Inland Revenue
Te Tari Taake

Supplementary Briefing Papers

VOLUME 2
Report on Research Commissioned by Inland Revenue

November 1999

Preface

This second volume of supplementary briefing papers contains Inland Revenue's response to research we commissioned on the economic effects of taxation. In 1997 and 1998 the department's Policy Advice Division circulated for public comment 38 working papers prepared under the supervision of its Taxation Economics Group. Our response to those papers outlines the background to the research being commissioned, identifies and discusses the key results of the research, and examines the implications of the research.

In view of the large number of working papers, this report does not seek to comment on each. Instead it discusses the key results of the research that have attracted considerable media attention. These are:

- the effect of taxation on economic growth; and
- the size of the "hidden" economy and the level of tax evasion.

The appendices to the report outline some of our main concerns about the methodologies used in some of the working papers, particularly those relating to the impact of taxation on the rate of economic growth in New Zealand.

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Chapter 1

Summary

Over the period 1994 to 1997, Inland Revenue commissioned 38 working papers on the economic effects of taxation. In accordance with the Generic Tax Policy Process (GTPP), those working papers have passed through a detailed process of internal and external consultation.

Inland Revenue's Policy Advice Division has completed its review of that research in the light of the results of that process of consultation. The purpose of this report is to:

- outline the background to that research;
- identify and discuss the key results of that research (sections 2 and 3 of this report); and
- examine the implications of the research (section 4 of this report).

This report is not intended to provide a detailed analysis of each of the working papers commissioned by Inland Revenue. Rather, its purpose is to discuss the key results of that research that have attracted considerable media attention. These are:

- the effects of taxation on economic growth; and
- the size of the "hidden" economy and the level of tax evasion.

The appendices to this report outline some of the key concerns we have with the methodologies used by some of the working papers, particularly the methodologies used to comment on the impact of the tax system on the rate of economic growth.

Background

The primary objective of the working papers commissioned by Inland Revenue was to assist us with the preparation of our "Health Report".

In accordance with the recommendations of the Review Committee chaired by the Rt Hon Sir Ivor Richardson, Inland Revenue has been preparing a regular "Health Report" for the Minister of Revenue. To date, three health reports have been submitted to the Minister of Revenue, one in February 1997, another in December 1997, and the most recent in December 1998.

As recommended by the Review Committee, the objective of those health reports is to provide the Government with a clear picture of the full set of major issues confronting the tax administration in the achievement of its objective, including any "pressure points". This is intended to ensure that the Government has all of the information necessary in order to make purchase and ownership decisions that are in the best long-run interests of the tax administration.

In particular, the structure and content of Inland Revenue's health reports reflect the Review Committee's recommendation that those reports should:

- integrate new and existing strategies;
- describe the requirements to operationalise policy initiatives, so that the Government can make purchase decisions consistent with its wider strategies and the overall objective for the tax administration; and
- state how Inland Revenue is dealing with any problems developing in the operation of tax legislation reported through the Generic Tax Policy Process.[1]

The Review Committee also recommended that Inland Revenue develop and maintain a set of macro performance indicators, for inclusion in its "Health Report", to assist the Government and Inland Revenue management in making strategic decisions on tax matters.[2]

In accordance with that recommendation, Inland Revenue has:

- included macro performance indicators of the efficiency of the tax administration in its health reports to the Minister of Revenue; and
- commissioned some 38 working papers to assist with the development of indicators of the overall efficiency and equity of the tax system.

Objectives of the research commissioned by Inland Revenue

The working papers commissioned by Inland Revenue have sought to help us monitor:

- the extent to which the tax system is imposing costs on New Zealand by reducing economic growth; and
- the size of the "hidden economy" and the level of tax evasion in New Zealand.

The research was not intended to come up with any specific recommendations as to the nature of possible reforms to the tax system. Rather, it was commissioned with a view to providing some indication of changes in the overall efficiency and equity of the tax system in order to assist both the Minister and Inland Revenue senior management in their consideration of taxation issues.

[1] Organisational Review Committee (1994) *Organisational Review of the Inland Revenue Department, Report to the Minister of Revenue* (and on tax policy also to the Minister of Finance), April, recommendation 8.6.4, page 53.
[2] Recommendation 8.6.5, page 53 op cit. Appendix C listed possible indicators including: best estimate of theoretical revenue; actual revenue collected; the "tax gap"; deadweight losses; taxpayer compliance costs; total administration costs; net revenue collected; taxpayer perceptions as a measure of voluntary compliance; tax disputes assessment; return on taxpayer audit; and macro benchmarks assessing IRD's performance against other industries in New Zealand and overseas tax administrations.

Process of consultation

In accordance with the Generic Tax Policy Process, the working papers have passed through an extensive process of internal and external consultation. That process of consultation has included:

- internal Inland Revenue workshops, where the working papers were discussed with an audience comprising the authors of the papers, officials from Inland Revenue, the Treasury, the Reserve Bank, academics from New Zealand and overseas, and a number of other interested parties;
- circulation of the working papers to a number of overseas academics who served as independent referees; and
- wider circulation of the working papers to various Members of Parliament, the media, New Zealand academics, and other interested parties.

Inland Revenue has now completed its evaluation of the working papers in the light of comments made during this process of consultation and further evaluation of the working papers by the Policy Advice Division. This process of consultation has culminated in the preparation of this report.

Key results of the research

Impact of taxation on economic growth

The key results of the research into the effects of taxation on economic growth are set out in chapter 2.

