, ACIL assumed a net benefit from the removal of fuel excise in the range of $30 to $40 per car.

Another ACIL study (1997) which looked at the effects of indirect taxes on the ***agri-food industry*** included case studies of individual farm and meat processors. In 1991–92, the *first round effects* of WST were estimated to add less than 0.1 per cent to the costs of meat processing. Fuel excise (after allowing for a road user charge component) added 0.3 per cent. For the farming case studies, WST was estimated to increase farm costs by between 0.1 and 3 per cent, while fuel excise added from 0.3 to 3.8 per cent.

An earlier ACIL study (1992a), undertaken for the National Farmers' Federation, also looked at the *first round effects* of taxation reform on ***farming***. It indicated that, for a number of farming enterprises, WST paid on inputs accounted for between 0.1 and 0.9 per cent of farm costs. It also indicated that, assuming half of fuel excise represented a road user charge, residual fuel excise amounted to 2.9 to 3.6 per cent of farm costs.

A recent study by the Melbourne Institute of Applied Economic and Social Research (Johnson et al 1998) provided estimates of the ***incidence of indirect taxes on business inputs and exports*** for 1993–94, assuming full cost pass through. In the *first round*, almost 60 per cent of WST, and over 70 per cent of fuel excise and franchise fees, were estimated to fall on business inputs. In terms of *final round* incidence, almost 12 per cent of WST and 25 per cent of fuel excise and franchise fees fell on exports.

Chisholm (1993) provided similar estimates of the ***incidence of indirect taxes on exports***. In terms of *final round* incidence, Chisholm estimated that, in 1990–91, the effective rate of WST on exports was 1.4 per cent. For manufacturing industries, the effective tax rate ranged from 0.9 per cent for machinery (not elsewhere classified) to 4.1 per cent for wood and wood products. For a combination of WST, the general taxation component of fuel excise and payroll tax, Chisholm estimated an effective tax rate on exports of 3.7 per cent. Within manufacturing, the tax rates on exports varied from 2.5 to 6.1 per cent.

Hence, it is not particularly surprising that previous studies provide both lower and higher estimates of the impact of WST and fuel excise (sometimes within the same study) than the Commission's estimates. Higher estimates in other studies may largely reflect consideration of a much larger component of fuel excise than in this study. Lower estimates in other studies may reflect a focus on first round costs rather than the total cost including tax embedded further back in the production chain. As noted above, these embedded effects greatly magnify the direct costs.

In any event, to properly assess the implications for the economy of WST and fuel excise collected on business inputs, it is necessary to go beyond the simple price effects reported in this chapter and similar studies. A comprehensive assessment involves looking at how these price changes affect the behaviour of consumers and producers (that is, demand and supply), the exchange rate and other economic variables. To this end, the next chapter presents an economy-wide general equilibrium analysis of the impacts of replacing WST and some fuel excise with a GST.

4 ECONOMY-WIDE EFFECTS

The previous chapter provided estimates of the extent to which Commonwealth indirect taxes increase input costs for manufacturers and other businesses. These imposts reduce the competitiveness of Australian firms in export markets and lead to less efficient outcomes in the domestic market.

The impact on exports will depend mainly on the extent to which the tax-induced price rises reduce demand by overseas buyers and the scope for exporters to absorb the tax burden. Similarly, the effects in the domestic market will depend on how this taxation of inputs alters the demand for, and supply of, goods and services across the economy. That is, like any other policy, the overall impact of these taxes on community wellbeing will reflect induced quantity as well as price changes.

One way of estimating economy-wide effects is to use general equilibrium (GE) modelling. This involves specifying how supply and demand respond to price changes in each segment of the economy and the linkages between the individual segments. As well as providing for a coherent explanation of the impacts of government policies on the community as a whole, GE modelling provides a means to compare the economy-wide benefits of different policy reforms. This can help to prioritise the reform effort.

The Commission has previously used the ORANI model to simulate the gains from changes to the taxation of petroleum products (IC 1994b). Meagher and Parmenter (1993) also used ORANI to simulate the effects of the then Liberal Opposition's Fightback! package.

For this exercise, the Commission used its recently developed PC Tax Model to simulate the effects of changes in the Commonwealth indirect tax regime. This model incorporates features of both the ORANI and MONASH models, but has been enhanced to deal with tax issues.

To help assess the robustness of the modelling results, the Commission undertook some sensitivity analysis on the outcomes projected by the model, as well as having the modelling independently refereed. As discussed below, the referee indicated that the modelling approach was broadly appropriate and the results for the key macroeconomic outcomes were plausible.

That said, it is clearly impossible to capture all of the complexities of the real world in such a modelling exercise. As with any economic modelling, the results are only as good as the underlying assumptions and the information base.

Thus, such modelling results should be regarded as indicative rather than definitive.

Indeed, the value of such modelling lies as much in establishing relativities of potential gains (or losses) from different policy changes, as in providing an estimate of the magnitude of the gains from a particular reform.

To provide such perspective, the Commission modelled two indirect tax reform scenarios — the first involving the replacement of WST and some fuel excise with a GST, and the second involving improvements to the current WST system. The Commission also compared the projected gains from Commonwealth indirect tax reform with previous estimates of the gains from some other tax and non-tax reforms.

4.1 Commonwealth indirect tax reform

The PC Tax Model

The PC Tax Model structure and assumptions are described in appendix C and in Revesz (1998). Key points are:

- The model is not dynamic. Rather, it provides a snapshot view of how the economy would look after a policy change once all adjustments to the change have occurred, compared to outcomes with no policy change. Given the time that it takes to reallocate capital and labour between activities, the adjustment period could be up to 10 years.
- The behavioural equations showing how firms, households and overseas buyers of our exports respond to tax-induced price increases are similar to those in the MONASH and ORANI models. In particular, the model assumes that export demand for Australia's non-traditional manufactured exports is sensitive to price.
- Changes in the tax regime have the potential to affect the supply of labour, both directly through changes in wages and indirectly through changes in non-wage incomes. The model's labour supply equations capture these effects, although the responsiveness of labour supply to such changes is assumed to be low.
- Similarly, changes in the tax regime will affect the deployment of capital across the economy. Indeed, as indicated below, the projected outcomes from Commonwealth indirect tax reform for the economy as a whole depend crucially on the degree of mobility of capital between industries and internationally. The Commission's preferred treatment assumes some 'stickiness' in capital — that is, returns in an industry must be

'appreciably' higher to attract capital from other activities. However, the model was also used to project outcomes under the polar assumptions of perfect capital mobility and fixed capital stocks in each industry. The latter scenario is very much a short-term one.

- The model produces several measures of the change in community wellbeing consequent upon a change in tax policy:
  - — It projects changes in *total factor productivity* — a measure of the efficiency with which a given bundle of resources is used.
  - — It projects changes in *real GDP*, reflecting induced changes in the level of resource use, as well as in the efficiency of resource use.
  - — It produces estimates of changes in *net disposable income* by netting out income repatriated to foreigners and depreciation from real GDP. The model also generates estimates of the impact of a policy change on the hours that people work, thereby allowing discounting (augmenting) of changes in disposable income for any reductions (increases) in leisure time.
  - — And, finally, the model has a module which evaluates the impact of a policy change on the real net income of different income groups, taking account of the output as well as the price effects induced by the change. It also makes provision for changes in social security payments in the event that a tax change alters the general price level. However, the income groups in the distributional module are relatively broad. As discussed below, this limits its usefulness as a tool for distributional analysis.

The scenarios

Introduction of a GST

Consistent with the terms of reference for the study, the primary reform scenario modelled by the Commission essentially involves the introduction of a New Zealand-style GST to replace WST.

The scenario also incorporates a small reduction in the fuel excise rate, so that the GST would not increase fuel prices to final consumers. At the same time, this would lower fuel costs for business users, with the resulting savings contributing to the projected benefits from the reform scenario.

That said, the scenario still leaves businesses paying a substantial amount of excise. The Commission emphasises that this treatment should not be construed as endorsement of fuel excise as a road user charge — as discussed in chapter 2,

excise has significant defects in this regard. Rather, the treatment reflected pragmatic considerations given the limited time available for the study — namely, the difficulty of separating the taxing and charging components of the excise and the complexities of specifying an alternative road user charging regime. However, it does mean that the projected economic benefits from the Commonwealth indirect tax reform scenario reported below are probably conservative. (Box 4.1 discusses some previous estimates of the gains that might arise from replacing fuel excise with an explicit road user charge.)

For modelling purposes, the Commission assumed that, as in New Zealand, the GST would apply to virtually all sectors of the economy, with the notable exemptions being financial services and ownership of dwellings. Such exemptions mean that, while these activities would not be directly subject to GST, they would be subject to GST on many of their inputs. GST paid on inputs to financial services in particular would feed through to the costs of other activities, including exports.

The Commission also assumed that exports (and sales to general government) would be zero-rated. This means that no GST would be payable on exports, and that exporters would be able to claim refunds of GST paid on inputs purchased from non-exempt suppliers.

The Commission imposed an (ex ante) revenue-neutrality constraint on the scenario. This means that the GST would only have to raise sufficient revenue to fund the removal of WST and the reduction in fuel excise that would initially leave the price of fuels to households largely unchanged. This assumption was necessary to ensure that the effects projected by the model reflected only changes in the form of taxation, rather than changes in both the form and the total amount of tax collected.

The revenue-neutrality constraint implied a GST rate of around 5 per cent and a reduction in fuel excise of around 4 cents a litre. This GST rate is well below the 12.5 per cent rate applying in New Zealand, and that commonly being discussed in the current tax reform debate in Australia. This is a direct consequence of the limited nature of the reform scenario modelled by the Commission compared with the broader reforms commonly featuring in the public debate and undertaken in New Zealand.

Although this alternative regime would be ex ante revenue neutral, it would not be so after the event for two reasons. First, the model holds the outlays of the government sector fixed in real terms. Price changes under the alternative regime would change the level of expenditure required to fund those outlays. Second, changes in the level of economic activity under the alternative regime would alter the amount of revenue collected.

Improving the WST regime

The GST regime described above addresses the two key problems with the WST — its incidence on business inputs and its selective, non-uniform rate structure.

In the past, there has been debate about the relative significance of the two problems. Thus, the Commission also addressed the question of how far a uniform WST system, applied across-the-board to services as well as goods, would go towards addressing the inefficiencies associated with the present system, even though it would continue to tax business inputs.

Specifically, the Commission modelled a second scenario in which a uniform, revenue-neutral, WST was applied to virtually all goods and services. To render the scenario consistent with the GST modelling, financial services, ownership of dwellings, exports and sales to government were excluded from the WST net. Similarly, fuel excise was reduced so that the price of fuels to households remained unchanged. The WST rate implied by this scenario was 1.8 per cent.

Model results

Results for the two scenarios are set out in tables 4.1 to 4.3.

The GST

Under the Commission's favoured assumption that capital is less than perfectly mobile, implementation of a New Zealand-style GST is projected to lead to an increase in GDP of 0.9 per cent, or more than $4 billion a year (table 4.1). In essence, eliminating WST on intermediate inputs improves profitability and provides an incentive for capital accumulation. Eliminating WST on capital inputs reduces the cost of investment. Not surprisingly, given the importance of capital accumulation, the projected GDP gain is considerably higher under an assumption of perfect capital mobility and negligible under the short-term assumption of fixed capital stocks.

