THE MARGINAL COSTS OF TAXATION
IN
NEW ZEALAND

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March 1994

Report prepared for the New Zealand Business Roundtable by
Swan Consultants (Canberra) Pty Ltd
ACKNOWLEDGEMENTS

In undertaking this study we have benefited from the support and encouragement of a number of people. John Zeitsch and John Fallon from Swan Consultants have given us continual help from the project's outset. Greg Dwyer, Alan Gibbs, Rodney Hide and Roger Kerr have given us valuable assistance and feedback. Jim Hagan from the New Zealand Treasury provided useful input, particularly in regard to the database construction, while Ted Sieper of EconData kindly gave us access to additional data. Roberta Wise and Christine Hryhoriak provided excellent word processing support. Finally, the project's draft report was circulated to a number of economists in Australia, Canada and New Zealand who provided useful feedback.
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PREFACE

This study is about the costs of raising tax. This is a critical issue in New Zealand because government spending financed by taxation looms so large in the economy.

Ultimately, the level of government expenditure determines the true tax burden since it must be primarily financed by present or future taxation. Central government spending ranged between 22 and 25 per cent of gross domestic product (GDP) from 1950 to 1974, but lifted sharply to reach 42 per cent in 1990-91. It is estimated to have fallen now to around 37 per cent. In addition, spending at the local government level accounts for a further 3 per cent of GDP. On top of these outlays are expenditures on government activities such as accident compensation and the fire service, most of which are not counted as part of the government's net financial expenditure and are financed primarily through compulsory levies.

Government spending has grown dramatically over the last 20 years, but what are we to make of this fact? Has that growth been a bad thing? Indeed, should the government be spending more? Should it be spending less? The question of the optimal size of government is a very important one. To answer it requires a balancing of the cost of more government spending against the extra benefit it generates.

Increased government spending is often favoured by special interest groups, and the benefits to them of such spending are usually clearly apparent. But what is the cost of government spending to the general community? Apart from those central and local government programmes that are financed by user charges or miscellaneous forms of income, government spending must be financed out of taxation (or compulsory charges such as levies). It's usual to think of government spending of a dollar as costing the taxpayer a dollar. After all, a dollar going out requires a dollar coming in. However, the government's spending of a dollar costs the taxpayer more than a dollar. This is because the process of raising the dollar through taxes is itself costly.

In the first place, there is what is known as the cost of compliance. This is the cost of keeping the necessary accounts and filling out the forms that the tax system requires. A recent study by the Institute of Policy Studies estimated the compliance costs of the main business taxes to be $1,882 million for the tax year 1990-91. Complying with the tax code was estimated to take up 46.5 million hours of the time of proprietors, partners, directors and other staff, and cost over $600 million in external advisers' fees as well as other miscellaneous costs. Moreover,
compliance costs were found to be highly regressive in their impact. Amongst smaller businesses, the equivalent of 13.4 per cent of the firm's turnover was taken up in compliance costs as against only 0.03 per cent for the largest businesses.

The costs of compliance are clearly large. There are also significant costs of administering the tax system, and of policing avoidance and evasion. But raising government revenue through taxes also imposes costs in a much more important but less visible way. It's not feasible to tax everything and the tax system makes those activities that are taxed relatively more expensive than those activities that aren't. Taxes thus change relative prices and thereby people's behaviour. Such tax-induced changes in behaviour impose an additional type of cost known as the deadweight cost of taxation. Taxes on income, for example, affect people's willingness to work, save, invest and take risks — in a multiplicity of ways.

An example will help illustrate the concept. A tax on cars may mean that some people choose not to buy a car. They would have bought a car in the absence of the tax, but the tax increased the price too much, and so they go without. Because the would-be car buyers don't make their purchases, no tax is paid. But that doesn't mean that the tax hasn't imposed a cost, because in the absence of the tax they would have bought cars. It follows that a tax has a deadweight cost over and above the actual money that it raises. It changes people's behaviour and causes them to make decisions that they wouldn't otherwise make. From the taxpayers' viewpoint, those decisions are less preferred ones.

The total cost of a tax is thus not just what the tax raises and the costs of tax collection (administration and compliance costs). It is instead what a taxpayer would need to be paid in order to be made just as well off with the tax as without it. The difference between the amount of tax raised plus collection costs and the total cost of the tax is known as the deadweight cost of the tax. The cost is 'deadweight' because it represents a loss of potential economic welfare. Compulsory levies incur similar costs if they alter people's behaviour.

The deadweight costs of taxation are typically ignored. This is because their estimation is technically very difficult and complicated. Government expenditure is, at best, treated as costing no more than the dollar amount spent. The deadweight cost of tax is effectively assumed to be zero. However, economists have long understood that taxation imposes economic costs and a number of studies overseas have suggested that the magnitude of these costs can be large. No such studies, however, have previously been undertaken in New Zealand.
To fill that gap, the New Zealand Business Roundtable commissioned Swan Consultants (Canberra) Pty Ltd in 1992 to undertake the present study. The Swan Consultants team consisted of Professor Erwin Diewert and Dr Denis Lawrence. Professor Diewert of the University of British Columbia has been a pioneer in the application of mathematics to economics. Dr Lawrence has worked for the Industry Commission and the Bureau of Industry Economics in Australia and has considerable experience in applied quantitative economics. We were indeed fortunate to attract the services of such an eminent team.

The results of their work are outlined in the executive summary of this report. In essence, they find that the deadweight costs associated with labour taxation (primarily taxation on the income of wage earners and the self-employed) in New Zealand are around 18 per cent (18 cents) for the last or marginal dollar of revenue and around 14 per cent (14 cents) for the marginal dollar raised through consumption tax (primarily GST). These costs (which are additional to collection costs) are very significant, and represent an important part of the costs of maintaining present levels of government spending.

The implication of the study's finding that the economic cost of labour taxation at the margin is around 18 per cent is that, to justify a claim on that dollar, a government project would need to return $1.18 net of collection costs for each dollar spent on it just to cover the opportunity costs to the community of the dollar and the deadweight loss. If it doesn't earn that return, then society is better off not undertaking the project. Of course, some of the returns to government expenditure are difficult to measure. However, we now have a professionally-researched estimate of what we are having to give up. That last dollar spent on defence, administration, income support, health or education means forgoing $1.18 of benefit that would otherwise accrue to taxpayers. If the dollar of government spending were only worth a dollar to the taxpayer, the gain from reducing government spending would be 18 cents — effectively an 18 per cent return.

Looking at the finding in that way, the study shows that there is a very attractive project available to the government. However, the project is no ordinary one involving increased government spending. Quite the reverse. The project involves reducing government spending and hence taxes on wages. The study finds that reducing taxes on labour would yield a return to New Zealand of around 18 cents for every dollar of tax reduction. Given that generally a dollar spent at the margin, whether by a government on behalf of individuals or by individuals themselves, produces at most only a dollar of benefits (and some individuals may value the
dollar of government spending less), a benefit of $1.18 per dollar of tax reduction represents a very large gain.

The only justification for not reducing government spending and realising that gain would be if the marginal dollar of government expenditure financed by labour taxation yields a return to the community of 18 per cent or more. This is highly unlikely. The present study thus provides a very powerful argument for reducing government expenditure from present levels. Cutting expenditure that yields a benefit which is less than the sum of the amount spent plus the marginal costs of taxation would make New Zealanders better off in aggregate.

Such a finding has obvious policy implications. For example, a major economic and social problem is the high rate of unemployment. An overriding concern for the government is accordingly what it can do to improve people's job prospects and ensure rising incomes for all New Zealanders. The so-called tax wedge — the difference between pre- and post-tax returns from working — itself discourages people from taking employment. Despite this, various schemes are frequently suggested involving higher government expenditure and, therefore, taxation. Furthermore, a major argument put forward for not reducing government expenditure is that it would involve job losses. But always ignored in the discussion is the drag on the economy that government expenditure imposes. If the drag is large, the very best thing the government can do for jobs and growth is to reduce government spending and hence taxes. As government spending falls, the deadweight costs fall more than in proportion to the associated fall in tax rates. To increase government spending and taxes risks making matters worse.