In brief, although the results of the working papers differ to some extent, they are consistent with the main conclusions reached in the working paper by Branson and Lovell:

- The optimal tax burden varies over time around a period mean of 22.5%, well beneath the actual period mean effective tax rate of 28% and far beneath the 1995 effective tax rate of 35%.
- The optimal tax mix varies over time around a period mean 65% share of direct taxes in total tax revenue. This optimal share is slightly less than the observed period mean 68% share of direct taxes in total tax revenue, although it is virtually identical to the 1995 share.
- A move to an optimal tax structure would on average generate nearly a 17% increase in the level of real GDP. Such a move would have no perceptible impact on the long run rate of growth of real GDP beyond the transition period, although the transition period might be quite long.

- The 17% increase in real GDP, in conjunction with the 20% reduction in the tax burden, would reduce government tax revenue by almost 6% on average. As a consequence, purchasing power in the remainder of the economy would increase by 27% on average. It is this release of resources from the public to the private sector which generates the higher output and faster transitional period growth.

Size of the hidden economy and level of tax evasion

The key results of the research into the hidden economy, and the effects of taxation on the size of the hidden economy, are set out in chapter 3.

In brief, the working papers conclude that:

- The size of the hidden economy as a percentage of GDP fluctuated over the period of analysis (1968 to 1994) between 7% and 11.3% of GDP in a manner that is positively correlated to the business cycle.
- The long run average size of the hidden economy was estimated to be 8.8% of GDP, and it peaked at 11.3% of GDP in both 1987 and 1994.
- The size of the hidden economy in New Zealand is in the lower half of the estimated size of the hidden economy for most OECD countries.
- A decrease in the tax/GDP ratio reduces the hidden economy ratio.
- A one-percentage point reduction in the tax/GDP ratio causes a 0.2 percentage point fall in the hidden economy for recent levels of tax/GDP.
- Below a tax/GDP ratio of 21%, the hidden economy decreases at a slower rate.
- If the Government were to reduce tax rates to zero, the hidden economy would still remain at 4%-4.5% of GDP.

Inland Revenue's views

We are concerned about the approach adopted, and some of the methods used, to estimate the adverse effects that taxation has had on the level of economic growth in New Zealand, and the manner in which the results of that research have been interpreted.

However, we are more comfortable with the conclusions reached by other working papers. For example, Professor Giles has provided the first estimates of the potential size of the hidden economy in New Zealand, and that work enables estimates to be made of the overall extent of tax evasion. We intend to explore the possibility of updating that type of analysis on a reasonably regular basis for inclusion in the department's annual Health Report.

Our views on the research are outlined briefly below.

Effect of the tax system on economic growth

Costs and benefits of taxation

In the course of raising and redistributing tax revenue, the tax system has the unintended effect of distorting decisions to save, invest, work, consume and produce. This imposes costs on the nation as a whole by encouraging a less efficient use of resources. Those costs, which are often referred to as "deadweight costs" or the "excess burden" of taxation, can take a number of forms including administrative costs, compliance costs, and other deadweight costs that arise because the tax system distorts consumption, production, savings, investment, work and education decisions.

At the same time, however, government expenditure financed by tax revenue can benefit the nation as a whole by improving the efficiency with which the economy operates, and achieving a more equitable distribution of income.

The net effect of taxation on economic growth, and the well-being of the nation as a whole, therefore depends on the relative magnitudes of these costs of raising tax revenue, and the benefits derived from the government expenditure financed by that tax revenue. Those benefits include both potentially higher rates of economic growth, and a more equitable distribution of income.

Objectives of the research

Several working papers sought to develop indicators of the net effect that the tax system has been having on rate of economic growth in New Zealand.

In particular, those working papers sought to determine:

- the effect of the tax burden (as measured by the ratio of tax revenue to GDP) on the rate of growth of GDP; and
- the effect of changes in the tax mix (as measured by the ratio of tax revenue raised by direct and indirect taxation to GDP) on the rate of growth of GDP.

Concerns regarding the approach adopted

Two approaches can be used to estimate the deadweight costs of taxation.

One approach is to develop a detailed model of the New Zealand economy that enables a detailed analysis to be undertaken of the extent to which the tax system distorts decisions and reduces the overall efficiency with which the economy operates.

This is the approach used by Professor Erwin Diewert and Dr Denis Lawrence to estimate the deadweight costs arising from the taxation of consumption, and labour income, in New Zealand.

The main advantage of that "bottom-up" approach is that it seeks to model the factors that actually determine the magnitude of the deadweight costs of the tax system. By contrast, the main disadvantage is that it is informationally demanding since it requires detailed information on the effective marginal tax rates facing taxpayers, and how responsive taxpayers' decisions are to changes in those tax rates.

An alternative approach to estimating the deadweight costs of taxation is to select some indicator of national welfare that is measurable (such as the rate of growth in GDP) and estimate the extent to which taxation has adversely affected that indicator.

This is the approach adopted by several of the working papers commissioned by Inland Revenue. In brief, that "top-down" approach involves first estimating the tax burden and tax mix that maximise the rate of economic growth, and then determining the adverse effects on economic growth that arise from a tax system that applies a higher tax burden, and a different tax mix.

The main advantage of the "top-down" approach is that it is potentially less informationally demanding than the alternative "bottom-up" approach described above. This enables readily observable data to be used for the purposes of the analysis.

The main disadvantage of that approach is that it is possible to reduce the information required for the purposes of the analysis significantly only by making even more simplifying assumptions than those made for the purposes of "bottom-up" models.