Under the intermediate capital mobility assumption, the model projects a somewhat smaller gain in disposable national income of 0.3 per cent or some $1.3 billion a year. There are two main reasons for this. First, the gain in disposable national income excludes the large increase in depreciation that accompanies the economy's higher capital stocks. Second, it excludes increased debt repayments to foreigners who fund part of the increase in those capital stocks. Given that the simulations assume that labour supply is relatively inelastic, the income benefits are reflected primarily in higher real wages, rather than in increased employment.

Table 4.1: **Projected effects of the Commission's GST scenario**[a]

	Full capital mobility	*Intermediate capital mobility*	*No capital mobility*
Efficiency and wellbeing			
Total factor productivity	..	..	..
Real Gross Domestic Product	2.0	0.9	..
Real Gross National Product	2.0	0.8	-0.3
Real Disposable National Income (DNI)	0.9	0.3	-0.3
Leisure discounted DNI	0.9	0.3	-0.4
Activity levels			
Real household consumption	0.3	-0.1	-0.5
Real investment	3.0	1.5	–
Real exports	8.8	4.8	1.9
Non-traditional manufactured exports	13.4	10.5	6.2
Real imports	2.6	1.4	0.2
Government borrowing requirement	-$1.6b	-$1.3b	-$0.8b
Primary factor usage			
Capital stock	3.0	1.5	–
Australian owned capital stock	3.1	1.3	-0.2
Total hours per person	..	..	0.1
Total labour supply (persons and hours)	0.1	..	..

.. Denotes negligible.

– Denotes held at zero by assumption.

a All results are percentage deviations from the no policy change scenario, except for government borrowing, which is an absolute change in billions of 1992–93 dollars.

Source: PC Tax Model.

As is apparent from table 4.1, household consumption is projected to decline somewhat in the scenarios that assume less than perfect capital mobility. This is because the ex ante revenue-neutral GST generates a sizeable fiscal dividend for the government (as reflected in a fall in the government borrowing requirement). However, if this fiscal dividend were redistributed in the form of a cut in personal income tax rates, household consumption would rise. Under the intermediate capital mobility assumption, this increase would be sufficient to give a significant, positive outcome for household consumption (see appendix C).

The projections also indicate that increased exports contribute significantly to the overall increase in activity in the economy. The growth in exports is particularly strong for 'non-traditional' manufactured exports which face more price-sensitive demand. (In the PC Tax Model, the latter are manufactured exports excluding a number of major processed mineral and food exports such as aluminium and sugar). Depending on the extent of capital mobility, the projected expansion in non-traditional manufactured exports ranges from about 6 to more than 13 per cent. In essence, the expansion in exports occurs because the export price falls resulting from the tax changes have an equivalent effect to a real depreciation in the Australian dollar.

Reflecting this export growth, output in the manufacturing sector is projected to increase by 2.5 per cent, with increases in individual industries ranging from 1.1 per cent for non-metallic mineral products to 4.4 per cent for machinery and equipment (table 4.2). The increase in investment consequent upon the introduction of the GST is another important contributor to the projected growth in the machinery and equipment sector.

Notably, however, the increases in domestic output fall well short of the boost to exports. One reason is that the prices of many goods and services sold domestically are increased by the GST. These price increases dampen domestic demand. Indeed, in a number of service industries that do not benefit directly from export growth, the price raising effect of the GST means that output would be lower than otherwise. However, it is important to note that lower projected output in the health and education sectors reflects reductions in private rather than public spending. As noted above, the simulation assumed that government outlays were unchanged in real terms.

Table 4.2: **Projected effects on industry output of the GST scenario (intermediate capital mobility)**

Industry	*Change in output*	*Industry*	*Change in output*
	%		%
Agriculture	**1.6**	Electricity, gas and water	0.5
Mining	**3.0**	Construction	0.6
Food, beverages & tobacco	2.0	Wholesale trade	2.4
Textiles, clothing & footwear	1.4	Retail trade	0.9
Wood & paper products	1.9	Accomm, cafes & rests.	-0.3
Printing & publishing	1.5	Transport & storage	1.4
Petroleum, coal & chemical products	2.7	Communication services	0.3
Non-metallic mineral products	1.1	Finance & insurance	0.6
Metal products	3.1	Ownership of dwellings	-0.5
Machinery & equipment	4.4	Property & bus. services	0.5
Other manufacturing	2.0	Administration & defence	0.1
Total Manufacturing	**2.5**	Education	-0.2
		Health & comm. serv.	-1.2
		Cultural & rec. services	-0.3
		Personal & other services	-0.3
		Total Services	**0.5**

Source: PC Tax Model.

A uniform WST regime

Implementation of the uniform WST is also projected to lead ultimately to a significant (though smaller) increase in non-traditional manufactured exports (table 4.3).

Importantly, however, the gains in GDP and disposable income are much smaller than those projected under the GST scenario. This is because there is no boost to capital accumulation since the tax burden on intermediate and capital inputs is maintained. Put another way, avoiding the tax burden on business inputs is much more important for community wellbeing than achieving uniformity in the WST regime.

Compliance costs

Prima facie, both the GST and the uniform WST regime would increase compliance costs. This is mainly because the number of firms liable to collect and remit tax would increase. Also, in the case of the GST, firms could face some up-front costs for equipment and software necessary to process tax payments. These increased compliance costs would detract from the gains projected above.

Table 4.3: **Projected effects of a uniform WST**

	Full capital mobility	*Intermediate capital mobility*	*No capital mobility*
Efficiency and wellbeing			
Total factor productivity	..	..	..
Real Gross Domestic Product	..	0.1	..
Real Gross National Product	0.1	0.1	..
Real Disposable National Income (DNI)	..	..	..
Leisure discounted DNI	..	..	-0.1
Activity levels			
Real household consumption	-0.1	..	..
Real investment	-0.4	-0.1	–
Real exports	1.4	1.1	0.7
Non-traditional manufactured exports	6.6	5.6	3.6
Real imports	0.6	0.6	0.5
Government borrowing requirement	-$0.4b	-$0.3b	-$0.2b
Primary factor usage			
Capital stock	-0.4	-0.1	–
Australian owned capital stock	0.2	0.1	-0.1
Total hours per person	..	..	..
Total labour supply (persons and hours)	-0.1	..	..

.. Denotes negligible.

– Denotes held at zero by assumption.

a All results are percentage deviations from the no policy change scenario, except for government borrowing, which is an absolute change in billions of 1992–93 dollars.

Source: PC Tax Model.

However, it is important to put such costs in perspective. In essence, the simulations involve replacing a single tax levied selectively, with a single tax levied across-the-board. If, on the other hand, a GST were to replace a range of indirect taxes, any net increase in compliance costs would be greatly reduced. Indeed, it is not inconceivable that total compliance costs could fall. For individual firms, the size and direction of outcomes would also depend on the timing of GST remittances to the government (see chapter 2).

Distributional impacts

The distributional effects of reforms that would reduce the taxation of business inputs and exports are not the focus of this study. In a wider sense, however, distributional effects are an important element of the tax reform debate.

Modelling the distributional effects of major tax reform such as the introduction of a GST is an extremely complex task. For example:

- No tax reform is unambiguously progressive or regressive. Rather, it depends on the regime it is replacing.
- Outcomes can depend crucially on the distributional indicators used. For example, in appendix D, Johnson argues that if the population is ranked according to income levels, then both WST and fuel excise can be regressive. But, if expenditure rankings are used, both taxes appear to be progressive. Johnson concludes that introducing a GST — which is proportional to expenditure — would therefore be regressive if households are ranked by total expenditure, and progressive if households are ranked by total income.
- Distributional outcomes will depend not only on the price changes resulting from a tax reform, but also on the output effects and demand responses to those price changes. For example, the introduction of a GST would see a shift in discretionary consumer spending towards items whose prices fall and away from those whose prices rise. As noted by Johnson et al (1998) — see box 4.1 — this is likely to dampen the redistributional impacts suggested by studies looking only at 'morning-after' effects. Similarly, the likely boost to national income from a GST would tend to mitigate any adverse distributional effects resulting from higher prices.
- Any modelling of distributional outcomes should ideally take into account the interaction between the tax system and the social security system. For example, many social security benefits are indexed to the cost of living. This could provide a means for compensating social security recipients for higher prices resulting from a GST.

Against this background, the distribution module of the PC Tax Model suggested that the replacement of WST and some fuel excise with a GST could be mildly progressive — that is, there would be an improvement in the net incomes (including social security transfers) of the poor *relative to* the rich. (This result runs counter to the widespread perception that a GST would be regressive, because it would introduce a tax on food which is not currently subject to WST. But, at the same time, the GST would tax a range of services that account for a higher proportion of the expenditure of the rich.)

However, because of the relatively broad income groups in the distributional module, it is not possible to assess what happens to a range of potentially vulnerable groups in the community. The independent referee expressed similar reservations (see below). The Commission did not pursue these distributional projections further in the study.

Refereeing of the modelling

The Productivity Commission Act specifies that, where a report relies on formal mathematical economic modelling, the Commission must either:

- if practical, use at least two different economic models, with the assumptions and results of those models made explicit in the report; or
- if not practical, appoint and report the views of an independent reference panel on the modelling.

For this study, the Commission has used both the PRISMOD and the PC Tax Models to look at the likely effects of Commonwealth indirect tax reform. It has also compared the results emerging from the PC Tax Model with those reported using different GE models (see below).

Nonetheless, given the sensitivity of the issues and the recent development of the PC Tax Model, the Commission took the additional step of having David Johnson from the Melbourne Institute of Applied Economic and Social Research review a draft of the GE modelling. Dr Johnson is a researcher with considerable experience in the analysis of the economic and distributional effects of tax reform. He is currently involved in a major collaborative project on tax reform involving the Melbourne Institute, the Brotherhood of St Laurence and the Committee for Economic Development of Australia.

Specifically, the Commission asked Dr Johnson to assess whether:

- the modelling approach and model used were appropriate for analysing the impacts of Commonwealth indirect tax reform;
- the model assumptions and closures were appropriate; and
- the results and the accompanying explanations were plausible.

His comments are reproduced as appendix D.

Dr Johnson concluded that the Commission's tax model has most of the required features to properly assess tax reform and that the longer run emphasis in the simulations is appropriate in the tax area. He further concluded that the macroeconomic projections are plausible and possibly understate the gains because of the lack of substitutability between inputs in the model formulation.

However, as noted above, he expressed significant reservations about the way distributional issues are handled in the model and thus about the policy relevance of the distributional outcomes reported in the draft provided to him. The report has taken his concerns into account.

Comparison with previous modelling exercises

A number of previous modelling exercises have examined the economic impacts of indirect tax reform, both Commonwealth and State (see box 4.1). Of particular relevance to this exercise are the studies by Meagher and Parmenter (1993) and Chisholm (1993).

Comparing the results of these exercises with the modelling results in this study is beset with the usual 'apples and pears' problem.

Nonetheless, at first blush, it appears that this study projects somewhat larger gains from Commonwealth indirect tax reform:

- Meagher and Parmenter projected a GDP gain of around 1.8 per cent for a package involving the introduction of a broadly-based GST (at 15 per cent) to replace WST, all fuel excise and payroll tax, as well as funding cuts in personal income tax. A disaggregation of the effects of the individual components of the reform package implies that only a quarter of the total gain — or less than 0.5 of a percentage point of GDP — was due to the abolition of WST. In the modelling for this study, abolition of WST is largely responsible for a projected GDP gain of nearly twice this size (under the Commission's preferred intermediate capital mobility assumption).
- Chisholm estimated a gain in consumption efficiency equivalent to 0.2 per cent of GDP from replacing WST, payroll tax and the revenue-raising component of fuel excise with a GST.