It is important to note that the study is not saying that less government spending is always better. The optimal level of government spending is not zero. The government has an important role to play, for example in providing public goods and physical and legal infrastructure that would not be supplied — at least in desirable quantities — through private transactions. It is worth incurring the deadweight costs of taxation up to the point justified by the returns to such expenditure.

Nor is the study saying that no sacrifices of economic output should be made in the interests of greater equity (e.g. through income redistribution). It does not deny the case for a social welfare safety net, for example. We may well wish to accept such trade-offs. What the study highlights, however, is that transferring a dollar from Peter to Paul is costly. Deadweight costs are associated with the taxation needed to finance government spending on transfers as well as spending on goods and services. Indeed they are higher for redistributitional programmes to the degree that individuals derive less benefit from a dollar of government consumption than they
do from a dollar of transfer payments. Because of these costs, the tax and transfer system has been likened to a leaky bucket, which 'spills' potential income in the process. Much government expenditure, for example on education, health and superannuation, benefits people with substantial levels of income or assets. The costs of taking money from them to buy such services on their behalf may be much higher than is commonly realised. If spending decisions were left to a greater extent to individuals, with support for those who needed assistance, the deadweight costs that taxation imposes could be reduced.

It also needs to be borne in mind that a less wealthy society has more difficulty catering for those who are less well off. Much evidence suggests that the most powerful force for poverty alleviation is sound economic growth. It is apparent that high spending and taxing countries, such as many of those in Western Europe, are finding it increasingly difficult to achieve economic growth and compete successfully with low tax countries such as those in the Asian region. Given open borders for trade and investment and intensifying competition from emerging economies, New Zealand must be conscious of the impact of tax burdens on its economic performance.

The study is a pathbreaking one for New Zealand which we hope will stimulate investigations into other aspects of the costs of the tax system. New Zealand researchers will no doubt focus on the study's methodology and the data sets that Professor Dievert and Dr Lawrence have generated. But the study is also important in terms of policy direction in New Zealand. It provides for the first time an estimate of the deadweight cost of taxation in New Zealand. There is now no excuse for not including deadweight cost in any serious debate about whether government spending should be increased or decreased. We also now know that we have a government project offering a very attractive potential return — that project is called reducing government expenditure.

R L Kerr
EXECUTIVE DIRECTOR
EXECUTIVE SUMMARY

The New Zealand economy has undergone considerable reform in the last decade. Reform of the tax system has been an integral part of this process. More reliance has been placed on indirect taxes with the introduction of what is regarded as one of the most comprehensive and 'pure' goods and services taxes in the world, the income tax has been made broader-based but with a flatter rate structure and import tariffs have been scaled down.

However, tax revenue as a proportion of gross domestic product (GDP) has continued to increase and is very high relative to comparable countries. In 1991 New Zealand's share of taxation in GDP was 38.2 per cent compared with 29.9 per cent in the United States and 30.8 per cent in Australia. New Zealand's tax share in 1991 was also higher than that of Germany, the United Kingdom and Japan (see Figure 1). While all these countries' tax shares have increased over the last 25 years, New Zealand's tax share has increased far more rapidly. Although New Zealand's tax share has fallen somewhat since its peak in 1990-91 and is projected to fall further, it remains high by OECD standards. Furthermore, the tax shares of OECD countries tend to be very high compared to the dynamic Asian economies. For instance, South Korea, Singapore, Thailand and Indonesia all had tax shares of less than 17 per cent in 1991. In a world of increasing globalisation and capital mobility, high tax countries will find it increasingly difficult to compete.

Figure 1: Tax Revenue as a Percentage of GDP — Selected OECD Countries

![Graph showing the tax revenue as a percentage of GDP for selected OECD countries.](image)

Source: OECD Revenue Statistics.
New Zealand’s situation is even more perilous when it is realised that its government expenditure has consistently exceeded taxation revenue by a large margin for all but one of the last 12 years, leading to increasing levels of public indebtedness. In 1992-93 net public debt stood at 55 per cent of GDP (Richardson 1992). High levels of government spending and consequent increases in public debt imply the need for higher taxation levels in the future to cover interest and repayments on borrowings.

Far from being free, government expenditure has to be financed sooner or later by increased taxation and that taxation imposes a number of costs on the economy. Sandford and Hasseldine (1992) found that the compliance costs alone of business taxation in New Zealand are quite significant. For instance, the compliance costs of pay-as-you-earn, fringe benefit and related taxes range up to 2 per cent of the revenue collected while the compliance costs of the Goods and Services Tax exceed 7 per cent of the revenue collected. However, apart from the direct cost of the extra revenue and associated administration and compliance costs, an important additional cost arises from the changes in behaviour induced by taxation. These incentive costs are generated when people turn to less preferred substitutes as a result of taxation, or employ less satisfactory methods of production. The losses created are known as deadweight costs or the excess burden of taxation.

Taxes distort the incentives to work, save and invest and the pattern of input use and production in the economy. These distortions impose costs on the economy by reallocating resources from their most productive uses to less productive ones. Consider the taxation of labour income. Because taxation adversely affects the incentives people face, as taxes increase people will tend to substitute towards leisure, work less intensively, undertake more do-it-yourself work and shift into occupations with relatively large non-pecuniary benefits. In New Zealand’s case, the way many social security benefits are provided also has a major negative impact on the incentive to work.

The deadweight cost of taxation is a measure of the value of the opportunities that are effectively lost when taxation diverts labour, land and capital from their best uses. By calculating the deadweight costs of taxation we can gauge the potential effects of taxation on the economy and society.

The size of deadweight costs is influenced by a range of factors but they are likely to be largest when the actions of producers and consumers are highly responsive to after-tax prices, when existing marginal tax rates are high and when savings are highly responsive to after-tax returns. Overseas studies have typically found that the deadweight costs associated with raising taxation revenue range from a minimum of 10 cents to well in excess of $1 for each additional dollar of
revenue raised. In percentage terms this corresponds to a range of 10 per cent to over 100 per cent of the additional revenue. For instance, the only study of deadweight costs in Australia found a range of 23 per cent to 65 per cent while key studies of the United States have found ranges of 17 per cent to 56 per cent depending on the assumptions made.

Against this background, the New Zealand Business Roundtable commissioned Swan Consultants (Canberra) to estimate the marginal deadweight costs of taxation in New Zealand.

The key findings of the study are that the marginal excess burdens or deadweight costs associated with labour taxation have increased from 5 per cent to over 18 per cent in the last 20 years (Figure 2). This more than tripling of the size of the deadweight cost of labour taxation is not accounted for solely by increases in labour tax rates as they increased by only around a half from 20 per cent to 32 per cent over the same period.

Even though deadweight costs tend to increase more rapidly than the increase in the tax rate (all else equal), much of the increase in the size of the deadweight cost is accounted for by the increased flexibility and responsiveness of the New Zealand economy in recent years and increasing international capital mobility. This can be seen from Figure 2 where the rate of increase in the labour tax rate eased off after 1983 while the deadweight cost of labour taxation increased rapidly after 1984.

Over the last 20 years the marginal excess burden of consumption taxation (all indirect taxes other than property taxes and import duties) has increased from 5 per cent to around 14 per cent (Figure 3). The almost tripling of the consumption taxation deadweight cost coincided with an almost tripling of the total consumption tax rate from around 11 per cent to 32 per cent. Most of
this increase in the consumption tax rate occurred after 1986 coinciding with the introduction of the goods and services tax. The average marginal excess burdens for labour and consumption taxation were 9.5 per cent and 8.3 per cent, respectively.