This means that the results of the analysis have to be interpreted with considerable caution in the light of those simplifying assumptions. The conclusions reached are only as good as the assumptions that have had to be made to reach those conclusions. Unfortunately, the results of empirical analyses are often accepted at their face value, with little regard for the validity of the underlying assumptions.

Two key assumptions underlie the working papers on taxes and growth:

- The tax structure is adequately described by:
  - the tax burden (the ratio of tax revenue to GDP); and
  - the tax mix (the ratio of indirect to direct taxes).
- The Government's sole objective is to maximise the rate of growth of real GDP.

As discussed below, we do not consider these assumptions are realistic.

First, the complex structure of the tax system cannot be described adequately by the "tax burden", or "tax mix". This is because the ratio of tax revenue, or components of tax revenue, to GDP is a poor indicator of the distortions introduced by the tax system.

In particular:

- **Major changes in the tax system and the level of distortions it creates may not produce significant changes in the ratio of tax revenue to GDP.** Indeed, a revenue-neutral package of tax reforms will have no effect on the ratio of taxation revenue to GDP even though it might significantly reduce distortions, improve efficiency and hence economic growth. This is a major problem with the approach adopted since the process of tax reform since 1984 has involved the introduction of numerous largely revenue-neutral packages of reforms aimed at broadening the tax base and lowering tax rates.
- **Tax reforms that have vastly different effects on the overall efficiency of the tax system can have the same effect on the ratio of taxation revenue to GDP.** For example, the introduction of a $100m package of highly distortionary tax concessions, or a $100m increase in tax avoidance and evasion, would have the same effect on the ratio of tax revenue to GDP as a $100m tax cut package that considerably reduced distortions.
- **The ratio of taxation revenue to GDP can fall as a result of decreases, rather than increases, in the efficiency of the tax system.** For example, increases in administrative and compliance costs that do not produce additional tax revenue will tend to reduce the ratio of taxation revenue to GDP.
- **The ratio of taxation revenue to GDP can change even when there are no changes in the tax system or the distortions it creates in the economy.** This is because not all activities face the same rates of taxation. As a result, different patterns of economic growth can have different effects on the level of taxation revenue raised. For example, economic growth that is predominantly due to an increase in the production and consumption of goods and services that are exempt from GST (such as financial services, or exports which are subject to a zero rate of GST) would not produce any additional GST revenue. By contrast, there would be an increase in GST revenue if that economic growth was predominantly due to an increase in the production and domestic consumption of consumer goods and services that are subject to GST. Simply dividing the amount of tax revenue by GDP is not a particularly accurate method of ensuring the estimated tax burden does not change simply as the result of economic growth.

These problems mean that if we simply study the relationship between changes in the ratio of taxation revenue to GDP and the rate of growth of GDP, we may get a very misleading view of the effect that changes in the tax system are having on economic growth. In particular, given the nature of the tax reform process to date, there is a risk that such an approach will understate the improvements in growth arising from tax reforms that have not resulted in significant falls in the ratio of tax revenue to GDP.

Second, it is highly unrealistic to assume that the sole objective of governments is to maximise economic growth. Government expenditure is aimed at objectives other than just increasing the rate of economic growth. These objectives include improving the quality of the environment within which New Zealand residents live, and the equity with which income is distributed in New Zealand.

As outlined below, the rate of growth in GDP is not a particularly good indicator of the net benefits of government spending financed by tax revenue. In particular:

- **The rate of growth of GDP does not adequately reflect the benefits of all government expenditure financed by taxation revenue.** The benefits of government expenditure on goods and services are difficult to value for national account purposes, owing to the absence of "arm's-length" market prices. In practice, most goods and services provided by the Government are valued at cost, which can either under or overstate their true benefit to the community. In particular, there is a risk of undervaluing the benefits arising from services that involve little or no government expenditure. These include the benefits from enforcement of regulations including property rights, quarantine regulations, health regulations, and environmental standards. Problems also arise when valuing the benefits arising from government expenditure that is not directed at increasing the rate of economic growth. This includes expenditure on social welfare programmes which is predominantly aimed at achieving a more equitable distribution of income in New Zealand. These benefits will not be reflected adequately by changes in the rate of growth of GDP. By using the rate of growth of GDP as an indicator, the approach adopted in the working papers considers the costs of raising the tax revenue required to finance social welfare expenditure, but it fails to take into account adequately the benefits of that expenditure. This has the potential to bias the observed relationship between the tax burden and the rate of economic growth.
- **Government expenditure needs change over time in response to a range of factors including changes in demographics, technology, the needs of the community, as well as community attitudes about the appropriate distribution of income.** For example, the expenditure needs of the Government during the early years of the period of analysis were vastly different from the expenditure needs over recent years. This makes it difficult to establish a stable, longer-term relationship between changes in the tax burden and the rate of growth in GDP. Of particular significance is the increase in the proportion of government expenditure on social welfare programmes over the period of analysis. This has the potential to exacerbate the bias arising from excluding the benefits of social welfare expenditure financed by taxation revenue.
- **The rate of growth of GDP reflects the benefits of government spending financed from sources other than tax revenue, such as increased government debt and increased government charges for those goods and services.** However, the approach adopted in the working papers does not consider the costs of raising that revenue. This has the potential to bias the observed relationship between the tax burden and the rate of economic growth.
- **The proportion of government expenditure financed from tax revenue has changed considerably over the period of analysis.** Once again, this makes it more difficult to establish a stable, longer-term, relationship between the tax burden and the rate of growth of GDP. It also has the potential to exacerbate the bias arising from excluding the costs of raising the non-tax revenue required to finance that expenditure.