However, on closer examination, the projected gains in this study are, in fact, conservative compared with these previous studies. The Meagher and Parmenter simulations were of a short-run nature in that capital was held fixed in each industry. That is, they made no provision for gains from the profitable reallocation of capital across industries in response to the change in the tax regime. Under this same assumption, the PC Tax Model projects a negligible change in GDP (see table 4.1). Similarly, virtually all of the gain in the Commission's projections comes from increased resource use rather than more effective use of existing resources — the source of the gain reported by Chisholm. As noted by Head (1993, p. 7), the Chisholm study did not specifically examine the sort of production effects driving outcomes in the modelling for this study.

Fuel excise

The modelling undertaken in this study involves only a relatively minor reduction in fuel excise.

However, the IC (1994b) modelled the impacts of a number of more significant reforms to fuel excise, including its replacement by a combination of a consumption tax on petroleum products and road user charges (see box 4.1). Given the nature of those simulations, the projected gains would be largely additional to those reported in this study.

4.2 Wider reform

The tax reforms countenanced in this study are relatively modest. Commentators such as Albon (1996) have made the case for wider reform, extending to state and local government indirect taxes, personal and corporate income tax and the distribution of taxing powers between levels of government.

Wider tax reform would produce commensurately bigger gains than the reforms considered in this study. For example, in the Meagher and Parmenter study, the abolition of payroll tax and a reduction in income tax made possible by the introduction of a GST were each projected to deliver a similar gain to the abolition of WST.

The significance of comprehensive tax reform is even more starkly illustrated by comparing the potential gains from the modest tax reforms considered in this study with the potential gains from other non-tax reforms. Such comparisons are best made in terms of projected changes in GDP, which are less sensitive than projected consumption gains to differences in the treatment of the government sector across reform scenarios.

At around 0.9 per cent of GDP, the projected gain from replacing only the WST and a small portion of fuel excise with a GST is similar to the projected gain from abolishing all remaining tariffs (Revesz 1998). It is also equivalent to the projected gain from full implementation of the Hilmer package at the Commonwealth level and around one-fifth of the projected gain from full implementation of the package in the States and Territories (IC 1995).

Again, the Commission emphasises that the precise magnitudes emerging from these sorts of modelling exercises must be treated with caution. Moreover, the relativities across reforms may depend on whether GDP or some other indicator of economy-wide benefit is used. Nevertheless, the sort of relativities outlined above suggest that Commonwealth indirect tax reform, and tax reform more generally, has the potential to deliver substantial gains to the community.

Box 4.1: **Previous modelling of indirect tax reform**

A number of previous studies have modelled the impacts of indirect tax reform. These include:

Chisholm (1993): This study looked at some of the impacts of replacing a range of Commonwealth and State indirect taxes with a consumption tax. Two of the reform options approximated the original and revised Fightback! package of the then Liberal opposition. The study confined itself to looking at the gains from reducing tax rate variability on consumer goods and services. Thus, it abstracted from the gains available from reducing taxation on business inputs, capital inputs and exports.

To calculate these consumption efficiency gains, Chisholm first calculated the final incidence of the indirect taxes in question across private expenditure, government expenditure and exports. (These calculations assumed that the cost of taxes on business inputs and capital investment were passed on in full.) He then used estimated demand elasticities to determine the efficiency costs of the resulting disparities in effective tax rates on different commodities.

Chisholm found that replacing WST, the revenue-raising component of fuel excise and payroll tax with a single rate GST would increase GDP by 0.2 per cent. If food was excluded from the GST base, the projected increase in GDP fell to 0.15 per cent.

Meagher and Parmenter (1993): This study used the ORANI model to project the short-run effects of the Fightback! package. Specifically, it modelled the effects of a package comprising: the abolition of WST, excise on petroleum products and payroll tax; cuts to income taxes; the imposition of a GST; and cuts in government outlays.

Reflecting the short-run focus of the study, Meagher and Parmenter held capital stocks in each industry fixed. Another important assumption was the existence of excess supplies of all categories of labour.

Under the authors' preferred model closure — nominal wages being unaffected by the fiscal changes that affect household disposable income — the projected GDP gain from the package was around 1.8 per cent. Abolition of WST, fuel excise and payroll tax, and the cuts to income tax funded by the GST and reductions in government outlays, each contributed around a quarter of the overall gain.

Box 4.1 (continued)

IC (1994b): In its inquiry on petroleum products, the Commission used a version of ORANI to look at the impacts of altering petroleum taxation arrangements. The Commission adopted a long-run closure for the simulations under which capital moved between industries to maintain an economy-wide fixed rate of return, and wage rates adjusted to maintain a fixed level of unemployment.

One simulation suggested that replacing Commonwealth fuel excise with a consumption tax on petroleum products would boost GDP by close to 0.3 per cent. This gain was driven by the removal of a tax on an intermediate input.

However, that simulation did not countenance the possibility that fuel excise could be in place for reasons other than revenue raising — for example, as a defacto charge for road construction and maintenance, or to redress externalities associated with road use, such as congestion and accident costs. Accordingly, in a further simulation, the Commission projected the effects of a regime which combined a revenue-raising tax on the final consumption of petroleum products with a road user charge set to recover the costs of road construction and maintenance. Based on overseas evidence, the simulation also assumed that the introduction of the road user charge would improve efficiency in road construction and maintenance by 10 per cent. This assumed increase in efficiency was primarily responsible for a projected gain in GDP of close to 0.5 per cent.

Johnson et al (1998): This study is one of a suite of papers (published or foreshadowed) on tax reform emanating from the Melbourne Institute of Applied Economic and Social Research. It focuses on the distributional impacts of indirect tax reform.

The study evaluates the distributional effects of replacing WST, payroll tax, taxes on financial transactions, stamp duty and fuel excise with a revenue-neutral GST. It does so by comparing the incidence of the current indirect tax regime with the incidence of a GST, using an expenditure-based ranking system for households.

The study considers two scenarios — one in which the GST applies with few exemptions, and the other in which food and health expenditures are zero-rated. On the assumption that consumption patterns do not change, it finds, amongst other things, that replacing fuel excise and WST with a broad-based GST would be mildly regressive. However, with food and health exempted, the GST would leave the tax incidence largely unchanged.

The study then recalibrates the results after allowing for changes in consumer purchasing patterns in response to tax-induced price changes. It finds that this dampens, though does not eliminate, the redistributional effects of the GST.

APPENDIX A TERMS OF REFERENCE

23 February 1998

Mr W Scales
Chairman
Industry Commission
L28, 35 Collins Street
MELBOURNE VIC 3000

Dear Mr Scales

The Government has initiated community wide consideration of taxation reform. An important element in an efficient tax system is the impact on Australia's exporting industries.

I would like the Industry Commission, under its incidental research powers, to undertake a short research study into the impact of Commonwealth indirect taxes on exporters, with particular regard to the effect of indirect taxes on manufacturing exports. The study should compare the effects on one or two reasonably typical Australian firms with equivalent firms in one (or more) other countries, eg New Zealand.

The objective of the study is to contribute to the tax reform debate by providing a well researched insight into the situation of our exporters. The study would be an information exercise and would not provide policy recommendations.

The study should be completed by 29 May 1998 and would be published.

Yours sincerely

PETER COSTELLO

APPENDIX B STUDY PARTICIPANTS

The terms of reference for this study requested the Commission to compare the effects of Commonwealth indirect taxes on one or two typical Australian firms with the effects of the tax regimes applying to equivalent firms in comparable countries, such as New Zealand.

To obtain information for this comparison, the Commission initially approached a number of peak business groups for help. Through the Business Council of Australia, three organisations provided general information to the Commission on the effects of Commonwealth indirect taxation. They were:

- Amcor Fibre Packaging Australia;
- Caltex Australia Ltd; and
- National Rail Corporation Ltd.

Subsequently, the Commission approached several major manufacturers for information on their export activity and the likely impact on that activity of cost reductions made possible by indirect tax reform. Three firms provided information on this basis:

- Amcor Fibre Packaging Australia;
- Goodman Fielder Limited; and
- Kraft Foods Limited.

Early in the study, the Commission also sought general comment and information on the impacts of Commonwealth indirect taxes through the release of an Issues Paper. It received responses from the Australian Chamber of Manufactures, the Australian Food Council, Qantas Airways Limited, the Western Australian Chamber of Commerce and Industry, and the Western Australian Trade Advisory Council.

The Commission thanks those who contributed to this study.

APPENDIX C MODELLING

There are two potential problems with the current wholesale sales tax regime:

- it is applied selectively — WST does not apply to all goods, its rates vary from 12 to 45 per cent on taxed items, and services remain completely untaxed; and
- despite the current system of exemptions, WST still applies to a range of business inputs, particularly on capital equipment and office supplies that are not directly embodied in final outputs.

The second problem is particularly pernicious, because it creates a non-transparent, tax-on-tax effect that cascades through the production chain. While businesses may have some idea of the amounts of WST they pay on their direct inputs of (say) office supplies and computers, they generally have little idea about the WST paid on inputs to those inputs, and so on. Their indirect liability could turn out to be a relatively large proportion of the total incidence of WST on their cost structure.

One way to assess the direct and indirect effect of WST on firms' input structures in the short run is to trace the impact through the production chain using input-output tables — these record all the important input linkages in the economy. The PRISMOD model developed by the Commonwealth Treasury does precisely this. It is an input-output price model that uses input-output linkages to calculate the direct and indirect impact of tax changes on industry cost structures, assuming that the price effects at each step in the chain are passed on in full, rather than being absorbed, say, in lower profits or muted by lower sales. In other words, the calculation assumes there are no quantity responses in the economy that would prevent the price impacts from being passed on completely. The assumption of no quantity response is more reasonable in the short term than the long term.

To assess the longer term impact of alternative tax regimes on levels of activity in the economy, including levels of manufactured exports, requires a model that can take account of quantity responses. Models such as ORANI or MONASH have the same input-output structure as PRISMOD, so they can trace through direct and indirect price effects. But they also have behavioural equations that specify likely quantity responses to price changes — for example, how much more of a product consumers buy if it becomes cheaper and how much more firms produce in response to that increased demand. As noted, some of the price

impacts tend to be muted as quantities change. These quantity responses determine the final impact on levels of economic activity.

This appendix reports the projected impacts of moving to alternative tax regimes using these two different modelling approaches. The PRISMOD results show the full extent of direct and indirect price effects. The PC Tax Model — a model with features from ORANI and MONASH, but enhanced to deal with tax issues — gives projections for levels of overall activity, once quantity and price responses are taken into account.

C.1 Alternative tax regimes

GST regime

The two models were used to examine the effects of replacing WST and some fuel excise with a GST.

The Commission assumed that, like New Zealand's GST, the modelled GST would apply with few exemptions. (This approach was consistent with the suggestion in the terms of reference that New Zealand is an example of a benchmark for assessing current Australian arrangements).