While at the lower end of the range of previous estimates of deadweight costs for other countries, both of these excess burdens are quite significant. Importantly, our estimates are the first to use key parameters calculated from consistently specified statistical models of the economy being examined whereas previous studies have typically assumed a range of values for these parameters. Also, our estimates are based on a rigorously specified general equilibrium model which takes account of interactions between different parts of the economy. Because we use this framework, our deadweight cost estimates apply year after year once a change in taxation has occurred. Consequently, if a government project is to be justified taking deadweight losses into account, it must provide a return each year which exceeds its direct cost (including a normal return) by at least the amount of the deadweight cost. This is equivalent to earning an ongoing real rate of return over and above the normal rate of return by at least the estimated percentage of deadweight costs.

For example, a government project financed by additional labour taxation should have, on average, earned a real rate of return 9.5 per cent above the normal real rate of return in order to overcome the adverse effects of increased taxation. Since the average real rate of return for the private sector of the New Zealand economy was only 0.6 per cent for the 20 years of our study, this represents a very large penalty which government spending has to overcome to be justified.

These findings point to the urgent need to review taxation levels in New Zealand as the costs of allowing the average tax take to continue to increase are becoming increasingly and prohibitively high. Conversely, the New Zealand economy would reap large benefits from reduced government spending and taxation.

The growth in the tax take in New Zealand has been driven by high levels of government expenditure, particularly on social services, and increasing government debt levels. In 1991 the high cost of taxation can be alternatively illustrated by considering that a reduction in government spending financed by reduced labour taxes would have led to a real rate of return on this 'investment' of 18.3 per cent. There are very few, if any, government projects which can boast such a high real rate of return. A more urgent priority, however, is likely to be a reduction in government spending accompanied by a period of unchanged taxation levels to facilitate the reduction of government debt. This would pave the way for a sustainable long-run reduction in taxation levels and associated gains to the New Zealand economy.
The importance of these issues is further highlighted by the fact that our deadweight loss estimates are likely to be relatively conservative as we have not calculated the marginal excess burden of capital taxation. Other studies which have attempted to introduce dynamics and model capital accumulation decisions have shown that the marginal excess burden of capital taxation is generally higher than that for labour. This is particularly likely to be the case for a small economy such as New Zealand trading in a world of ever-increasing capital mobility.

The priority for future work should be to extend the model to include explicit modelling of the capital accumulation process. This will enable marginal excess burdens associated with capital taxation to be calculated.

To summarise, the main policy conclusions from the study are:

- New Zealand’s tax share of GDP has increased rapidly, is high by OECD standards and over double those found in the dynamic Asian economies;
- the costs that this high level of taxation have imposed on the New Zealand economy have increased rapidly as the economy has become more flexible and integrated with the rest of the world;
- continuing reforms in New Zealand and overseas, and ever-increasing international capital mobility will further increase the costs of high levels of taxation;
- increasing levels of public indebtedness are bequesting high levels of taxation and poverty to New Zealand’s future generations;
- far from being free, government expenditure comes with a high price tag and must correspondingly be spent wisely on high yielding projects or not at all;
- the over-riding priority should be to reduce government expenditure and public debt levels, and to pave the way for sustainable reductions in taxation levels; and,
- priority should be given to reducing income taxes ahead of consumption taxes.
1. INTRODUCTION

When revenue is raised through taxation, a number of costs are imposed on the community. The most obvious of these is the cost accounted for by the amount of the revenue, a cost which is borne by consumers and producers in the particular market in which the tax is imposed. Looking at the community as a whole, this cost is offset, to some extent, by gains to those who benefit from the expenditure financed by the revenue.

However, an important cost arises from the changes in behaviour induced by taxation. These incentive costs are generated when people turn to less preferred substitutes as a result of taxation, or employ less satisfactory methods of production. The losses created are known as deadweight costs or are sometimes referred to as the excess burden of taxation.

1.1 How do deadweight costs arise?

Taxes distort the incentives to work, save and invest and the pattern of input use and production in the economy. These distortions impose costs on the economy by reallocating resources from their most productive uses to less productive ones. The deadweight cost of taxation is a measure of the value of the opportunities that are effectively lost when taxation diverts labour, land and capital from their best uses. By calculating the deadweight costs of taxation we can gauge the potential effects of taxation on the economy and society.

Consider the taxation of labour income. Because taxation adversely affects the incentives people face, as taxes increase people will tend to substitute towards leisure, work less intensively, undertake more do-it-yourself work and shift into occupations with relatively large non-pecuniary benefits. Individuals lose because their purchasing power is reduced and society gains because tax revenue is collected to provide government services. It is possible that these effects could offset each other so that there is no deadweight cost. But this is unlikely because in the absence of taxation people would have chosen to do things differently, implying that they valued the choice of more work (and all it could buy) more than they valued more leisure.

Deadweight losses measure the extent to which the actual tax system deviates from a 'neutral' tax system. A neutral tax system is one which leaves individuals' decisions unchanged relative to what they would be if no tax system existed but their incomes were reduced by the amount of the revenue collected. A poll or head tax is the classic example of a neutral tax where people's incomes are reduced by a given amount irrespective of what actions they may take. However,
for most forms of taxation the amount paid will be influenced by the responses people take to the tax, inducing them to adopt less preferred actions and imposing additional costs on them. One way of thinking about deadweight losses is as the amount that consumers and producers would pay to avoid taxation, less the revenue raised from them. This amount is almost always positive, indicating that taxation generally imposes a net cost on society.

The size of deadweight losses is influenced by a range of factors but they are likely to be largest when the actions of producers and consumers are highly responsive to after-tax prices, when existing marginal tax rates are high and when savings are highly responsive to after-tax returns. Overseas studies have typically found that the deadweight losses associated with raising taxation revenue range from a minimum of 10 cents for each additional dollar of revenue raised to well in excess of $1 for each additional dollar of revenue raised. Deadweight losses thus have the potential to be very significant and should be taken into account in discussions of the role and size of government.

In addition to the direct costs and deadweight losses associated with taxation there are a number of additional resource costs. These relate mainly to avoidance, evasion, compliance and administration. In a free society individuals will arrange their affairs so as to minimise the amount of tax paid. This can be done legally by means of tax avoidance as less preferred mechanisms are adopted to split income and substitute less heavily taxed goods for more highly taxed ones or illegally by means of tax evasion as income is hidden from authorities. In both cases significant resources of individuals, firms and specialist advisers are tied up in socially “unproductive” activities. Similarly, compliance with taxation laws usually requires firms to keep additional records that they would not otherwise require. Enforcement and administration of the tax system also tie up significant amounts of society’s resources, increasing the costs of raising revenue.

1.2 Why are deadweight costs important?

The calculation of deadweight losses is central to a number of policy questions including:

• how valuable do public projects have to be to cover the full costs of the revenue needed to finance them?;
• which tax measures impose least costs in financing a given expenditure burden?; and
• how much redistribution from rich to poor can society afford?
The value of public projects

The total cost to society of financing a marginal dollar of public expenditure is the sum of that dollar (since it is diverted from another use) plus the deadweight costs of raising that dollar. A study of the deadweight cost of taxing labour income for Australia estimated the marginal deadweight cost to vary from 23 cents to as much as 65 cents (Findlay and Jones 1981). This means that an extra $1 of public expenditure costs $1.23 to $1.65. The implication from this analysis is that, in undertaking a cost-benefit assessment of a publicly-funded project, benefits should be at least 23 to 65 per cent more than the value of the funds provided, if taxes are raised from labour income. The costs could be higher for other forms of taxes since deadweight costs are highest where behavioural responses to taxes are highest and the behavioural response of labour is normally relatively low on average.