Concerns regarding the methods used

We are also concerned about the analytical methods used in some of the working papers.

In particular, we are concerned about the methods used by Professor Scully in his working papers on the effects of taxation on economic growth. Those concerns are outlined in chapter 2, and are discussed in more detail in the appendices. In view of those concerns, Inland Revenue does not agree with the conclusions reached by Professor Scully.

Interpretation of the results of the research

The results of the research into the effects of taxation on economic growth need to be interpreted carefully in the light of the objectives of the research, and the inherent limitations of the approach adopted.

As noted in several working papers:

- The objective of the research into taxation and economic growth was not to determine the optimal ratio of tax revenue to GDP and tax mix for New Zealand. Rather, the research sought to calculate the "growth maximising" tax burden, and tax mix, in order to develop macro performance indicators of the extent to which taxation has been imposing costs on New Zealand by retarding the rate of economic growth.
- Since any Government will have numerous objectives other than maximising the rate of economic growth, it may need to raise revenue in excess of the estimated "growth maximising" ratio of tax revenue to GDP.

As a result, Inland Revenue does not consider the research has established that:

- the optimal rate of tax for New Zealand is 20% of GDP;
- the "optimal tax mix for New Zealand is 65% from direct taxes, and 35% from indirect taxes; and
- tax rates and government expenditure should be reduced to achieve those optimal ratios.

Consequently, it would be inappropriate to use the estimated "growth maximising" tax burden and tax as targets for tax policy purposes.

Even if a Government's sole objective were to maximise the rate of economic growth, the problems inherent in the "top-down" approach adopted by the working papers are such that the results of the research should be interpreted with considerable caution. As outlined above, the tax burden (as measured by the ratio of taxation revenue to GDP) is a very poor indicator of the structure of the tax system and the extent to which it distorts economic decisions. Many of the increases in the rate of economic growth that are due to relatively revenue neutral packages of tax reform will not be attributed to changes in the tax system.

In view of these problems, we do not consider that the working papers have established a clear relationship between the effects of taxation on economic growth in New Zealand. We share the OECD's concerns about the merits of "top-down" research and agree with its view that current research on the relationship between taxation and economic growth is far from conclusive.

However, we do consider that the overall level of taxation in New Zealand is high by historical standards and is likely to be imposing considerable costs on the community as a whole.

Size of the "hidden economy" and the level of tax evasion

Inland Revenue welcomed the research by Professor Giles into the size of the hidden economy in New Zealand and is concerned about overall level of tax evasion in New Zealand.

Although the estimated size of the hidden economy in New Zealand is well below the average for most OECD countries, this is not a reason to be complacent.

The overall size of the hidden economy is still significant, and Inland Revenue is committed to reducing that level.

It is reassuring, however, to learn that New Zealand does not suffer from an unusually high level of unreported income, and that much of this activity would occur regardless of the level or rate of taxation.

The relationship between taxation and the size of the hidden economy does pose an interesting dilemma for policy makers.

To the extent that it is possible and desirable for the Government to do so, lowering the tax/GDP ratio may have two offsetting effects on the hidden economy. In itself, the research shows that such a policy would decrease tax evasion. However, because tax evasion and economic growth are positively correlated, it would also encourage tax evasion. The net effect remains ambiguous.

It is important to note that reducing tax rates, and broadening the tax base produce numerous benefits in addition to reducing the size of the hidden economy. These include improving the overall efficiency and equity of the tax system. As a result, it is better to view reductions in the size of the hidden economy as being one of the many potential benefits of reducing taxes, rather than the main reason for wanting to cut taxes.

Although reducing taxes may help to reduce the incentive to avoid and evade taxes, the Government's ability to reduce taxes is obviously constrained by its revenue needs. At the end of the day, the tax system must raise sufficient revenue to meet the Government's expenditure and debt servicing needs.

A more practical approach to tax evasion is that recommended by the European Commission, endorsed by the Committee of Experts on Tax Compliance and being applied by Inland Revenue.[3] This involves pursuing a range of initiatives aimed at enhancing compliance by simplifying the tax system, and discouraging non-compliance through more effective audits and penalties. These initiatives are discussed in section 3.4.2 of this report.

Implications for future research

Practical constraints on the development of macro performance indicators

Although it is highly desirable to monitor the overall efficiency and equity of the tax system, Inland Revenue's experience suggests that there are numerous factors that constrain our ability to do so.

In particular, research into the efficiency and equity of the tax system:

- **Requires large amounts of information that is often not available.** In the absence of such information, numerous simplifying assumptions need to be made which may not be realistic.
- **Produces results that can be difficult to interpret.** The need to make numerous simplifying assumptions can make it difficult to interpret the results of the analysis. In many instances it is necessary to qualify those results heavily in the light of the simplifying assumptions that have had to be made, and the methodologies adopted, to get around those information constraints. This severely limits the usefulness of those results for the purposes of tax policy development and tax administration.
- **Consumes considerable resources**. Research into the efficiency and equity of the tax system is typically complex, costly and takes considerable time to complete, given an adequate process of consultation.

These practical difficulties do not mean that we should not attempt to monitor changes in the efficiency and equity of the tax system. However, they do suggest:

- the need for caution when interpreting macro performance indicators of the costs of taxation and the size of the hidden economy;
- the need for more practical research; and
- the need to explore alternative methods of monitoring the progress that the tax policy work programme is making towards improving the overall efficiency and equity of the tax system.