An exemption from the GST means that an industry's sales are not subject to the tax, but they cannot claim back GST paid on their inputs. That is, they are input-taxed instead of output-taxed. This element of input taxation can still feed through indirectly to other industries. In New Zealand, the main exempt activities are financial services, life insurance (but not other types of insurance) and rental accommodation (to ensure it has the same treatment as owner-occupied housing, the imputed services of which do not attract GST). However, sales of new houses attract GST, as do central and local government services.

In modelling its GST scenario, the Commission assumed that all intermediate and capital inputs (other than financial services and rental accommodation) into the financial services and 'ownership of dwellings' industries attracted GST. The entire financial service sector was counted as exempt because of the difficulty, at least in the PC Tax Model, of separating life and other types of insurance. The 'ownership of dwellings' industry is one that includes both rental accommodation and the imputed rental services of owner-occupied housing, and was treated as exempt. Among the non-financial capital inputs into

the 'ownership of dwellings' industry in the PC Tax Model are sales of residential construction. Taxing these is equivalent to taxing new housing.[1]

In New Zealand, manufacturers are still subject to excise on fuels. Under the Commission's scenario, it was assumed that the rate of Australian excise on fuel would fall by enough to offset the effects (on final consumers) of imposing a GST on fuel. The Commission also imposed an (ex ante) revenue-neutrality constraint on the scenario. This meant that the GST would only have to raise sufficient revenue to fund the removal of WST and the reduction in fuel excise.

Thus, in sum, the package that was modelled was a small reduction in excise rates and the imposition of a uniform-rate GST so that:

- the overall impact of eliminating WST, reducing fuel excise and imposing a GST was ex ante revenue-neutral; and
- there was no initial change in the price of fuels to households.

In PRISMOD, the required GST rate was around 5.4 per cent and the required reduction in fuel excise around 5 cents per litre. In the PC Tax Model, the required GST rate was about 4.5 per cent and the required reduction in fuel excise around 4 cents per litre. These model-based estimates are slightly lower than back-of-the-envelope calculations of the GST rate required to replace WST because the input-taxing of exempt items is taken into account when imposing revenue neutrality.

The model-based estimates are slightly different because of differences in the models' databases (although the estimates are of the same broad order of magnitude). The PRISMOD model incorporates the best available estimates of the incidence of the WST for 1996–97, generated by the Commonwealth Treasury. These are described in more detail below. The PC Tax Model is based on ABS's published input-output tables for 1992–93, and contains the Bureau's estimates of the incidence of WST for that year. Compared with PRISMOD, the ABS's tables appear to overstate the direct incidence of WST on inputs into the printing and equipment (electronic, household, and other electrical) industries, and to understate the direct incidence on inputs into construction (residential

[1] Non-exempt goods and services used and paid for by governments would attract GST in New Zealand, but governments would also have to increase appropriations to departments and agencies to cover the GST. These sales were therefore modelled as being zero-rated, equivalent to netting out these two effects. Other aspects of the New Zealand GST could not be modelled, in particular the inclusion of local government rates in the GST base, the exemption from GST of small businesses with under $30 000 annual turnover, and the provision that non-profit organisations are not required to collect GST on sales of goods they receive as donations. These omissions are not likely to have a major impact on the model results.

and non-residential), legal and some other service industries. In general, however, the two models tell the same broad story about the current incidence of WST on business.

The model-based estimates of the 'required' GST rate are also significantly lower than the 12.5 per cent rate applying in New Zealand. However, that rate covers the revenue lost from replacing a range of indirect taxes and from a reduction in direct tax rates. The Commission's exercise has a more narrow focus, excluding changes in direct tax rates and replacing only some indirect taxes. It would be inappropriate, for the purposes of this study, to model a GST set to recover much more than the revenue lost from abolishing WST and reducing fuel excise. To do so would mean that the modelling results, at least from the PC Tax Model, would be dominated by the fact that the package was not ex ante revenue neutral (in the absence of shocks to other taxes).

However, although the alternative regime has been chosen to be revenue neutral ex ante, it would not be budget neutral ex post, for two reasons.

- In both PRISMOD and the PC Tax Model, while government outlays are held fixed in real terms, price changes induced by the shift in the tax regime would alter the amount of nominal expenditure required to fund those outlays. Both models would pick up this effect.
- Changes in the level of economic activity would alter the amount of revenue collected under the new tax regime. Only the PC Tax Model would pick up this effect.

Uniform WST regime

The alternative tax regime just described is one that addresses both of the key problems with the WST — its non-uniform rate structure and its incidence on business inputs. But to understand which problem is the greater, the PC Tax Model was also used to assess the impact of an alternative WST regime that solves one, but not both, problems.

Suppose the WST could be redesigned to solve the incidence problem. Since at least 50 per cent of WST is currently collected from business inputs, eliminating these input taxes would see WST rates on households more than double. Given the current patchy coverage of WST, this would require very high tax rates on relatively few goods. Thus, it would not be a very attractive alternative.

The Commission therefore modelled the effects of a WST that addresses the selectivity problem. This WST would have a low and uniform rate and apply to all goods and services. Importantly, and in contrast to the GST, it would apply

to all business inputs as well as to household purchases. (Thus, this uniform WST should not be viewed as being 'half way' to a GST.)

To keep the uniform WST regime comparable with the GST alternative, the same sorts of restrictions were imposed. Financial services and 'ownership of dwellings' were excluded from the uniform WST tax net, as were all export sales and sales to government. Fuel excises were reduced so that the price of fuels to households remained unchanged after the imposition of the uniform WST. And the entire package was kept ex ante revenue neutral. The required WST rate for this scenario was 1.8 per cent.

C.2 Direct and indirect price effects

PRISMOD

The theoretical structure of PRISMOD is described in detail in Henry and Wright (1992). As noted earlier, it is an input-output price model that traces the direct and indirect effects of price changes through the production chain, on the assumption that the price effects are passed on fully at each stage.

The model portrays a very rich story about direct price effects. Thus, there are many channels through which the indirect effects can flow. The model currently identifies over 1000 commodities, each either imported or produced by one (or more) of 107 domestic industries. The unit costs of each industry are recognised as comprising:

- the costs of each domestically produced intermediate (or material) input, with its associated taxes (including WST);
- the costs of each imported intermediate input, with its associated taxes (including WST);
- excises levied on domestic production;
- purchases (or sales) of second-hand assets, and purchases of complementary imports (these being imports of goods for which there is no domestic production, for example, cocoa), and their associated taxes (including WST);
- the costs of domestically produced 'margins' (primarily trade and transport activities) used in the movement of intermediate goods from their place of production to the using industry, along with their associated taxes (being services, these margins activities do not attract WST directly, but may do so indirectly);
- the costs of imported margins, along with their associated taxes;

- labour costs;
- capital costs; and
- indirect taxes not elsewhere covered (for example, motor vehicle taxes).

PRISMOD differs from many price input-output models by recognising that, in the long run, the capital costs faced by an industry will depend on the replacement cost of its capital stock. Thus, capital costs are in turn broken into:

- domestically produced capital inputs and associated taxes (including WST);
- imported capital inputs and associated taxes (including WST);
- excises on the production of capital goods;
- purchases of second-hand assets or complementary imports for the purpose of capital creation; and
- indirect taxes on investment.

Thus, there is a rich web of inter-industry linkages in the model — involving intermediate inputs, margins activities and capital inputs — through which the impost of WST, excises and the like can spread through the production chain.

In addition, PRISMOD pays particular attention to the definition of indirect tax bases. It recognises, for example, that WST is levied on a valuation that includes the wholesale trade margin and those transport margins required to ship the commodity to the wholesaler, but excludes retail margins and those transport margins required to ship the commodity from the wholesaler to the retailer. In this respect, PRISMOD is superior to the PC Tax Model, which does not split transport margins into their pre-wholesale and post-wholesale components, although the detail is less important in simulations in which WST is eliminated entirely.

Finally, unlike some input-output price models, PRISMOD starts with a totally consistent database, and its simulation results preserve that internal consistency. Indeed, the model results are presented in terms of a completely updated database.

Results

Direct effects

Table C.1 summarises the information drawn from PRISMOD's initial database about the direct price effects of WST and the component of fuel excise that would be replaced by the GST regime outlined above.

Table C.1: **Direct incidence of WST and a component of fuel excise on business inputs[a], by sector, 1996–97**

	WST	*Component of fuel excise*	*Total*	*Implied tax rate[b]*
	$ million	*$ million*	*$ million*	*%*
Agriculture	**459**	**42**	**500**	**1.6**
Mining	**685**	**13**	**699**	**1.4**
Food, beverages & tobacco	317	26	343	0.7
Textiles, clothing & footwear	38	2	40	0.3
Wood & paper products	143	7	150	1.3
Printing & publishing	127	6	133	1.0
Petroleum, coal & chemical products	240	8	248	0.6
Non-metallic mineral products	97	6	103	1.1
Metal products	192	12	205	0.6
Machinery & equipment	407	5	412	1.0
Other manufacturing	31	1	32	0.5
Total Manufacturing	**1 592**	**73**	**1 666**	**0.8**
Electricity, gas and water	80	20	100	0.5
Construction	773	25	798	1.3
Wholesale trade	490	53	543	1.2
Retail trade	957	45	1 002	1.6
Accommodation, cafes & restaurants	198	3	202	0.9
Transport & storage	561	242	803	1.6
Communication services	456	21	478	2.4
Finance & insurance	305	2	306	0.7
Ownership of dwellings	70	4	74	0.1
Property & business services	952	63	1 015	1.3
Administration & defence	0	19	19	0.0
Education	16	0	16	0.1
Health & community services	156	25	181	0.4
Cultural & recreational services	346	7	353	2.0
Personal & other services	238	43	280	1.4
Total services	**5 596**	**573**	**6 169**	**1.0**
TOTAL	**8 333**	**701**	**9 034**	**1.0**

a WST and 4 to 5 cents a litre of fuel excise.

b Tax revenue as a percentage of the total production cost of the taxed industry.

Source: PRISMOD, Commission estimates.

Total revenue raised from WST is more than $13 billion a year. The PRISMOD database shows that, of this, more than $8 billion or over 60 per cent is collected on inputs to business. Slightly less than half of this impost ($3.6 billion) is collected on intermediate inputs, with the remainder ($4.7 billion) being collected on capital inputs such as plant and equipment.

The direct incidence of WST on individual sectors, shown in the first column of table C.1, is the sum of the direct impost on all intermediate inputs and an imputed impost on capital costs. While the PRISMOD database directly allocates WST collected on intermediate inputs to industry sectors, it does not allocate WST collected on capital inputs in the same way. Therefore, the Commission undertook its own allocation to industry sectors, based primarily on sectoral shares of total private capital investment in machinery and equipment. (Virtually all WST on capital inputs is collected on machinery and equipment.)

The Commission then summed these figures to get an estimate of the total direct impact of WST on costs for individual industry sectors. It is important to recognise that there is an element of 'apples and pears' in this summation. While WST on intermediate inputs is an immediate expense, WST on capital equipment is spread over the life of that equipment. However, in a long-run steady state, investment spending would converge to that required to cover the depreciation on a long-run equilibrium capital stock. Hence, in the long run at least, the cost impost on investment would equal the cost impost on depreciation, a major component of current costs. If annual investment in plant and equipment is reasonably uniform over time, then the figures in the table will provide a reasonable approximation of the total percentage impost of WST across sectors.