Cost-benefit calculations often neglect the cost of raising revenue and the true economic penalty — in terms of deadweight costs — is usually not even contemplated. A better understanding of the marginal deadweight cost of raising revenue and its careful application in cost-benefit assessments would help ensure value for money when spending the taxpayer’s dollar.

The choice of the tax base

Different methods of taxation have different deadweight costs. These costs can be central in choosing among methods of raising revenue. Thus one tax base may generate a deadweight cost of 20 cents for each additional dollar raised, while another may involve costs of 40 cents. In fact, these principles are often implicit in conventional views about public finance. The idea that a tax base should be as broad as possible has its origins in the observation that deadweight costs increase with higher tax rates, at an increasing rate. Thus the broader the base, the lower the tax rate and the lower the deadweight losses in aggregate. An optimal tax system would be one that equates the marginal deadweight losses across revenue sources.

The benefits from redistribution

Raising revenue for transfer to the less well-off also involves deadweight costs. Even now the level of such transfers implicitly involves consideration of the cost to those from whom revenue is being taken. Because the costs of transfers also involve deadweight losses, these should be included.
Given that the taxation required to finance public expenditure is costly to raise, governments should leave money in the hands of taxpayers unless it is abundantly clear that they can do a better job of spending it. If the deadweight loss figure for New Zealand was 50 cents in the dollar, then reducing tax collections by a billion dollars would lead to national income being higher by up to half a billion dollars.

1.3 Is taxation a problem in New Zealand?

The New Zealand economy has undergone considerable reform in the last decade. Reform of the tax system has been an integral part of this process. More reliance has been placed on indirect taxes with the introduction of what is regarded as one of the most comprehensive and 'pure' goods and services taxes in the world, the income tax has been made broader-based but with a flatter rate structure and import tariffs have been scaled down. However, tax revenue as a proportion of gross domestic product has continued to increase and remains high relative to comparable countries. In 1991 New Zealand's share of taxation in GDP was 38.2 per cent compared with 29.9 per cent in the United States and 30.8 per cent in Australia (OECD 1991).

Government expenditure has consistently exceeded taxation revenue by a large margin for all but one of the last 12 years leading to increasing levels of public indebtedness. In 1992-93 net public debt stood at 55 per cent of GDP (Richardson 1992). In addition, the way many social security benefits are provided has a major negative impact on the incentive to work.

The time is now ripe to review and calculate the deadweight costs of taxation in New Zealand. This will be an important input to reviewing the role of taxation and government expenditure in the economy and assessing the taxation reforms introduced to date.

1.4 The approach adopted in this study

The responsiveness of economic activity to changes in after-tax prices is the critical determinant of the size of deadweight costs. Consequently, a major part of this study has been concerned with obtaining accurate estimates of the key price elasticities for both consumers and producers. These elasticity estimates are then a key input to a small scale general equilibrium model from which deadweight cost estimates are derived making use of duality theory.

In the case of New Zealand there is little consistent time-series data available and few econometric studies from which to obtain elasticity estimates. Since a consistent database of prices and quantities of goods and services consumed and of outputs produced and inputs used
by producers for at least a 20 year period is a pre-requisite for obtaining credible elasticity estimates, the construction of such a database has also been a major undertaking. The database covers the years 1971-72 to 1990-91.

The producer model estimated contains 3 outputs — motor vehicles, general consumption (excluding housing and transport) and investment, and exports — and 2 variable inputs — imports and labour — along with two fixed inputs — capital and land. A normalised quadratic profit function was estimated for the aggregate private production sector. This provides for fully flexible modelling of production relationships between all outputs and inputs. By placing a minimum of restrictions on the production technology this technique enables accurate elasticity estimates to be derived.

The consumer model estimated contains 4 consumption goods — motor vehicles, general consumption (excluding housing and transport), housing and leisure. A normalised quadratic expenditure function model was estimated for the representative consumer incorporating a linear spline on utility levels. This methodology again places a minimum of restrictions on the consumer’s preferences and enables accurate elasticity estimates to be derived. At this stage the consumer model is static. Intertemporal considerations have not been included.

The small scale general equilibrium model equates supplies of goods from producers with the demand for them from consumers and the government. Consumer and government budget constraints are included and the balance of payments on current account and the budget deficit are specified exogenously. Producers’ supplies are specified as price derivatives of the profit function in terms of producer prices while consumer demands are specified as price derivatives of the expenditure function in terms of consumer prices.

The difference between producer prices and consumer prices represents the price wedges or distortions introduced by taxation and government subsidies. The marginal excess burden associated with changing a given tax rate is calculated as follows. Consumer’s utility levels are held constant by means of transfers following a change to the tax rate. The change in overall welfare resulting from the change to the tax rate is then equal to the change in the value of the government’s consumption of goods and services (what the government can purchase after it has compensated consumers to return them to their original utility level). The marginal excess burden or marginal deadweight cost is defined as minus the rate of change in welfare divided by the rate of change in revenue with respect to the given tax rate.

Marginal deadweight cost estimates are derived for four major tax categories: labour taxes, general consumption taxes, motor vehicle consumption taxes and import duties. Because the
model is not dynamic (it does not have an intertemporal dimension) deadweight costs resulting from the taxation of capital cannot be calculated. Capital is instead assumed to be in fixed supply each period and investment is treated as being exogenous.

1.5 Results of the study

The key findings of the study are that the marginal excess burdens or deadweight costs associated with labour taxation have increased from 5 per cent to over 18 per cent in the last 20 years. Over the same period the marginal excess burden of consumption taxation has increased from 5 per cent to around 14 per cent. The average marginal excess burdens for labour and consumption taxation were 9.5 per cent and 8.3 per cent, respectively. Both of these excess burdens are quite significant. For example, a government project financed by additional labour taxation should have, on average, earned a real rate of return 9.5 per cent above the normal real rate of return in order to overcome the adverse effects of increased taxation. Since the average real rate of return for the private sector of the New Zealand economy was only 0.7 per cent for the 20 years of our study, this represents a very large penalty which government spending has to overcome to be justified.

Over the 20 year period the average tax rate on labour income less than doubled while the marginal excess burden associated with labour taxation more than tripled. The more than proportional growth in the marginal excess burden can be attributed in part to the increasing flexibility of the New Zealand economy and points to the urgent need to review taxation levels.

The growth in the tax take in New Zealand has been driven by high levels of government expenditure, particularly on social services, and increasing government debt levels. Many countries have experienced rapidly increasing per capita government debt levels and are also discovering the substantial costs associated with this policy as tax rates increase to cover interest costs. In the case of New Zealand, in 1991 the high cost of taxation can be alternatively illustrated by considering that a reduction in government spending financed by reduced labour taxes would have led to a real rate of return on this “investment” of 18.3 per cent. A more urgent priority, however, is likely to be a reduction in government spending accompanied by a period of unchanged taxation levels to facilitate the reduction of government debt. This would pave the way for a sustainable long-run reduction in taxation levels and associated gains to the New Zealand economy.

The importance of these issues is further highlighted by the fact that our deadweight loss estimates are likely to be relatively conservative. By estimating a static model which treats
investment as exogenous and capital as fixed each period we have not been able to calculate the marginal excess burden of capital taxation. Other studies which have attempted to introduce dynamics and model capital accumulation decisions have shown that the marginal excess burden of capital taxation is generally higher than that for labour. This is particularly likely to be the case for a small economy such as New Zealand trading in a world of ever-increasing capital mobility.

1.6 Structure of the report

In the following section of the report the costs of taxation are examined in more detail. After illustrating the concepts involved in deadweight costs and discussing the adverse incentive effects of taxation, the impacts of taxation on economic growth are briefly examined. The results of previous attempts to calculate deadweight costs are then reviewed.