[3] Commission of the European Communities (1998) *On Undeclared Work*, Communication from the Commission, p.11.

Need for caution when interpreting and using macro performance indicators

In view of the complexity of the tax system, and the numerous simplifying assumptions that have to be made in order to derive indicators of the overall efficiency and equity of that system, considerable care needs to be exercised when interpreting changes in those indicators.

In particular, we should be careful not to place too much emphasis on those macro performance indicators in the tax policy development process.

The temptation with indicators is to ignore all of the assumptions that have had to be made to derive those indicators, and to ascribe much greater accuracy and relevance to those indicators than is warranted.

Indicators should be used to assist the policy development process, rather than become the entire focal point of that process. In particular, we need to avoid making the indicators the end objective, and forgetting about the real objectives. At the end of the day, tax policy formulation still involves a considerable amount of judgement, both on behalf of advisors and the Government. Indicators can assist in that process, but cannot replace it.

It is appealing to think that it might be possible to develop a model that would be capable of determining what rates of tax should apply in New Zealand, and what proportion of tax mix should be raised by direct, as opposed to indirect, taxes.

In reality, however, empirical models are incapable of providing answers to these complex questions. The tax system, and the manner in which it affects the operation of the economy, is extremely difficult to model in a realistic manner. Inevitably, it is necessary to make numerous simplifying assumptions that abstract from reality in order to overcome data limitations and ensure the model can be solved.

Tax policy design also involves some important and complex trade-offs that cannot, and should not, be made by an empirical model. For example, practical tax policy formulation inevitably involves trade-offs between the efficiency and equity of the tax system which can, and should, only be made by the Government.

Tax policy development is not, and is unlikely ever to be, a science. It requires decisions to be made often in the presence of considerable uncertainty and incomplete information. Ultimately, tax policy formulation requires complex judgements to be made by both officials and the Government. Although empirical analysis can assist the Government in making those decisions, it cannot, and should not, seek to make those judgements.

Tax reform to date has been designed to deal with these severe information constraints. It has not involved the use of extensive empirical analysis to determine the "optimal" rates of tax to apply to different activities in order to minimise the costs of taxation.

Rather, the approach has been to improve the overall efficiency of the tax system. This has not required detailed information on differences in effective marginal tax rates, and the manner in which taxpayers are responding to those different tax rates.

Need for more practical research

In view of the problems with the "top-down" research commissioned into the economic effects of taxation, the results of that research are of little use for the purposes of purposes of tax policy development and administration, or for inclusion in the department's Health Report. We share the concerns expressed by the OECD about "top-down" research into the effects of taxation and economic growth, and agree that such research needs to be supplemented with further "bottom-up" research.

As a result, Inland Revenue's Policy Advice Division has decided to discontinue that research and focus its research efforts over the next twelve months on other areas of our current research programme that are of greater practical use to tax policy development and administration. This includes further research aimed at:

- **Identifying those areas of the tax base that are being eroded by tax planning activities and developing possible solutions to those problems.** Such tax base erosion reduces the overall efficiency and equity of the tax system by encouraging inefficient patterns of consumption, production and resource use, as well as a less equitable distribution of income. The recent discussion document on the post-implementation review of GST identified a number of tax planning activities that are eroding the consumption tax base, and proposed solutions to these problems. Other base maintenance initiatives will be proposed for inclusion in future tax bills.
- **Simplifying the tax system for businesses, especially small businesses.** Unnecessary complexity in the tax system also reduces its overall efficiency and equity by increasing both compliance and administrative costs. Phase 1 of the tax simplification project has resulted in significant reductions in the number of individuals required to file tax returns, thereby improving the overall efficiency and equity of the tax system by reducing compliance costs. Phase 2 of the project is focusing on identifying aspects of the tax system applying to businesses, particularly small businesses, that would benefit from simplification.

In the medium term, we also intend to explore the possibility of updating the research into the size of the hidden economy, and the overall level of tax evasion. Although it is not feasible to update that data on an annual basis, it may be possible to provide an update on a less frequent basis, say every three years.

In addition, we will be continuing to:

- assist the Treasury with the research currently being undertaken by Professor Erwin Diewert and Dr Denis Lawrence into the deadweight costs arising from the taxation of income from capital;

- contribute to the joint work on savings issues with the ISI; and
- pursue other more practical ways of monitoring the efficiency and equity of the tax system.

Need to explore alternative ways of monitoring the efficiency and equity of the tax system

In view of the difficulties associated with developing annual indicators of the overall efficiency and equity of the tax system, the department's Policy Advice Division has been considering alternative ways of providing key decision makers with an overview of the tax system, and the progress that is being made to improve that system.

The continuing process of tax reform in New Zealand is extensive and complex. Each year, a large number of detailed proposals for tax reform are proposed and implemented.

In the course of working through those detailed proposals for tax reform proposals, it is relatively easy to lose sight of the current tax system, the overall tax policy objectives, and the progress that is being made each year towards the implementation of that work programme.

In particular, it is often difficult to see how the various proposals for tax reform fit together to form a consistent approach to tax reform. Often the detailed reforms can appear to be piecemeal, even though they are part of a consistent strategy for improving the overall efficiency and equity of the tax system.

The process of tax reform could be improved by raising the overall level of public understanding of the Government's tax policy work programme, and the progress that is made in implementing it.

Therefore we propose to provide up-to-date information on the process of tax reform on our tax policy web site and to update that information at least once a year.

This will provide both Ministers and other interested parties with an overview of New Zealand's tax system, and a qualitative discussion of the progress of the tax policy work programme. In particular, we intend to outline the Government's revenue strategy, the announced tax policy work programme, and the progress that Inland Revenue's Policy Advice Division is making to implement that work programme.