The PRISMOD database also shows that around two-thirds of fuel excise, or more than $6 billion a year, falls initially on business. Roughly 4 cents a litre of this excise, or around $700 million, would be replaced by the GST. The impact of this component of fuel excise on intermediate input costs is shown in the second column of table C.1.

Overall, the total impost from WST and 4 cents a litre of fuel excise is $9 billion, or 1 per cent of total production costs. For the manufacturing sector, the direct cost is $1.7 billion, or 0.8 per cent of total production costs. In addition, there are significant imposts on agriculture, mining, and some of the service sectors that provide inputs to manufacturing. Thus, the total (direct and indirect) impact on manufacturing costs is likely to be much greater than the direct cost estimates in table C.1.

Direct and indirect effects

Table C.2 shows the total, direct and indirect, effects on industry costs of WST and roughly 4 cents a litre of fuel excise. These estimates were obtained by comparing total industry production costs in the initial PRISMOD database with those in the updated database, after the simulated replacement of WST and the component of fuel excise with a GST.

The estimates confirm that, through the cascading of taxes on taxes, WST and a component of fuel excise add to production costs by much more than the amount of revenue collected. For example, WST paid on agricultural machinery not only inflates agricultural costs at the point of revenue collection, but also goes on to inflate the cost of agricultural products used in food processing. Similarly, the small amount of fuel excise collected on mining not only inflates mining costs at the point of revenue collection, but can also inflate the metal ore costs of minerals processing industries, the sheet metal costs of metal fabrication industries and the fabricated metal costs of machinery and equipment industries. In turn, this can further inflate the costs of mining and other industries using such equipment.

In other words, although the tax revenue is collected only once, it can impact on production costs many times. Tables C.1 and C.2 suggest that, for the economy as a whole, the total impact on production costs is more than double the direct revenue collected from business inputs. For the manufacturing sector, the total effects on industry costs are almost quadruple the direct revenue effects. The higher multiplier for the manufacturing sector reflects the relatively dense web of inter-industry linkages in manufacturing, with many layers of transactions between different companies at different points in the production chain, all of which may become a target for an input tax.

It should be stressed that these implicit multipliers are only approximate. As noted above, the direct effects have had to be estimated, since PRISMOD does not allocate WST on capital inputs to particular industry sectors. Also, the direct effects do not recognise the element of input taxation that would remain under the modelled GST, via exemptions for financial services and rental accommodation. And, the direct effects were based on a 4 cent reduction in fuel excise, whereas the PRISMOD simulation assumed a 5 cent reduction (although this makes very little difference to the size of the multipliers obtained). The multipliers are nevertheless realistic orders of magnitude for the cascading effects of taxes on business inputs.

Table C.2: **Direct and indirect effects of WST and a component of fuel excise[a] on production costs, by sector, 1996–97**

	Total cost increase	*Implied tax rate[b]*
	$ million	*%*
Agriculture	**622**	**2.0**
Mining	**1 614**	**3.3**
Food, beverages & tobacco	1 176	2.4
Textiles, clothing & footwear	252	2.0
Wood & paper products	291	2.5
Printing & publishing	364	2.7
Petroleum, coal & chemical products	1 193	2.9
Non-metallic mineral products	292	3.2
Metal products	1 013	2.9
Machinery & equipment	1 039	2.6
Other manufacturing	138	2.2
Total Manufacturing	**5 759**	**2.6**
Electricity, gas and water	499	2.6
Construction	2 269	3.6
Wholesale trade	1 053	2.4
Retail trade	1 773	2.8
Accommodation, cafes & restaurants	469	2.0
Transport & storage	1 457	2.9
Communication services	784	3.9
Finance & insurance	523	1.2
Ownership of dwellings	1 045	1.9
Property & business services	1 652	2.1
Administration & defence	582	1.3
Education	107	0.4
Health & community services	495	1.1
Cultural & recreational services	529	2.9
Personal & other services	457	2.3
Total Services	**13 694**	**2.2**
TOTAL	**21 689**	**2.4**

a WST and 4 to 5 cents a litre of fuel excise.

b Total cost increase as a percentage of the total production cost of the taxed industry.

Source: PRISMOD, Commission estimates.

PRISMOD can also trace the impact of changes in manufacturing production costs through to the impact on manufactured exports. This takes into account any additional cost changes, including any taxes imposed between the factory gate and the point of export (a direct effect), and changes in the cost of transporting manufactured goods between those points (an additional indirect effect). The PRISMOD database shows that WST and 4 cents a litre worth of fuel excise add nothing *directly* to the cost of exports beyond the factory gate.

This is because exports are exempt from WST at the output stage, while excise on fuel exports is rebated via a duty drawback scheme. By contrast, the simulation shows that WST and the small component of fuel excise add $1 billion *indirectly* to the cost of manufactured exports, and $2.4 billion to the cost of all exports.

C.3 Effects on activity levels and economic wellbeing

PC Tax Model

The PC Tax Model is described in more detail in Revesz (1998). It has been designed to include both Commonwealth and State, direct and indirect taxes, and improves on previous CGE modelling efforts (Meagher 1983, Meagher and Parmenter 1985, Dee 1989) by taking account of dividend imputation. It is particularly useful in the current context because it incorporates newly available disaggregated data on indirect taxes that allow wholesale sales taxes and excises to be separately identified in the ABS input-output tables.

As noted, the PC Tax Model starts with a detailed input-output structure very similar to PRISMOD. But unlike PRISMOD, it also incorporates behavioural equations showing the demand responses of firms, households and foreign buyers of Australia's exports to tax-induced price changes. These behavioural equations are similar to those in ORANI and MONASH. In particular, the PC Tax Model adopts the MONASH model's treatment of export demands, whereby Australia's non-traditional manufactured exports are assumed to be price responsive, with a foreign demand elasticity for the group of -10 (Dixon and Rimmer 1997).

The PC Tax Model also contains equations showing how labour and capital supplies respond to tax-induced price changes.

The labour supply equations are similar to those in FH-ORANI (Dee 1989). There is a small positive response of participation rates and a small negative response of hours worked to increases in real wages. There is a small negative response of both participation and hours worked to real increases in non-wage income. The wage elasticity of hours worked is particularly important in simulations involving changes in direct tax rates. However, as the results reported in this appendix do not involve such changes, they are very insensitive to the value chosen for the elasticity governing the wage responsiveness of hours supplied. Thus, this sensitivity analysis is not reported explicitly.

In examining alternative tax regimes, it was assumed that the impact on employment is determined solely by these labour supply responses — there is

assumed to be no change in the level of unemployment. Thus, most of the labour market effects are reflected in changes in real wages. Had an alternative assumption been adopted, the quantity responses of the economy to the alternative tax regimes would have been greater than projected here.

The model recognises that policy changes that increase real per capita incomes need not improve welfare if the increases come from longer hours of work. The model therefore contains an index that combines the changes on real (net of depreciation) disposable income with changes in hours worked per person to give a better indication of the effects of policy changes on overall wellbeing.

The capital supply equations are somewhat similar to those recommended for long-run applications of the MONASH model (Dixon and Rimmer 1997). The PC Tax Model, like FH-ORANI, is not a dynamic model. It has been designed to give a snapshot view, at a point in the future, of how the economy would look after a policy change, compared with the situation had the policy change not occurred. Previously, FH-ORANI assumed perfect international capital mobility — any amount of capital was available at the going world rate of return. The only question was whether the capital could be financed domestically (in which case the returns to that investment stayed in Australia), or was financed by foreigners (in which case the returns were repatriated overseas). However, other studies have queried the assumption of perfectly elastic capital supplies, especially those that are equity-financed (for example, IC 1991).

For these simulations, the preferred treatment of capital mobility was therefore one in which there is a degree of stickiness — investors require 'appreciably' higher returns before they are willing to increase their capital holdings in any given industry. Nevertheless, results are also reported for two alternative treatments — one of perfect capital mobility, and a shorter term view in which capital stocks in each industry are fixed.

The model contains several measures of activity levels and economic wellbeing, apart from the leisure discounted disposable income index mentioned earlier.

First, it contains a measure of pure allocative efficiency gains. This is defined as the change in real GDP, a measure of real output, minus the change in an index of real primary factor usage. To the extent that this 'total factor productivity' index increases, it shows how the economy is able to do more with the same bundle of resources. In the absence of explicit productivity improvements, it measures the effects of allocative efficiency changes. The changes in this index are typically very small.

However, policy changes can also have important dynamic effects, some of which will affect the willingness of employees to work and the willingness of

investors to accumulate capital in particular industries. Change in real GDP is a measure that takes into account the effects of policy changes on the amount of resources used in the economy, as well as on the efficiency with which resources are used.

As noted earlier, however, not all of the returns to capital in Australia need accrue to Australians. GNP nets out those returns to capital that are repatriated to foreigners. But a better measure of the income available to Australians is Disposable National Income. This also nets out economic depreciation.

The final measure of economic wellbeing is one that combines the impact of policy changes on disposable national income and the impact on hours worked per capita, thus taking account of at least one non-pecuniary effect of economic policy changes.

Results

GST regime

The results reported in table C.3 confirm that the pure allocative efficiency effects of the modelled GST are small.

However, the dynamic effects, particularly on capital accumulation (where this is allowed to occur), ensure that the overall impacts on activity levels and the preferred measures of economic wellbeing (disposable national income and its 'leisure discounted' counterpart) are positive. This result should not be surprising. Eliminating the WST on intermediate inputs improves profitability and provides an incentive for further capital accumulation, while eliminating the WST on capital inputs lowers the cost of doing so.

The projected overall gain in real disposable national income is of the order of 0.3 per cent ($1.3 billion a year) under the intermediate capital mobility assumption, and 0.9 per cent ($3.8 billion a year) under the perfect capital mobility assumption, once capital stocks are allowed to adjust. These percentage gains are smaller than the gains in real GDP and real GNP (0.9 and 0.8 per cent, respectively, under the intermediate capital mobility assumption), because they exclude increases in debt service payments to foreigners, as well as the large growth in depreciation provisions arising from the economy's higher capital stocks.

Table C.3: **Projected effects of the Commission's GST scenario**[a]

	Full capital mobility	*Intermediate capital mobility*	*No capital mobility*
Efficiency and wellbeing			
Total factor productivity	..	..	..
Real Gross Domestic Product	2.0	0.9	..
Real Gross National Product	2.0	0.8	-0.3
Real Disposable National Income (DNI)	0.9	0.3	-0.3
Leisure discounted DNI	0.9	0.3	-0.4
Activity levels			
Real household consumption	0.3	-0.1	-0.5
Real investment	3.0	1.5	–
Real exports	8.8	4.8	1.9
Non-traditional manufactured exports	13.4	10.5	6.2
Real imports	2.6	1.4	0.2
Government borrowing requirement	-$1.6b	-$1.3b	-$0.8b
Primary factor usage			
Capital stock	3.0	1.5	–
Australian owned capital stock	3.1	1.3	-0.2
Total hours per person	..	..	0.1
Total labour supply (persons and hours)	0.1	..	..

.. Denotes negligible.

– Denotes held at zero by assumption.

a All results are percentage deviations from the no policy change scenario, except for government borrowing, which is an absolute change in billions of 1992–93 dollars.

Source: PC Tax Model.