In Chapter 3 we examine the empirical highlights of the New Zealand economy over the last two decades. After reviewing key price and quantity movements, the performance of the private production sector is assessed using the summary measures of total factor productivity and the real rate of return. The New Zealand taxation system is then reviewed along with trends in government expenditure.

Two models of the marginal excess burden arising from taxation are developed in Chapter 4 to illustrate the concepts involved and the importance of having accurate price elasticity estimates for the production and consumption sectors. The econometric producer and consumer models estimated are then described in detail in Chapters 5 and 6, respectively.

The more detailed model from which deadweight costs estimates are derived is presented in Chapter 7. The policy implications of the resulting deadweight cost estimates are briefly discussed in Chapter 8.

The database which has been constructed for this study is described in detail in Appendix A and the data inputs to the general equilibrium model are listed in Appendix B.
2. THE COSTS OF TAXATION

2.1 Analysis of deadweight costs

The behavioural changes which are caused by taxation can occur at a number of margins. Some of the most important are:

- willingness to work;
- choices among consumption goods;
- willingness to save;
- the pattern of savings;
- the production pattern in society;
- the use of inputs by particular industries; and
- the pattern of investment.

The measurement of the impact of taxation in all these areas has received research attention, although success in putting a money value on the costs of behavioural changes has been patchy. Most work has been devoted to the question of labour supply and this will serve as a convenient example for a diagrammatic exposition of how deadweight costs arise.

Figure 2.1: The Deadweight Costs of Taxation
The measurement of the deadweight loss arising from the taxation of labour is illustrated in Figure 2.1. The willingness of workers to supply labour (say hours per week) at various hourly wage rates is indicated by SS, the compensated labour supply schedule. The demand for labour is denoted by DD. In Browning’s (1976) formulation of the excess burden concept (which followed up on Harberger’s (1964) analysis of total excess burden), the demand curve was taken to be perfectly flat, which corresponds to a perfectly elastic demand for labour. In Figure 2.1, we extend Browning’s analysis to allow for a general demand curve for labour. In the absence of labour taxation, the equilibrium wage rate is $w_0$ and the equilibrium supply of labour is $L_0$. A tax at the rate of $t_1$ causes the wage received by workers to fall to $w_1(1 - t_1)$ and, at the lower wage, they are less willing to offer work. Labour supply consequently falls to $L_1$.

The total loss of welfare to workers due to the imposition of the labour tax $t_1$ is the familiar deadweight loss triangle, $ABC$. A more relevant concept than the total deadweight cost of taxation, however, is the marginal deadweight cost of taxation, since the interesting policy issue is not whether public spending should be abolished altogether, but whether public expenditure and related taxes should be raised, lowered or kept constant. Suppose we are considering adding an additional public sector spending program which will require an increase in the tax rate from $t_1$ to $t$ to be funded. This increase in taxation will lead to a further reduction in labour supply to $L(t)$ and the deadweight cost increases by the trapezoidal area $BCFE$. If the additional public sector program is to be justified on efficiency grounds, then the benefits of the project should exceed the costs by at least $BCFE$.

Denote the incremental welfare loss $BCFE$ as a function of the tax rate $t$ by $W(t)$. With linear supply and demand curves, it can be seen that the area defined by $BCFE$ has the following analytic form:

\[
W(t) \equiv \left( \frac{1}{2} \right) \left[ t_1 w_1 + t w(t) \right] [L_1 - L(t)].
\]

Denote the revenue raised by taxing labour income at the rate $t$ by $R(t)$. In Figure 2.1, $R(t)$ is equal to the area of the rectangle joining the line segment $EF$ to the $w$ axis. Analytically, $R(t)$ is defined as follows:

\[
R(t) \equiv t w(t)L(t).
\]

The marginal excess burden associated with increasing the tax rate $t$, $MEB(t)$, in order to finance a government project, evaluated at $t = t_1$, can be defined as the rate of change of the
incremental excess burden defined by (1) divided by the rate of change of the revenue defined by (2); i.e., we have the following definition:

\[ MEB(t_1) \equiv \frac{W'(t_1)}{R'(t_1)} \]

where \( W'(t_1) \) denotes the rate of change of \( W(t) \) with respect to \( t \) evaluated at \( t_1 \) and \( R'(t_1) \) denotes the rate of change of \( R(t) \) with respect to \( t \) evaluated at \( t_1 \).

An explicit formula for \( MEB(t_1) \) in terms of demand and supply elasticities and the rate of labour taxation \( t_1 \) can be obtained if we approximate the inverse demand curve \( DD \) by the following linear approximation:

\[ w = w_1 - b(L - L_1) \]

where \( b \) is the slope of \( DD \) at the point \( B \). Similarly, we approximate the consumer’s inverse compensated labour supply curve \( SS \) by the following linear approximation:

\[ (1 - t)w = (1 - t_1)w_1 + c(L - L_1) \]

where \( c \) is the slope of \( DD \) at the point \( C \). Now regard (4) and (5) as two simultaneous equations and solve for \( w \) and \( L \) in terms of \( t \), obtaining the solution functions \( w(t) \) and \( L(t) \). Substituting these functions into (1) and (2) and evaluating the derivatives in (3) yields the following expression for the marginal excess burden evaluated at \( t = t_1 \):

\[ MEB(t_1) = \frac{t_1 w_1}{[L_1 (b + c) - t_1 w_1]} \]

Define the negative of the elasticity of demand evaluated at the point \( B \) as \( \sigma \). The elasticity \( \sigma \) and the slope \( b \) are related as follows:

\[ b = \frac{w_1}{\sigma L_1} \]

Define the compensated elasticity of supply evaluated at the point \( C \) as \( \eta \). The elasticity \( \eta \) and the slope \( c \) are related as follows:

\[ c = \frac{(1 - t_1)w_1}{\eta L_1} \]

Substitution of (7) and (8) into (6) yields the following expression for the marginal excess burden:

\[ MEB(t_1) = \frac{t_1}{[(1 - t_1)\frac{1}{\eta} + (1 \sigma) - t_1]} \]

\[ = \sigma \eta t_1 \left[ \frac{1}{\eta + (1 - t_1)\sigma} \right] \]

MARGINAL COSTS OF TAXATION IN NEW ZEALAND

10
where (10) follows from (9) if \( \eta \) and \( \sigma \) are both non-zero and finite.

The case considered by Browning (1976) (and corrected by Findlay and Jones (1982; 556)) is a special case of (9) when \( 1 / \sigma = 0 \). In this case, (9) reduces to:

\[
MEB_{FJ}(t_1) = \frac{\eta t_1}{1 - t_1 - \eta t_1}
\]

which in turn is approximately equal to Browning’s (1987; 13) amended formula for the marginal excess burden:

\[
MEB_B(t_1) = \frac{\eta t_1}{1 - t_1}.
\]

The above diagram and analysis illustrates the Harberger-Browning partial equilibrium approach to measuring the incremental excess burden that can be associated with increasing taxes to finance a government project. Note that this approach leads to the rather complex formulae (9) or (10) when the demand for labour function is not perfectly elastic. Note that if either \( \eta \) (the supply elasticity) or \( \sigma \) (the negative of the demand elasticity) are zero, then the marginal excess burden will also be zero.

By differentiating the right hand side of (10) with respect to \( t_1 \), \( \eta \) and \( \sigma \), it can be shown that the marginal excess burden increases as \( t_1 \) (the tax rate on labour income), \( \eta \) (the supply elasticity) and \( \sigma \) (the negative of the demand elasticity) increase. This means that if \( \sigma > 0 \), \( \eta > 0 \) and \( 0 < t_1 < 1 \), we have the following relationships between our general measure of marginal excess burden \( MEB(t_1) \), the Findlay and Jones special case \( MEB_{FJ}(t_1) \) and Browning’s approximate measure of marginal excess burden \( MEB_B(t_1) \):

\[
MEB(t_1) < MEB_{FJ}(t_1)
\]

\[
MEB_B(t_1) < MEB_{FJ}(t_1).
\]

We also require positive denominators in (10), (11) and (12) to establish the inequalities in (13) and (14).