Chapter 2

Effect of Taxation on Economic Growth

Ideally, the tax system should be capable of raising and redistributing tax revenue in a manner that does not impose costs on the nation as a whole. That is, the burden imposed on taxpayers should equal the amount of tax revenue raised.

In practice, however, the tax system imposes a burden on taxpayers that exceeds the amount of tax revenue raised by an amount referred to as the "excess burden" or "deadweight costs" of taxation.

These deadweight costs arise because the tax system unintentionally distorts consumption, production, savings, investment, work and education decisions. This imposes costs on the nation as a whole by encouraging a less efficient use of resources, thereby reducing New Zealand's prospects for increased economic growth.

Deadweight costs can take a number of forms including:

- the **administrative costs** associated with collecting tax revenue;
- the **compliance costs** incurred by taxpayers in the course of determining and satisfying their tax liabilities, or collecting tax revenue on behalf of the Government; and
- **other "deadweight" costs** of taxation which arise because the tax system distorts consumption, production, savings, investment, work and education decisions.

At the same time, however, the revenue raised by taxation is used to finance government expenditure that can benefit the nation as a whole by improving the efficiency with which the economy operates, and achieving a more equitable distribution of income.

For example, government expenditure on public goods, such as infrastructure, can improve the productivity of human and fixed capital, thereby enhancing New Zealand's prospects for increased economic growth and higher living standards.

By contrast, other forms of government expenditure are directed at achieving objectives other than enhancing economic growth. For example, expenditure on social welfare is predominantly redistributive in nature and is directed at improving the welfare of the community by achieving a more equitable distribution of income.

The net effect of taxation on economic growth, and the well-being of the nation as a whole, therefore depends on the relative magnitudes of these costs of raising tax revenue, and the benefits derived from the government expenditure financed by that tax revenue. Those benefits include both potentially higher rates of economic growth, and a more equitable distribution of income.

Objectives of the research

Several working papers sought to develop macro performance indicators of the net effect that the tax system has been having on rate of economic growth in New Zealand.

In particular, those working papers sought to determine:

- the effect of taxation on the rate of growth in GDP; and
- the effect of changes in the tax mix (between direct and indirect taxation) on the rate of growth of GDP.

Scully working papers

The paper by Professor Scully on *Taxation and Growth in New Zealand* attracted the most media attention and comment by academics.

That working paper sought to determine the relationship between the average level of taxation (as measured by the ratio of tax revenue to GDP), and economic growth (as measured by the rate of growth in GDP).

Professor Scully argued that up to a certain level, government expenditure tends to increase economic growth:

> Economic theory suggests that up to some level government expenditures increase the productivity of private economic resources. The provision of national defense and a judicial system protect property and individual rights. Other publicly provide [sic] goods, such as infrastructure, also enhance private productivity. Thus, up to some point, government expenditure acts as a positive externality on private economic activity. Government expenditure for public administration, defense, and law and order represented about 12.2 percent of total outlays in 1987 and 14.1 percent of them in 1994. This expenditure amounted to about 5.5 percent of GDP.[4]

By contrast, he argued that expenditure beyond that level tends to reduce growth:

> Beyond some optimal size of government, increased taxation acts as a negative externality on the private sector. The negative effects of taxation and public expenditure (e.g. incentive effects such as work versus leisure, the wedge between personal savings and investments, debt versus equity financing, etc.) are well known in the public finance literature. The inefficiency of resources allocated in a political market, problems of collective choice (overproduction) and rent-seeking are well known in the public choice literature. Most of government spending in New Zealand is redistributive. Expenditure on education, health, social welfare, housing and community, recreation and culture, and economic services amounted to 87.8 percent in outlays in 1987 and 89.5 percent in 1994. These redistributive outlays were about 39.5 percent of GDP. On a more narrow definition of redistribution as current government transfers, these were about 62 percent of government outlays and a quarter of GDP.[5]

[4] Scully, G. (1996) *Taxation and Economic Growth in New Zealand,* Working Paper No.14, Inland Revenue, March, p.3.
[5] Scully, G. (1996) *Taxation and Economic Growth in New Zealand,* Working Paper No.14, Inland Revenue, March, p.3-4.

Specifically, the working paper by Professor Scully postulated that increases in taxation up to some "growth maximising" level increase the growth rate at a decreasing rate, whereas taxation above that level reduces the growth rate at an increasing rate.

Professor Scully also prepared a working paper on *The Growth Maximising Tax Mix in New Zealand.* In that paper, Professor Scully examined trends in the revenue collected from direct and indirect taxes in New Zealand, and estimated "growth maximising" tax rates by type of tax in order to determine the "optimal" or "growth maximising" tax mix.

Branson and Lovell working paper

The working paper by Branson and Lovell also sought to determine the net effect of both the level of taxation (the tax burden) and the tax mix (the ratio direct to indirect taxation) on the rate of economic growth in New Zealand.

In particular, that working paper sought to provide answers to the following questions:

- Is there a relationship between the rate of growth in real GDP and the tax structure (tax burden and tax mix)?
- If so, which component of the tax structure, the burden or the mix, has the more potent impact on the rate of growth of real GDP?
- Is it possible to determine values of the tax burden and the tax mix which would maximise the rate of growth of real GDP?
- What would be the effect, on both the level and the rate of growth of real GDP, of moving to an optimal tax structure?
- What would happen to tax revenues, and to purchasing power in the remainder of the economy, if New Zealand adopted an optimal tax structure?