The results also indicate that the expansion in activity comes partly from additional exports, particularly non-traditional manufactured exports. Expansions in more traditional exports are also significant, though more modest. At least some of the traditional exports (for example, wool) have a greater share of world markets and tend to be less price-responsive than the non-traditional exports. In essence, the expansion in exports occurs because export price falls resulting from the tax changes have an equivalent effect to a real depreciation in the Australian dollar.

Reflecting this export growth, output in the manufacturing sector is projected to increase by 2.5 per cent (under the intermediate capital mobility assumption), with increases in individual industries ranging from 1.1 per cent for non-metallic mineral products to 4.4 per cent for machinery and equipment (table C.4). However, the increases in output tend to be smaller than the projected increases in exports. A major reason is that an important category of domestic

sales — private final consumption — bears the GST required to fund the reductions in WST and fuel excise.

Table C.4 also shows that, while the size of the implied tax rates in table C.2 is sometimes a good guide to the strength of the projected output expansions, there are a number of exceptions:

- The output expansions in the food, beverages and tobacco and the textile, clothing and footwear industries are muted because of the imposition of the GST.
- The disproportionate output expansion of the machinery and equipment sector is due in part to its importance in providing inputs to investment.
- While the non-residential construction industry also benefits from the rise in investment spending, the residential construction industry is projected to decline slightly as a result of the imposition of the GST. Thus, the construction industry as a whole is projected to achieve only modestly higher output.

Table C.4: **Projected effects on industry output of the GST scenario (intermediate capital mobility)**

Industry	*Change in output*	*Industry*	*Change in output*
	%		%
Agriculture	**1.6**	Electricity, gas and water	0.5
Mining	**3.0**	Construction	0.6
Food, beverages & tobacco	2.0	Wholesale trade	2.4
Textiles, clothing & footwear	1.4	Retail trade	0.9
Wood & paper products	1.9	Accomm, cafes & rests.	-0.3
Printing & publishing	1.5	Transport & storage	1.4
Petroleum, coal & chemical products	2.7	Communication services	0.3
Non-metallic mineral products	1.1	Finance & insurance	0.6
Metal products	3.1	Ownership of dwellings	-0.5
Machinery & equipment	4.4	Property & bus. services	0.5
Other manufacturing	2.0	Administration & defence	0.1
Total Manufacturing	**2.5**	Education	-0.2
		Health & comm. serv.	-1.2
		Cultural & rec. services	-0.3
		Personal & other services	-0.3
		Total Services	**0.5**

Source: PC Tax Model.

- Several other services industries are projected to experience lower output than otherwise, because of the imposition of the GST. However, it is

important to note that the reductions in the health and education sectors reflect lower private rather than public spending. As noted above, the simulation assumed that government outlays were unchanged in real terms.

While the Commission's GST was designed to be revenue-neutral ex ante, it is projected to generate a sizeable 'fiscal dividend' ex post, primarily because of the increase in economic activity — the government borrowing requirement is projected to fall by more than $1 billion under the intermediate capital mobility assumption (table C.3). This unspent dividend explains why household consumption is projected to decline under the intermediate and no capital mobility assumptions. That is, unless overall national income increases sufficiently, the rising government share of that income can lead to a decline in overall household consumption.[2] However, if the fiscal dividend were redistributed to households in the form of cuts in personal income tax rates, then the outcome for real household consumption would be greatly improved — rising by 0.4 per cent in the case of intermediate capital mobility and by almost 1 per cent in the case of full capital mobility, with similar projected increases in real GDP as before.

The PC Tax Model has a distributional module which evaluates the impact of policy changes on the real net income (including government transfer payments, assumed to be indexed to price changes) of different income groups.

But because the module gives a relatively broad ranking by income level, it is not able to capture the impact on particular disadvantaged groups. For this reason, the results from that module are of limited policy relevance and are not reported here. However, they were made available to David Johnson, who refereed the modelling work. His report contained a number of comments on the distributional results. It is reproduced in full as appendix D.

Nevertheless, some general points emerged from the distributional results and the referee's comments on them.

A priori, it is difficult to say what the distributional consequences of a New Zealand-style GST might be. Such a GST would tax food items that are not currently subject to WST, and this would tend to make it regressive. However, it would also tax housing construction and introduce taxes on a range of services. These tend to account for a higher proportion of total expenditure (though not necessarily the cash expenditure measured in expenditure surveys) among the rich. The overall balance is uncertain.

[2] The unspent dividend also increases national saving by more than investment in some scenarios, raising the Australian owned capital stock by more than the total stock.

The answer may depend in part on how households are compared and ranked. Johnson argues in appendix D that if the population is ranked according to income levels, then both WST and fuel excise can be regressive. But, if expenditure rankings are used, both taxes appear to be progressive. Johnson concludes that introducing a GST — which would be proportional to expenditure — would therefore be regressive if households are ranked by total expenditure, and progressive if households are ranked by total income.

Johnson's first-round or 'morning-after' distributional consequences of a GST would be modified in a number of respects once the quantity responses of producers and consumers were taken into account. Johnson et al (1998) point out that, to the extent that households substitute away from goods and services whose prices rise, this will dampen the distributional consequences of the tax change. Further, the Commission's projections suggest that introducing a GST would raise overall levels of activity in the economy (once capital is allowed to adjust). The impacts of the resulting increases in incomes on the circumstances of households would also need to be taken into account.

Similarly, if an ex ante revenue-neutral GST generates a fiscal dividend — as in the Commission's projections — the distributional consequences would further depend on how that dividend was spent. The modelling above referred to a scenario in which the dividend was spent on cuts to personal income tax rates rather than on, say, real increases in social security payments. (The model does assume that social security payments increase in nominal terms, in line with increases in the consumer price index. This is similar to the current government indexing provisions.)

Uniform WST regime

Table C.5 shows, for comparison purposes, the projected impact of a 'uniform WST' — one that has a uniform rate across all taxable goods and services, but that continues to tax intermediate and capital inputs.

The results indicate that, while the uniform WST ultimately provides a boost to exports, it leads to much smaller projected gains in activity and disposable income than the GST scenario (at least when capital stocks are allowed to vary). This is because, although the uniform WST spreads the direct burden of input taxation more evenly, it does not remove it. Thus, the disincentive to capital accumulation remains. Put another way, avoiding the taxation of business inputs, and the tax-on-tax problem that this generates, is more important for activity levels and economic wellbeing than reducing disparities in tax rates, once the dynamic impact on capital accumulation is taken into account.

Table C.5: **Projected effects of a uniform WST**

	Full capital mobility	*Intermediate capital mobility*	*No capital mobility*
Efficiency and wellbeing			
Total factor productivity	..	..	..
Real Gross Domestic Product	..	0.1	..
Real Gross National Product	0.1	0.1	..
Real Disposable National Income (DNI)	..	..	..
Leisure discounted DNI	..	..	-0.1
Activity levels			
Real household consumption	-0.1	..	..
Real investment	-0.4	-0.1	–
Real exports	1.4	1.1	0.7
Non-traditional manufactured exports	6.6	5.6	3.6
Real imports	0.6	0.6	0.5
Government borrowing requirement	-$0.4b	-$0.3b	-$0.2b
Primary factor usage			
Capital stock	-0.4	-0.1	–
Australian owned capital stock	0.2	0.1	-0.1
Total hours per person	..	..	..
Total labour supply (persons and hours)	-0.1	..	..

.. Denotes negligible.

– Denotes held at zero by assumption.

a All results are percentage deviations from the no policy change scenario, except for government borrowing, which is an absolute change in billions of 1992–93 dollars.

Source: PC Tax Model.

APPENDIX D REVIEW OF THE MODELLING

The Productivity Commission Act specifies that, where a report relies on formal mathematical economic modelling, the Commission must either:

- if practical, use at least two different economic models, with the assumptions and results of those models made explicit in the report; or
- if not practical, appoint and report the views of an independent reference panel on the modelling.

For this study, the Commission has used both the PRISMOD and the PC Tax Models to look at the likely effects of Commonwealth indirect tax reform. It has also compared the results emerging from the PC Tax Model with those reported using different GE models.

Nonetheless, given the sensitivity of the issues and the recent development of the PC Tax Model, the Commission arranged for Dr David Johnson,[1] the Deputy Director of the Melbourne Institute of Applied Economic and Social Research, to review a draft of the modelling of the impacts of Commonwealth indirect tax reform. His report is reproduced in this appendix.

[1] Dr Johnson has 16 years experience undertaking analysis of applied economic and social phenomena, many involving the use of economic models. He has helped build a number of models including ORANI-truck and ORANI-milk, and was involved in many projects using ORANI-F and variants of it. Since 1991, he has also had extensive involvement in projects concerning distribution and equity, notably Johnson (1996); Johnson, Manning and Hellwig (1995); and Melbourne Institute and Deakin Human Services (1997a and 1997b). He is currently directing a collaborative project involving the Melbourne Institute, the Brotherhood of St Laurence and the Committee for Economic Development of Australia which aims to evaluate tax and equity aspects of tax reform. As part of this work, two monographs have been published (Johnson et al 1997, 1998) and two more are planned for later this year.

Review of the use of the Productivity Commission Tax Model to measure the impact of the reform of Commonwealth indirect taxes

1 Introduction

The following comments are based on my knowledge of economic modelling, the Australian taxation system, and material supplied to me by the Productivity Commission (PC) — the draft of Appendix C of the PC report titled 'Modelling' and the research memorandum, Revesz (1998), which describes the model used for the analysis.

In undertaking this review I have been asked specifically to comment on:

- the appropriateness of the modelling approach and how the model is used;
- whether the model assumptions and closures are appropriate; and
- whether the results and the accompanying explanation of them are plausible.

In the remainder of this section, I make some general observations about the use of economic models for studying distribution. In sections 2, 3 and 4, I address each of the criteria in turn and a summary is provided in section 5.

Use of economic models

Economic models are frameworks which organise data and relationships in order to develop understanding of economic phenomena and events. Models may be partial or general. Partial modelling uses a framework in which a problem can be relatively easily defined within a small range of economic activities and a small number of economic agents. Typically microeconomic issues to do with particular industries may be modelled in this way. Partial models are often purpose built for the task in hand and are generally much less demanding to design and run. However, for some problems where economic change is likely to have economy-wide effects, partial models are unlikely to be able to capture all the important factors impinging on change. In such instances a general model is required.

The most important of the general models used in Australia are economy-wide computable general equilibrium models. The first, and probably still the best known, general equilibrium model in Australia is the ORANI model developed by Professor Peter Dixon and colleagues at various locations and now at the

Centre of Policy Studies at Monash University.[2] A very wide range of models have since been built with specifications varying according to the application. In particular, the Commission has used ORANI-based models extensively in its work. The model used in the application discussed here is based on extensions to the basic ORANI model to provide a much more extensive representation of government income and expenditure, explicit modelling of labour supply with aggregate consumption and savings linked to disposable income, and a more developed means of measuring distributional change.[3]

Modelling distributional effects

Several types of economic model have been used to model distributional effects. These vary in the extent to which they can identify and represent both the general economy and the distribution of households.

First are models with a very well developed household sector in which all main household types are present. A useful basis for the household sector is ABS income survey unit records. These records carry an extensive description of household composition, income from various sources, labour market participation, age, gender, occupation and industry, and enable household groups to be defined on almost any desirable criteria. However, because they lack information on individual household expenditure elasticities, they are not able to capture consumer responses to changes in prices consequent on, say, tax reform. Results from these models describe morning-after effects with no behavioural response to change. STINMOD is a good example of this type of model (see Lambert et al 1994).