The above partial equilibrium approach to defining marginal excess burdens has a number of important limitations: (i) the approach is limited to changes in labour tax rates and it is not clear how to extend the approach to changes in other tax rates; (ii) the change in \( t \) may induce changes in other prices and quantities which may affect welfare; (iii) the partial equilibrium approach does not specify precisely what the government will do with any extra tax revenue; and, (iv) it is not clear whether consumers receive transfer payments from the government to keep them at a constant utility level as tax rates are varied. The above difficulties (and
additional ones) were raised by Stuart (1984), Ballard, Shoven and Whalley (1985), Hansson and Stuart (1985), Ballard (1990) and Fullerton (1991). The general approach of the above authors to dealing with the problems raised by the partial equilibrium approach has been to specify a small general equilibrium model of the economy under consideration with explicit consumer, producer and government budget constraints. The incremental disincentive effects of raising any government tax rate can then be evaluated in the context of their specific general equilibrium model. We shall take up this general equilibrium approach in later chapters. However, instead of using restrictive functional forms to model consumer and producer behaviour or relying on guesstimates for the relevant elasticities, we shall attempt to estimate statistically these elasticities using flexible functional form techniques. Our econometric model of producer and consumer behaviour will be explained in detail in Chapters 5 and 6 below.

Taxes place a 'wedge' between social and private returns. The effects of tax wedges can be illustrated by considering an individual who allocates his labour and capital endowments to maximise returns (both monetary and non-monetary). To do this he will allocate his endowments so as to equalise the after-tax return from uses in both high tax and low tax sectors. Low tax sectors include leisure, do-it-yourself work and the 'shadow' economy. Tax wedges induce people to allocate too much of their resources to low tax sectors where the marginal social returns (as measured by the pre-tax return) are lower. The tax wedges thus divert resources from high tax to low tax sectors and act as barrier to raising total output (goods and leisure) that could result from reallocating resources.

Tax wedges pervade the economy and it is their total impact which is important rather than just looking at one particular market or activity in isolation. Lindbeck (1986) argues the most obvious disincentive effects of marginal tax wedges can be summarised as substitution in favour of:

- leisure or recreation;
- lower intensity of work ('on-the-job' leisure if wages are tied to productive effort);
- the pursuit of do-it-yourself work;
- production for barter;
- occupations with large non-pecuniary benefits; and
- the search for tax loopholes.

There may also be many less obvious effects of tax wedges. For instance, if the income tax system is progressive and the after-tax discount rate is relatively insensitive to tax increases, there will be an incentive to substitute away from investment in human capital although in practice this may be offset to some extent by the tendency of governments to provide highly
subsidised education. Labour mobility will also be adversely affected by progressive taxes as wage differentials between regions or industries provide less incentive for people to incur the adjustment costs associated with changing locality or occupation.

The structure of the tax system is also very important. To the extent that the government relies on income rather than consumption taxes there will be a substitution effect away from savings due to the double taxation of savings inherent in most income tax systems. Asset choice can also be distorted by effective tax rates which differ widely between assets. Investment in shares, bank deposits and physical production assets are usually discriminated against relative to consumption-related investment in housing, consumer durables and collector's items which all receive favourable tax treatment, often not being taxed at all. Inflation often aggravates this situation in tax systems which are not indexed.

Given the highly mobile nature of capital today, taxes which penalise investment in physical production assets or make a country a less attractive place to invest relative to its competitors are likely to be particularly damaging. By reducing the rate of capital accumulation, economic growth will be adversely affected and living standards will suffer in the long-run.

Depending on the institutional and cultural characteristics on an economy, there may also be significant lags in the disincentive effects of taxation becoming fully apparent. Consider an economy which has centralised wage fixing and a standard award structure. The long-run impact of higher taxation will be for employees to seek changes to awards to allow for shorter working hours and more liberal special-purpose leave conditions. In other words, there will be pressure for more tax-free benefits to be built into awards.

Disincentive effects are not the only form of deadweight costs which need to be allowed for. As noted in Chapter 1, avoidance, evasion, compliance and administration costs are all likely to be significant and need to be taken into account when assessing the worth of public sector projects. This is best summarised by Slemrod (1990) who notes:

"Taxation is a system of coercively collecting revenues from individuals who will tend to resist. The coercive nature of collecting taxes implies that the resource cost of implementing a tax system is large."

The focus of the current study, however, is on the deadweight costs arising from the disincentive effects of the New Zealand tax system. The disincentive effects of the tax system are likely to be the empirically most significant source of deadweight cost.
2.2 The Effects of Taxation on Economic Growth

Many factors determine a country's rate of economic growth. The interactions between these factors are often complex. Typically, higher rates of investment lead to higher economic growth as current consumption is forgone to make way for higher production levels in the future. However, innovation and the development of new products are also vital to the process.

Government expenditure and, hence, taxation plays a crucial role in providing law and order and the enforcement of property rights necessary for a stable economic environment which will be conducive to investment and risk-taking necessary for economic growth. Public provision of key economic infrastructure such as transport systems can also play an important role.

However, increasing intervention by governments and higher levels of taxation will affect growth prospects as individuals' incentives to undertake investment, innovation and improvements in their human capital are reduced. By stifling these incentives, high levels of taxation will encourage people to substitute in favour of current consumption, including leisure consumption.

A number of studies have attempted to examine the relationship between taxation levels and achieved economic growth rates. While these studies typically lack any underlying analytical framework and rely instead on ad hoc regression analysis, a number of interesting conclusions have emerged. For instance, in a combined cross-section, time-series study of 103 countries between 1960 and 1980, Scully (1991) found that, on average, countries reached their maximum economic growth rates when they took less than 20 per cent of GDP in taxes. Economic growth rates tended to reach zero and then become negative once taxes consumed more than 45 per cent of GDP.

Scully also found that governments maximised the dollar value of their revenue collections when around 43 per cent of GDP was taken in taxes. Attempts to take a larger share of private sector income actually led to the tax base shrinking to the extent that the dollar value of revenue collected declined.

To illustrate the interaction of taxes and growth rates in his study, Scully compares two identical countries. If one chooses its tax rate to maximise current revenue (43.2 per cent of GDP) while the other chooses the tax rate to maximise economic growth (19.3 per cent of GDP), then after 40 years the country that maximises growth will have nearly the same government revenues as the high taxing country but its citizens will have more than three times as much after-tax income as the high tax country.
Studies by Littman (1990, 1991) have found a similar pattern within the United States where states with the highest tax effort (state taxes as a per cent of the tax base) have been losing population to the states with the lowest tax efforts. The ten states with the highest population growth between 1970 and 1990 had an average tax effort 12 per cent below the national average. For the same period, the ten states with the lowest tax effort had an average employment growth of 18 per cent while the ten states with the worst employment growth records all had tax efforts above the national average.

The results of these studies provide important circumstantial evidence on the likely adverse effects of high levels of taxation on economic growth prospects. They point to the need to reassess whether the community is getting value for money from the taxes it pays.

### 2.3 Key studies of the magnitude of deadweight costs

As noted at the start of this Chapter, a seminal paper in the literature on deadweight costs is that of Browning (1976) who formalised the notion of the marginal cost of public funds. He was motivated by the observation that the cost of financing public expenditure is the value of the expenditure itself plus the welfare or deadweight cost of that expenditure. He applied his methodology to calculate the deadweight cost for taxes that affect labour in the United States.

Browning used the standard formula developed by Harberger (1964). The formula shows that the total deadweight cost aggregated over all workers is:

\[
W = \frac{1}{2} \eta t^2 Y
\]

where \(W\) is the deadweight cost, \(\eta\) is the elasticity of labour supply (compensated for income effects) with respect to a change in disposable income, \(t\) is the tax rate and \(Y\) is total labour income.