Caragata and Small working papers

These papers examined:

- the impact of the tax to GDP ratio on the real rate of growth of both the measured and hidden economies in New Zealand; and
- the interaction of the tax to GDP ratio and the tax mix (direct versus indirect taxes) and their effects on real output growth in New Zealand.

Approach adopted

Although the working papers outlined above employed different analytical methods, they all used the same basic approach to determine the net effect that the tax system has been having on economic growth.

That approach involved first estimating the level of taxation and tax mix that maximise the rate of economic growth, and then determining the adverse effects on economic growth that arise from a tax system that applies a higher level of taxation, and a different tax mix.

For example, Professor Scully's model sought to estimate the ratio of tax revenue to GDP, which would have maximised the growth rate over the last 70 years.

In so doing, the work sought to reveal the forgone growth in output associated with failing to sustain the growth-maximising tax/GDP ratio for the period 1927-94.

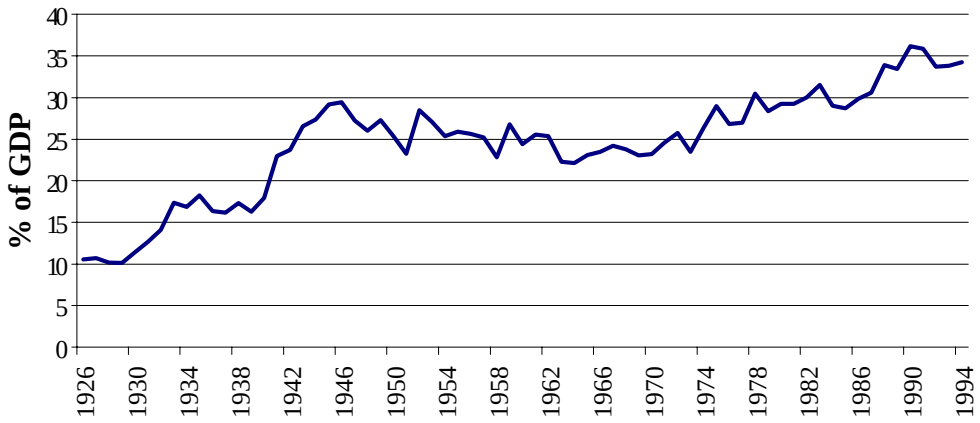
This was achieved by estimating the rate of growth of real GDP that would have occurred if the tax/GDP ratio was at its growth-maximising level over the period. This growth-maximising level of GDP was then compared with actual (lower) GDP growth over the same period.

Key results

Trends in the ratio of tax revenue to GDP

Figure 1 outlines the trends in the ratio of tax revenue to GDP over the period of analysis.

FIGURE 1: TOTAL TAX REVENUE AS A PERCENTAGE OF GDP



SOURCE: NZIER and Inland Revenue Department

Effect of taxation on the rate of growth

Scully concluded that:

- The growth maximising tax rate over the period 1927-1994 is about 20 percent of GDP and hence is much lower than the actual tax rate. Tax as a share of GDP was not below this rate in the post-World War II period.

- As such, the economic growth rate and, hence, the level of GDP, is below that which would have been achieved had the optimal tax rate been kept in effect throughout the period.
- The difference between the growth rate with the optimal tax rate and the observed growth rate is not trivial. This difference in growth rates is shown to be responsible for a $1.17 trillion (in 1988 NZ dollars) loss in output over the period 1946-1994.

Branson and Lovell concluded that:

- The optimal tax burden varies over time around a period mean of 22.5%, well beneath the actual period mean effective tax rate of 28% and far beneath the 1995 effective tax rate of 35%.
- The optimal tax mix varies over time around a period mean 65% share of direct taxes in total tax revenue. This optimal share is slightly less than the observed period mean 68% share of direct taxes in total tax revenue, although it is virtually identical to the 1995 share.
- A move to an optimal tax structure would on average generate nearly a 17% increase in the level of real GDP. Such a move would have no perceptible impact on the long run rate of growth of real GDP beyond the transition period, although the transition period might be quite long.
- The 17% increase in real GDP, in conjunction with the 20% reduction in the tax burden, would reduce government tax revenue by almost 6% on average. As a consequence, purchasing power in the remainder of the economy would increase by 27% on average. It is this release of resources from the public to the private sector which generates the higher output and faster transitional period growth.
- Applying the analysis to a longer time series (1928 to 1995) changes the estimates of the optimal tax structure and the benefits of moving to it slightly, but does not overturn the major findings. These are that the tax burden has been too high, excessive emphasis has been placed on direct taxes, and the resulting growth penalty has been large.

Caragata and Small concluded that:

- The total tax burden has a negative effect on real GDP but increases the size of the hidden economy.
- The total tax burden has a larger effect on the measured economy than on the hidden economy.
- Tax cuts are less attractive at higher levels of the tax/GDP ratio (for example, over 35%) as compared to lower levels (for example, 25%) in promoting economic growth (and possibly generating tax revenue) and reducing the size of the hidden economy (and related tax evasion).

- Tax cuts enhance economic growth more when they are applied well before a recession begins.
- The cumulative effect of lowering the overall tax burden to 20% over the sample period would have produced in excess of $64 billion real 1991/92 dollars worth of output fiscal year 1994 and shrunk the hidden economy by $1 billion. They argue that these results tend to confirm Scully's estimates of the growth-maximising tax rate for New Zealand.
- The three models developed estimate the optimal tax rate for New Zealand is in a range between 13.4% and 15.5% of GDP.