Second are models which also identify expenditures of households, thereby presenting the possibility of capturing household response to price changes. These models use ABS expenditure survey unit records and, like the first type, may incorporate well defined and extensive household types. The inclusion of expenditure information means that utility curves may be defined for households and consumer responses to behavioural change can be incorporated. The model reported in Johnson et al (1998) is of this type.

Third are models which concentrate on the production side and have a well developed representation of the market economy, but may not have a well defined and extensive household sector. These models are embedded in a

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2 The original ORANI model is documented in Dixon et al (1982). The prototype for the most recent (much enhanced) version is now known as the MONASH model (details available from the Centre of Policy Studies, Monash University).

3 The major developments from the ORANI model are described in Dee (1989) and Revesz (1998).

general equilibrium framework and may model demand and supply of factors including labour, capital and land (and therefore both labour participation and investment). They may also have a well defined macro accounting system to enable government income and expenditure to be traced, and an international interface to follow movements in the exchange rate and terms of trade. These models are likely to describe producer, household labour force participation and investment responses to indirect tax change well.

The key factor in considering this range of models for some purpose is the nature of the impacts that are likely to be generated. If the impacts are likely to be fairly local to the household sector, it may not be necessary to employ a model with an extensively developed representation of the market economy. On the other hand, if the impacts are likely to be general, then such a model is mandatory. The limitation then becomes the extent to which the changes captured in the model can be used to describe the desired impacts on households. For some purposes, impacts on a single aggregate household may suffice. But if the focus is on equity, then it is highly desirable to have sufficient disaggregation to show effects on all groups of interest.

2 Appropriateness of the modelling approach

The modelling work to be considered here has been undertaken as part of research work commissioned by the Treasurer to investigate the impacts on manufacturing exporters and others of Commonwealth indirect tax reform. It looks at the impacts of replacing wholesale sales tax (WST) and a part of fuel excise with a revenue-neutral goods and services tax (GST).

It therefore follows that to adequately trace indirect tax reform a model needs:

- to be economy-wide with all important economic agents and all economic transactions represented — incidence of indirect taxes is not simple, not well understood and linkages between industries are crucial to tracing effects;
- to have a well developed macroeconomic sector so that government revenue and expenditure effects can be traced;
- to have a well defined mechanism for tracing exchange rate effects — since it is also likely that macroeconomic impacts will flow back to traded goods through the exchange rate;
- to allow for producer responses to changed input and output prices, including through changes in production processes;
- to allow for consumer responses to changed prices; and

- to have a diverse and differentiated household sector — if the purpose is to understand distributional effects.

The PC Tax Model has most of the required features, though they are developed to varying degrees of clarity and comprehensiveness. While producers are able to respond to changes in prices, they are restricted in the way this may happen, since material inputs to production processes are assumed to be in fixed proportions. In an application where the specific purpose is to adjust inputs to remove distortions caused by taxes, this is likely to underestimate the efficiency gains from reform.

I have particular reservations about the way in which the household sector is defined and this is discussed in detail below. In general, however, the PC Tax Model is suitable for undertaking indirect tax experiments provided its limitations are both understood and transparent.

Limitations in regard to the household sector

Interest in equity issues is usually framed in terms of particular groups. Groups may be defined according to several criteria, such as income or expenditure level, demographic type, source of income or combinations of these. Equity issues in tax reform are likely to centre on the effects on particular groups. Thus, the definition of the groups of concern is crucial to understanding the likely policy implications.

Groups based on income level include quintiles and deciles of income units. Choices concerning income level groups are whether to use original income, income after tax, income after tax and transfers, or income equalised in some way to account for need.

Just as groups may be defined by their income, they may also be defined by their total expenditure. This is likely to be particularly useful where income data is thought not to be a good indicator of standard of living, or where confidence in its meaning is low.

Demographic types are typically defined by the composition of the household and include groups such as: single persons; single parents with one, two or three dependents; couples; couples with one, two, three, or four and more dependents; households of single persons living together; and households of couples with non-dependent family members.

Groups defined by source of income include households in which the principal earner is a wage and salary earner, is a self employed person, or is a recipient of a government benefit or pension which provides the main source of income.

Pension recipients may be further divided by type — for example, sole parents, old age pensioners, the unemployed and the disabled.

The equity effects of a change in indirect taxes are likely to be important in two respects. First, in relation to the aggregate effect, they will indicate the extent of compensation which may be required if change were to be distributionally neutral. But having established an overall distributional cost (if there is one), most importantly it is necessary to establish which groups in the community are likely to be badly affected and by how much. Establishing who are the losers also suggests the best method of compensation — through tax relief or increases in transfer payments.

Distribution in the PC Tax Model

Household types are not defined explicitly in the PC Tax Model. The model has a single representative consumer/household who responds to changes in prices and income. However, the representative consumer is bypassed in the method used to provide distributional content in the model.

A distribution of households is obtained by using information about changes in industry wages and returns to capital.[4] The PC Tax Model separately distinguishes income for employees and the self-employed (calculated from a combination of wages and capital) for each industry. In addition, it is possible to add changes for non-working people derived from information on changes in transfer payments and changes in superannuation (which may be affected by changes in returns to capital). These changes are imposed on wage and non-wage income of a population of household types[5] and the change in income of groups of households estimated. Group-specific consumer price indexes are calculated so that (real) income changes reflect the consumption bundle of the group. Equivalence scales are used to adjust household income for varying size and composition.

Some observations are pertinent to this method of defining distribution:

- A major limitation of this approach is that the same wage and non-wage change is applied to all members of an occupation in an industry.[6] Equity issues are very much concerned with the outlook for poor people and such

[4] The model also reports occupational results, but these are not independent of the industry results and are calculated using knowledge of the occupation composition of each industry workforce.

[5] The population used is that represented by the 1989–90 ABS income and housing survey.

[6] Revesz (1998, p. 43) notes that the actual distribution of income (as reported in the 1989–90 income and housing survey) contains considerably greater dispersion than does the distribution based on this method.

people are characterised by marginal labour force attachment, with higher concentrations of part-time and casual employment. The application of the average earnings change for all employed people in an industry may mask considerable variation which may also be systematically related to income — within the broad industry categories, the poor get laid off first in times of duress, and in times of growth the rich take advantage of overtime first.

- The distributional content is exogenous to the model solution — it is derived from applying wage and non-wage changes to a distribution derived from the income and housing survey. Since the distribution is not itself represented in the model, there is limited capacity for the reaction of individual households (of the distribution) to price changes to be transmitted to other economic agents. The model does have a representative consumer who can react to price changes and from whom responses may be imputed to other households. However, this method requires all households to have common price elasticities.
- The use of a common labour demand elasticity for both genders, for all ages and all labour force categories may also introduce problems in relation to equity since these characteristics are also likely to be related to income.

For these reasons, I think there must be questions about the aggregate distributional results. More pertinently, because household types are not explicitly defined, further distributional work is needed from other sources to bring out the effects of the proposed change on particular groups. I firmly endorse the principle of triangulation in economic research whereby a range of tools and methods is directed at a problem or issue. Where different methods and tools yield similar results, confidence is enhanced. Where this does not occur, further work is required to discover the reasons for the differences.

3 Model assumptions and closure

The modelling reported is the replacement of the current Australian WST and a small component of fuel excise with a New Zealand-style GST. By New Zealand-style is meant a multi-stage GST with exemptions for such things as government expenditure, financial services and rental accommodation (and implicitly the unobserved imputed value of rent to owner-occupied dwellings), and zero-rating for exports.

There are some important constraints on the way in which the PC Tax Model may be used. In raw form, the model is a very large set of simultaneous equations. Because there are more variables than equations, to be identified, not

all variables may be endogenous and therefore determined by the behavioural relationships built into the model. However, the choice of which variables to be endogenous and which exogenous is not completely free, though there are some natural choices. Generally, in relation to a particular value, either its price or its quantity must be exogenous (pre-determined). In standard long-run closures, employment will be held fixed while wage rates are allowed to vary and changes in total wages will be determined from the changes in wage rates. Hence, the model cannot predict a result in which both employment and wage rates are each affected to some degree.

Similarly, in relation to capital, the capital stock may be fixed while the price of capital (rate of return) may vary. Whether capital stock is fixed usually depends on whether the model is to be used in short-run or long-run mode. Where the model is in short-run mode, the capital stock is fixed and exogenous, whereas in long-run mode the capital stock is allowed to vary and the rate of return is fixed. This latter assumption is consistent with a situation of completely mobile capital where a shock does not alter the rate of return to different industries. The rationale for the short-run closure is that rates of return may vary since it normally takes some time for new investment to be brought into production and during this period, while investment occurs, capital stocks are fixed. In the long-run closure with employment fixed, any changes in taxes which reduced capital costs are likely to produce a dramatic rise in investment, capital/labour substitution and a much improved outlook for capital-intensive industries. Thus, the model exhibits rather dramatic oscillation according to the closure. Aware of this problem, the PC has generated an intermediate case of imperfect capital mobility.

In tax reform, interest is centred on structural change in the longer term. I do not think the short-run closure is helpful. The short-run closure may aim to establish the path of adjustment, but there are other variants in the ORANI suite of models better configured to do this job. I suspect other types of sensitivity analysis would be more interesting. For example, in the main closures reported, there are fiscal dividends because government borrowing is allowed to be endogenous. The Commission points out that if this dividend were distributed to households, then the projected household consumption results would be improved. It is also true that distribution would be affected, but in a manner that would depend on the way in which the closure was implemented. Thus, the choice of closure, in part, defines the distributional result. I think it would have been useful to examine further closures (with government borrowing fixed) to further explore this matter.

4 Plausibility of results

The results for the primary simulation in the draft are based on a uniform GST of around 5 per cent which would replace WST and around 4 cents a litre of fuel excise.

They indicate that restructuring of the indirect tax system is likely to have only small activity effects in the short term in which capital is immobile, but significant effects with completely mobile capital. In this latter instance, real GDP is 2 per cent higher than it would be in the absence of indirect tax reform. With mobility half-way between fixed and fully free, an increase of just under 1 per cent of GDP is expected.

The size of these effects may seem at first surprising. It might seem that, in a revenue-neutral change in which the same aggregate revenue is raised on the indirect side, most of the effects would be compositional, with the outlook for some industries being improved and others worsened, but with fairly small aggregate results.

However, a plausible case can be made for the aggregate results. The most likely avenue for aggregate change is via exports since, under the proposed GST, exports would be zero-rated. Indeed, high growth occurs among (aggregate) exports with rises varying from 1.9 (short run) to 8.8 per cent (long run with complete capital mobility). Are these orders of magnitude plausible? Scutella (1997, table 5.4) suggests that, in 1992–93, the incidence of WST on exports was about $0.93 billion and of all petrol excise around $1.9 billion. In 1992–93, total exports were worth $60 billion, so the removal of WST and some fuel excise on exports may have reduced costs by between 1.5 and 4 per cent. How export output responds depends on the product supply and export demand elasticities assumed — the values assumed in such modelling exercises have been a matter of some contention. However, it is not hard to see why expansion of the order of between 2 and 9 per cent is possible.