Browning's measure requires an estimate of the elasticity of labour supply compensated for income effects. The intuition of this is as follows. The imposition or raising of a tax on labour income reduces the incentive to work relative to consuming leisure. However, there is also a reduction in disposable income and this has a separate general affect on the amount of consumption of goods and leisure that an individual chooses. This income effect does not normally affect allocative choices and it is, therefore, separated out when measuring deadweight costs. Another reason for separating out income effects is that it is normally assumed that the alternative means of raising the revenue would be a lump sum tax that would only have income effects.
Browning examined the effect of a change in the tax rate by taking the derivative as follows:

\[ dW = \eta t Y \, dt \]  

where \( dW \) is the change in the deadweight cost and \( dt \) is the change in the tax rate. Assuming a proportional income tax, revenue (R) is given by:

\[ R = tY \]

and additional revenue for a change in the tax rate (for an unchanged tax base) is given by:

\[ dR = Y \, dt. \]

The marginal welfare or deadweight cost per dollar of revenue raised is therefore:

\[ \frac{dW}{dR} = \eta t. \]

The marginal cost of one dollar of public funds is the marginal welfare cost of taxation plus the direct cost or \((\eta t + 1)\).

The above formulae were derived for the case of a proportional tax. Browning also considered the case of a flat rate tax with an exemption up to a certain limit (known as a regressive tax) and of a tax with graduated rates that rise as incomes rise (known as a progressive tax).

The deadweight cost for a regressive tax is given by:

\[ \frac{dW}{dR_D} = \eta t \, \frac{Y}{B} \]

where \( B \) is the tax base. Since \( Y \) is greater than the base, the deadweight cost for a regressive tax will be greater than for a proportional tax. Browning shows that with an exemption of 40 per cent of average income, \( Y / B \) would be 1.6. In order to raise the same revenue as a proportional tax, \( m \) would have to rise from 35 to 56 per cent. This implies the marginal deadweight cost for a regressive tax would be 2.5 times larger than for a proportional tax yielding the same revenue.

The deadweight cost for a progressive tax varies depending on how the different rates in each tax bracket are varied. The general formula is as follows:

\[ \frac{dW}{dR_p} = \sum_i \eta_i t_i Y_i + B_i * \text{change in } t_i + \text{change in } t \]

where \( t \) is the average tax rate for all brackets and there are \( i \) brackets. Browning used formulae 5, 6 and 7 to calculate the deadweight costs of raising an additional dollar in taxation after taking account of the existing marginal tax rates implied by the US federal, state and local income and sales taxes, payroll taxes and social security taxes. He thus assumed that all these
taxes affect the decision to work and are effectively borne fully by labour. For example, sales taxes reduce the purchasing power value of earnings and this induces a substitution from taxed goods to untaxed goods including leisure.

Browning’s results are shown in Table 2.1. They show that the marginal deadweight cost of raising additional tax revenue varies from 8 per cent to 16 per cent of the additional revenue depending on whether a proportional or a progressive tax structure is used. Although Browning’s work was pathbreaking, his estimates of the magnitude of marginal deadweight costs are low compared to subsequent, more sophisticated studies.

As noted in Section 2.1, Browning (1987) modified the approach to adjust for an error arising from the fact that data relating to a situation in the presence of a tax were used, whereas the formula applied to the situation in the absence of a tax. This understated the welfare cost by a factor of 1/(1-t). The revised estimates of the marginal deadweight costs as a per cent of tax revenue varied from 8 to well over 100 per cent.

Findlay and Jones (1982) identified the error in Browning’s original paper. They also allowed the tax base to vary in their methodology which they applied to Australian data for income, excise and sales taxes. For a compensated elasticity of supply of 0.2 they found the deadweight cost varied from 23 to 65 per cent of tax revenue, depending on whether the rate structure change was proportional, degressive or progressive. For an elasticity range of 0.1 to 0.4, they found a deadweight cost of 11 to 160 per cent of tax revenue.

A number of other approaches to measuring the deadweight costs of taxation have been developed in the literature. Differences can often be traced to the definition of consumer utility and the specification of labour supply, and whether partial or general equilibrium approaches are used.

The measures of Stuart (1984) and Ballard, Shoven and Whalley (1985) were derived from the computation of a two sector and a multisector general equilibrium model, respectively. They can be used to illustrate some general equilibrium implications.
As noted by Stuart (1984), Browning's approach is strictly only valid for small changes and, more importantly, it compares an undistorted equilibrium to a fully compensated situation. However, most tax changes start with a distorted equilibrium and lead to a new distorted equilibrium. Another problem is that the equilibrium level of welfare and tax revenue depends on the way the government spends the revenue. Stuart overcomes these problems and also relaxes Browning's assumption of a fixed tax base by using a simple general equilibrium framework.

The model assumes two sectors, corresponding to a taxed market sector and a non-taxed household (and leisure) sector. Capital stocks in each sector are assumed fixed and immobile between sectors. Simple, explicit production and utility functions are assumed. Government expenditure takes two forms; consumption which does not affect utility, and transfers that increase household income. The model yields a general equilibrium computation for the deadweight cost of taxation. Calculations are undertaken for United States data on personal income, payroll and excise taxes since all these can be avoided if labour shifts from taxed to untaxed uses.

The deadweight cost as a per cent of tax revenue varied from 21 to 100 per cent for compensated elasticities of supply from 0.2 to 0.84 and a marginal tax rate of 42.7 per cent. The range was 24 to 133 per cent for a marginal tax rate of 46 per cent.

The foregoing estimates relate to an assumption that all marginal tax revenue is distributed on a lump sum basis. When an alternative assumption is made that all tax revenue is used to finance government consumption the benchmark deadweight cost falls from 21 to 7 per cent. The intuition of this result is that when revenue is directed to government consumption, individuals receive no income (or consumption) benefits and they do not consume more leisure. But when the revenue is spent on transfers, the income effects mean that they do consume more leisure making it more difficult to raise revenue. Thus, in the former case it is easier to raise revenue because of income effects and this lowers the deadweight cost burden. This striking result suggests that the marginal excess burden of wasteful government expenditure is less than for redistributational programs.

Ballard, Shoven and Whalley (1985) used a multisector, intertemporal, computational general equilibrium model to calculate simultaneously the welfare effects of all major taxes in the United States. They estimated the marginal deadweight loss from a 1 per cent increase in all distortionary taxes. For a plausible range of elasticities they found deadweight costs amount to from 17 to 56 per cent of revenue raised (Table 2.2). They also demonstrated that the deadweight cost is higher when elasticities and tax rates are larger.
Table 2.2: Marginal Deadweight Cost Estimates of Ballard, Shoven and Whalley

<table>
<thead>
<tr>
<th>Labour supply elasticity (uncompensated)</th>
<th>Saving elasticity</th>
<th>per cent of revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>0.0</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>0.15</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>0.30</td>
<td>39</td>
<td>48</td>
</tr>
</tbody>
</table>

Source: Ballard, Shoven and Whalley (1985)

Jorgenson and Yun (1990) also used a multisector general equilibrium model of the United States to calculate the welfare effects of the complete tax system. Their model differed from that of Ballard, Shoven and Whalley by specifying a very detailed representation of the tax system. In particular, distinctions were made between short- and long-lived assets and among assets held in the corporate, non-corporate and household sectors. Distinctions were also made between average and marginal tax rates and the different tax treatment of different types of income.

For the tax system after the 1986 tax reform, they found a marginal efficiency cost of 38 per cent of tax revenue and an average efficiency cost of 18 per cent of tax revenue.

They also calculated efficiency costs before the tax reform and compared them with earlier estimates (Table 2.3). They found generally higher estimates, especially for capital. It should be noted that they model capital taxes in much more detail than Ballard, Shoven and Whalley and therefore show inter-asset and inter-sectoral capital distortions to be very large. This is consistent with strong substitution possibilities among capital assets.

Table 2.3: Comparison of Marginal Deadweight Cost Estimates

<table>
<thead>
<tr>
<th></th>
<th>Ballard, Shoven and Whalley</th>
<th>Jorgenson and Yun</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>per cent of tax revenue</td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>46</td>
<td>92</td>
</tr>
<tr>
<td>Labour</td>
<td>23</td>
<td>48</td>
</tr>
<tr>
<td>All</td>
<td>33</td>
<td>46</td>
</tr>
</tbody>
</table>

Source: Ballard, Shoven and Whalley (1985), Jorgenson and Yun (1990)

These studies illustrate that the deadweight costs of taxation can be very high, even for relatively low-tax countries such as the United States. The few studies which have been carried out for the high-tax, European 'welfare state' countries indicate that deadweight costs can become massive when very high taxes are combined with complex social welfare systems. For instance, using a two sector, two input general equilibrium model, Hansson and Stuart (1985; 345) found that the marginal cost of public funds in Sweden was around $2.30 for government spending on transfer payments and $1.70 for government spending on goods and
services for each additional dollar of taxes collected. Marginal tax rates in Sweden at the time were around 70 per cent for the average taxpayer (inclusive of all taxes and income-dependent transfers).
3. EMPIRICAL HIGHLIGHTS OF THE NEW ZEALAND ECONOMY

3.1 Background

The New Zealand economy has undergone considerable change over the last 20 years. New Zealand was traditionally an agricultural exporting nation heavily reliant on exports to Britain. It was badly affected by Britain joining the European Community. The Muldoon government in the late 1970s engaged in large and unsustainable spending programs and attempts to support industry which produced burgeoning debt levels and led the country into a precarious economic state.

The Labour government elected in 1984 embarked on an ambitious reform program which reduced assistance levels dramatically, completely revamped the tax system and saw the commercialisation and privatisation of key state-owned enterprises. The focus of recent reforms has been the labour market where the centralised wage-fixing system has been replaced by a system of individual employment contracts.

The pace of reform in New Zealand has been rapid, aided by the unusual parliamentary system which has only one house elected on a first-past-the-post basis. The extent of reform undertaken has made New Zealand the focus of interest of other countries interested in gauging the success of the reforms. Until recently, the adjustment costs associated with the reforms appear to have been high and growth performance has been disappointing but evidence is now emerging that the benefits of the reform program are flowing through and New Zealand is well placed to emerge from the international recession ahead of other countries.

The tax system has been a major focus of the New Zealand reform program and the tax system now existing is regarded by many to be one of the best in the world. However, total tax levels remain high compared to many countries and government expenditure has largely continued unchecked leading to significant deficits and increased foreign debt. This points to the need for further reforms.

In the following section key price movements in the New Zealand economy over the last 20 years are reviewed. This is followed by a review of the performance of the economy's market sector in Section 3.3. The characteristics of the New Zealand tax system are then reviewed in Section 3.4. The derivation of the data reported in this Chapter and the principles used in its construction are outlined in Appendix A.
3.2 Price Movements

Output prices received by market sector producers increased at an annual trend rate of 10.3 per cent per annum between 1972 and 1991. However, the aggregate input price paid by producers increased at an annual trend rate of 11.6 per cent. As can be seen from Figure 3.1, overall output and input prices remained relatively close for the first of the two decades but steadily diverged after 1982.

Figure 3.1: Market Sector Total Output and Input Prices

![Graph showing output and input prices from 1972 to 1990.](image)

Source: Swan Consultants (Canberra) New Zealand database.

The declining price situation faced by New Zealand producers is illustrated in Figure 3.2 where the prices received to prices paid ratio for total outputs and inputs can be seen to have fluctuated but remained steady for the first half of the period before generally declining after 1982. The annual trend rate of decline for the whole period was 1.2 per cent. If producers are to maintain

Figure 3.2: Prices Received to Prices Paid Ratios

![Graph showing terms of trade and output/input price ratio from 1972 to 1990.](image)

Source: Swan Consultants (Canberra) New Zealand database.
their profitability in the face of such declines in the prices received to prices paid ratio then offsetting productivity improvements must be made.

In terms of international price movements the New Zealand economy has fared better. The terms of trade graphed in Figure 3.2 shows the ratio of export prices to import prices. It illustrates that since 1985 export prices have improved relative to import prices meaning that New Zealand's exports have been able to purchase an increasing quantity of imports. For the 20 year period the terms of trade annual trend decline was only 0.2 per cent.

Price indexes for 5 output components - motor vehicles, housing investment, general consumption goods (excluding housing and transport), general investment and exports - are shown in Figure 3.3. Prices for the major outputs of general consumption goods and exports have moved together closely and increased at a trend annual rate of over 10 per cent. Producer prices for motor vehicles have increased the most rapidly with a trend growth rate of almost 15 per cent, followed by housing investment on 11 per cent. The price of general investment goods have increased the least rapidly with a trend rate of growth of 8.4 per cent.

Figure 3.3: Producer Output Prices

[Graph showing trends in output prices]

Source: Swan Consultants (Canberra) New Zealand database.

Input prices shown in Figure 3.4 have exhibited more variability with land user cost prices increasing the most steeply at an annual trend rate of over 14 per cent. Labour prices have also risen sharply at a trend rate of 12.4 per cent. Import prices, on the other hand, have levelled off since 1985 to produce an annual trend increase of 10.4 per cent. Capital user costs have consistently remained low throughout the period with a trend increase of 8.7 per cent.
3.3 Economic Performance of the New Zealand Economy

The best summary measures of economic performance are total factor productivity and the economic rate of return. Total factor productivity (TFP) measures the amount of total outputs produced per unit of overall inputs. Improvements in TFP can be brought about by technical change, improved management and the elimination of inefficient work practices. The economic rate of return provides a measure of true profitability based on the current market value of assets.

The New Zealand economy's market sector TFP is presented in Figure 3.5 along with total output and total input quantity indexes. TFP performance is quite different between the first and second decades of the period covered. For the first half of the 20 year period, TFP remained
stationary apart from minor fluctuations around the trend. This coincided with the period of high assistance to industry and large expenditure of public resources on 'Think Big' projects. The deleterious effects of these polices on the economy can be seen from the dismal TFP performance.

The situation only began to improve after 1983 when extensive reforms were introduced. These reforms have led to productivity improvements but the economy's performance has remained sluggish as extensive restructuring has taken place with associated adjustment costs. Nevertheless, by the end of the 20 year period New Zealand's TFP level was 30 per cent above its 1972 level.

The annual trend rate of change in New Zealand's TFP for the period as a whole was 1.2 per cent. Although total output increased at a trend rate of 2.2 per cent over the 20 years, it has increased little since 1984. Recent productivity improvements have mainly been brought about by reductions in total input use, particularly since 1988. The main input whose use has fallen is labour which decreased by 13 per cent in effective terms between 1988 and 1991.

Year-to-year changes in TFP presented in Figure 3.6 have again centred around zero until the last few years reflecting the relatively poor TFP growth performance.

**Figure 3.6: Total Factor Productivity Year-to-Year Changes**

![Graph showing Total Factor Productivity Year-to-Year Changes from 1973 to 1991](image)

*Source: Swan Consultants (Canberra) New Zealand database.*

The relatively poor performance of the economy has been reflected in a very slow increase in the index of individual welfare or utility presented in Figure 3.7. This index represents the benefit the average person in the 15 to 64 years age group receives from the goods and services they consume. The goods and services included in the index are housing, transport, general consumption and leisure. Its derivation will be explained in the Chapter dealing with the