Investment goods are also exempt and, again, Scutella (1997, table 5.4) suggests savings of the order of $300 million of total investment. Following a similar line of reasoning, changes in volumes of investment of the order of up to 3 per cent with full capital mobility may be imagined. The increase in GDP follows from the expansion in exports and investment. Since exports constitute about 20 per cent of GDP, a 9 per cent increase in exports will raise GDP by around 2 per cent as predicted by the model. Similarly, a 3 per cent increase in investment will add a further 0.5 per cent to GDP.

I am less sanguine about the distributional results because of concern about the extent to which they truly represent equity in the population, for the reasons stated above. The results indicate an improvement in equity.

In a broad sense, Johnson et al (1998, table 2.5 and appendix 2) indicate that whether both WST and petrol excise are progressive or regressive depends on the basis on which household groups are compared and ranked. If households are ranked by total expenditure and the taxes expressed as a proportion of either total expenditure or income, then WST and petrol excise are progressive. If, however, taxes are expressed as a proportion of income and households are ranked by income, then the taxes are regressive. The GST is almost proportional to expenditure by definition, so, leaving aside the effects of behavioural responses of both producers and consumers, the introduction of a GST would be regressive if total expenditure is used for ranking households and progressive if total income is used for the ranking. Since the PC adopts the latter definition of regressivity/progressivity, the increase in equity is not surprising.

The primary explanation in the draft for the distributional result is that the GST changes relative prices in a manner which impacts more on the goods and services purchased by the rich than by the poor. However, Johnson et al (1998, table 2.4) suggest that expenditures of the low expenditure people are concentrated on food and housing, whereas expenditure shares for high expenditure people are more evenly spread. Table 2.3 in that publication suggests that the incidence of WST on food and housing purchases is low. With no behavioural change, this suggests that the introduction of a GST would decrease equity, although when consumers change their preferences (table 4.5) almost all households improve their position relative to the initial situation.

In sum, the different results from the PC Tax Model may result from: a different population over which distribution is measured; the use of income rankings to define the distribution; the effect of producer responses (though not changes in the mix of material inputs); the effect of different consumer price elasticities to those in the Johnson et al (1998) model (a single set of consumer price elasticities is used in the PC model); the effect of household income responses included in the PC model; or some combination of all of these.

It is hard to judge the relative merits of the results without an extensive study to disentangle each of these effects. Nevertheless, the fact of the differences supports the view that the equity results presented in the draft should be treated with some caution.[7]

[7] Indeed the author(s) of the modelling appendix do not claim sophistication in the presentation of the distributional results. So it will be important in considering the distributional effects of indirect tax reform not to rely on this modelling work for them.

5 Summary

The use of the PC Tax Model is appropriate for study of the effects of indirect tax reform, but the model has some important limitations. I believe that the long-term macroeconomic results are plausible, though the lack of substitutability between inputs in production processes may underestimate efficiency gains. However, more work is required to justify the distributional results. It goes without saying that any gaps or limitations of the model may need to be addressed in other ways and the PC would be unwise to rely on the model for understanding the likely equity implications of the proposed reform.

REFERENCES

ABS (Australian Bureau of Statistics) 1997, *Taxation Revenue, Australia 1996–97*, Cat. no. 5506.0, Canberra.

ACIL (ACIL Economics and Policy) 1992a, *Farmers and Fightback!*, A report to the National Farmers' Federation, Canberra, July.

— 1992b, *Cars and Fightback!*, Canberra, October.

— 1997, *Tax Reform: Issues for Australia's Agri-Food Industry*, Discussion Paper prepared for Supermarket to Asia Ltd and the Business Competitiveness Working Group of the Supermarket to Asia Council, Canberra.

Albon, R. 1996, *An Overview of Australia's Taxation Structure*, Paper commissioned for the Productivity Commission's Stocktake of Progress in Microeconomic Reform, AGPS, Canberra.

ASCPA (Australian Society of Certified Practising Accountants) 1998, *Tax Reform — Agenda*, Melbourne.

ATO (Australian Taxation Office) 1997a, *Annual Report 1996–97*, AGPS, Canberra.

— 1997b, *A Report into Taxpayer Costs of Compliance*, Report commissioned from the Australian Taxation Studies Program, University of New South Wales, AGPS, Canberra.

Bollard, A. 1992, *New Zealand's Experience With Consumption Tax*, Centre for Economic Policy Research, Discussion Paper no. 268, Australian National University, Canberra.

BRC (Business Research Centre) 1994, *Reduction of Compliance Costs*, New Zealand.

Brooks, N. 1992, *The Canadian Goods and Services Tax: History, Policy and Politics*, Australian Tax Research Foundation, Research Study no. 16, Sydney.

BTCE (Bureau of Transport and Communications Economics) 1997, *Taxes and Charges in Australian Transport: A Transmodal Overview*, Working Paper no. 34, AGPS, Canberra.

CCIWA (Chamber of Commerce and Industry Western Australia) 1998, *Tax Reform Policy*, March.

Chisholm, A. 1993, 'Indirect Taxation, Effective Tax Rates and Consumption Efficiency', in Head, J. (ed.), *Fightback!: An Economic Assessment*, Papers from a conference organised by the Public Sector Management Institute, Monash University, Australian Tax Research Foundation, Conference Series no. 12, Melbourne.

Dee, P. 1989, *FH-ORANI: A Fiscal ORANI with Horridge Extension*, IMPACT Project Preliminary Working Paper no. OP–66, Melbourne.

Dixon, P., Parmenter, R., Sutton, S. and Vincent, D. 1982, *ORANI: A Multisectoral Model of the Australian Economy*, North Holland Publishing Co., Amsterdam.

Dixon, P. and Rimmer, M. 1997, *MONASH: A Disaggregated, Dynamic Model of the Australian Economy*, Centre of Policy Studies, Monash University, Melbourne.

Docwra, G. and Kolsen, H. 1993, 'Fuel Taxes and Road User Pricing', in Head, J. (ed.), *Fightback!: An Economic Assessment*, Papers from a conference organised by the Public Sector Management Institute, Monash University, Australian Tax Research Foundation, Conference Series no. 12, Melbourne.

DPM&C (Department of the Prime Minister and Cabinet) 1991, *Building a Competitive Australia*, Statements by the Prime Minister, Treasurer and Industry Minister, AGPS, Canberra, 12 March.

Head, J. (ed.) 1993, *Fightback! An Economic Assessment*, Papers from a conference organised by the Public Sector Management Institute, Monash University, Australian Tax Research Foundation, Conference Series no. 12, Melbourne.

Henry, K. and Wright, J. 1992, *PRISMOD: Development, Database and Methodology*, Paper presented to Australasian Economic Modelling Conference, September 2–5.

IAC (Industries Assistance Commission) 1986, *Certain Petroleum Products — Taxation Measures*, Report no. 397, AGPS, Canberra.

IC (Industry Commission) 1991, *Availability of Capital*, Report no. 18, AGPS, Canberra.

— 1994a, *Urban Transport*, Report no. 37, AGPS, Canberra.

— 1994b, *Petroleum Products*, Report no. 40, AGPS, Melbourne.

— 1995, *The Growth and Revenue Implications of Hilmer and Related Reforms*, A report to the Council of Australian Governments, Final Report, AGPS, Canberra.

IC and DIST (Industry Commission and Department of Industry, Science and Tourism) 1997, *A Portrait of Australian Business: Results of the 1995 Business Longitudinal Survey*, AGPS, Canberra.

Johnson, D., Manning, I. and Hellwig, O. 1995, *Trends in the Distribution of Cash Income and Non-cash Benefits*, AGPS, Canberra, December.

Johnson, D. 1996, *Poverty, Inequality and Social Welfare in Australia*, Physica Verlag, Heidelberg, February.

Johnson, D., Freebairn, J., Creedy, J., Scutella, R. and Cowling, S. 1997, *A Stocktake of Taxation in Australia*, Report no. 1 of Tax Reform: Equity and Efficiency, Melbourne Institute of Applied Economic and Social Research, University of Melbourne.

Johnson, D., Freebairn, J., Creedy, J., Scutella, R., Cowling, S. and Harding, G. 1998, *Indirect Taxes: Evaluation of Options for Reform*, Report no. 2 of Tax Reform: Equity and Efficiency, Melbourne Institute of Applied Economic and Social Research, University of Melbourne.

Lambert, S., Percival, R., Schofield, D. and Paul, S. 1994, *An Introduction to STINMOD: A Static Microsimulation Model*, STINMOD Technical Paper no. 1, National Centre for Social and Economic Modelling, University of Canberra.

Meagher, G. 1983, *Fiscal Policy and Australian Industry: The Effects of a Change in the Mix of Direct and Indirect Taxation*, Economics Discussion Paper no. 7/83, La Trobe University.

Meagher, G. and Parmenter, B. 1985, *Some Short Run Effects of Shifts from Direct to Indirect Taxation*, IAESR Working Paper no. 10, Melbourne.

— 1993, 'Some Short-Run Implications of Fightback!: A General Equilibrium Analysis', in Head, J. (ed.), *Fightback!: An Economic Assessment*, Papers from a conference organised by the Public Sector Management Institute, Monash University, Australian Tax Research Foundation, Conference Series no. 12, Melbourne.

Melbourne Institute of Applied Economic and Social Research and Deakin Human Services Australia 1997a, *Social and Economic Effects of Electronic Gaming Machines on Non-Metropolitan Communities*, Victorian Casino and Gaming Authority, December.

— 1997b, *Impact of Gaming Venues on Inner City Municipalities*, Victorian Casino and Gaming Authority, December.

OECD (Organisation for Economic Co-operation and Development) 1995, *Consumption Tax Trends*, Paris.

Pender, H. and Ross, S. 1995, *Business Taxation in Australia and Asia*, EPAC Commission Paper no. 4, AGPS, Canberra.

Poddar, S. and English, M. 1993, 'The Canadian Goods and Services Tax — Some Lessons for Australia?', in Head, J. (ed.), *Fightback!: An Economic Assessment*, Papers from a conference organised by the Public Sector Management Institute, Monash University, Australian Tax Research Foundation, Conference Series no. 12, Melbourne.

Pope, J., Fayle, R. and Chen, D. 1991, *The Compliance Cost of Wholesale Sales Tax in Australia*, Australian Tax Research Foundation, Research Study no. 19, Sydney.

Revesz, J. 1998, *Modelling Income Taxation and Its Distributional Impact*, Industry Commission Research Memorandum, Canberra.

Rimmer, S. and Wilson, S. 1996, *Compliance Costs of Taxation in Australia*, Office of Regulation Review, Staff Information Paper, AGPS, Canberra.

Ryan, A. 1998, *New Zealand Tax Reform — The GST as a Model for Australia*, Paper prepared for the Business Coalition for Tax Reform GST Seminar, 8 April.

Sandford, C. and Hasseldine, J. 1992, *The Compliance Costs of Business Taxes in New Zealand*, Institute of Policy Studies, Victoria University of Wellington, Wellington.

Scutella, R. 1997, *Calculating the Final Incidence of Australian Indirect Taxes*, Taxation Reform: Efficiency and Equity Project, Melbourne Institute of Applied Economic and Social Research, Working Paper no. 18/97, University of Melbourne.

Stevens, R. 1993, 'New Zealand's Tax Reform 1984–1992', in Head, J. (ed.), *Fightback!: An Economic Assessment*, Papers from a conference organised by the Public Sector Management Institute, Monash University, Australian Tax Research Foundation, Conference Series no. 12, Melbourne.