Effect of the tax mix on the rate of economic growth

Scully concluded that:

- The level of taxation is too high and the tax mix is inappropriate for the economy to grow at its maximum potential rate. Over the period 1927-93, real growth was 3.4 percent per annum. Had the growth-maximising tax rate of around 20 percent of GDP been in effect during the period, growth would have been in the 5 percent range.
- The tax mix is misaligned for maximum potential growth. Direct taxes are nearly twice and indirect taxes 28 percent more than is consistent with high growth.
- It will be politically difficult to reduce the tax burden and change the tax mix to the levels suggested in this paper.
- It would take a decade or so to bring taxes down to 20 percent of GDP, nearly two decades to bring personal taxes down to 7.1 percent of GDP and 13 years to reduce indirect taxes to 5.7 percent of GDP. And after a decade or so, transfer payments would be 14.5 percent of GDP, rather than 25%. While politically difficult, such a fiscal programme is not too radical.

Branson and Lovell concluded that:

- The tax mix (the ratio of indirect to direct taxes) has varied between 0.31 and 0.75, having increased recently with the introduction of GST.
- The optimal tax mix varies over time with a mean of 0.54 suggesting a mean share of direct taxes in total tax revenue of 65%.
- An excessive tax burden has done far more damage to economic growth than has an inappropriate tax mix.
- Reducing the tax burden is a more potent way on enhancing economic growth than is fine-tuning the tax mix. This is due to the fact that the actual tax burden has consistently been far higher than the growth-maximising tax burden, while the actual tax mix has typically been much closer to the growth-maximising tax mix.

- The cost of maintaining a sub-optimal tax structure was 16.4% of GDP in 1995 (the difference between optimal and observed GDP).
- In 1995 an optimal tax structure would have reduced tax revenue by 10.8% and would have increased the purchasing power in the remainder of the economy by 31%.
- In 1995, the modified effective tax rate (the observed effective tax rate plus the forgone output sacrificed to a suboptimal tax structure) was 51.4% compared with an observed effective tax rate of 35%.

Branson and Lovell also concluded that:

- Their primary findings were robust to a lengthening of the time period on which they are based (from 1946-1995 to 1928-1995). They found that their estimates of the optimal tax structure were very close to those obtained with the 1946-1995 data, although their estimates of the cost of maintaining a suboptimal tax structure were somewhat lower. Nonetheless, they considered their long period findings to be consistent with their short period findings.
- Their estimates of the optimal tax structure are remarkably close to Scully's in light of the methodological differences involved.

Caragata and Small concluded that:

- Decreases in the overall tax burden and increases in the proportions of tax raised indirectly are each associated with greater real growth rates.
- The efficacy of changes to the overall tax burden and the tax mix are greater at relatively high growth rates. If the tax burden were reduced to 20% of GDP, changes to the tax mix would have the greatest effect on economic growth when around 72% of taxes were derived indirectly. They note that this does not imply that a 72:28 split of taxation between indirect and direct taxes will maximise growth given a 20% tax burden since they maintain that maximum growth would be attained when all revenue is collected from indirect tax. However, they argue that if a hybrid tax system is deemed desirable for other reasons, then their results provide support for using a 72:28 split. They also note that efficiency is note that efficiency is not the only objective in taxation. Given an equity constraint, the settings of the tax/GDP ratio and the tax mix could be quite different than under a simple efficiency constraint.

Inland Revenue comment

We have a number of concerns in relation to these working papers on taxation and economic growth.

In particular, we are concerned about:

- the approach adopted in those working papers; and
- the methodologies employed in some of the working papers.

These key concerns, and their implications for the interpretation of the results of the research, are outlined below.

Concerns about the approach adopted

As noted earlier, the overall objective of the working papers is to assist Inland Revenue to monitor the overall efficiency and equity of the tax system.

Ideally, both officials and the Government would like to know how much it costs the economy to raise the tax revenue required to finance government expenditure, and the benefits the nation derives from that expenditure. In other words, ideally we want an indication of how changes in the tax system are affecting national welfare.

There are two main approaches that can be adopted to obtain such an overall estimate of the net effect of taxation on the economy.

"Bottom-up" approach

One approach is to construct a detailed model of the New Zealand economy that allows us to examine the effects of changes in the tax system on individual consumption, production, and investment decisions.

This "bottom-up" type of approach was used by Professor Erwin Diewert and Dr Denis Lawrence to obtain the first estimates of the deadweight costs of taxing labour income and consumption in New Zealand. It is also the approach they are currently using to extend their original study to include estimates of the deadweight costs arising from the taxation of income from capital (income from investment).

In principle, the main advantage of this type of approach is that it is capable of modelling the complexities of the tax system, and the effects that changes in that system have on economic decisions, and hence national welfare.

In practice, however, the main disadvantage of this type of approach is that it is informationally demanding. In particular, it requires information on the effective marginal tax rates applying to different activities in New Zealand, and how responsive those activities are to changes in those tax rates.

"Top-down" approach

An alternative approach is to estimate the impact that the overall tax system has been having on some overall macroeconomic indicator of the welfare of the community as a whole, such as the rate of growth of GDP.
This "top-down" type of approach was used by Scully, Branson and Lovell, and Caragata and Small.

The main advantage of this type of approach is that it is potentially less informationally demanding than the "bottom-up" approach described above. This enables readily observable data to be used for the purposes of the analysis.

The main disadvantage of this approach is that it is only possible to reduce the information required for the purposes of the analysis significantly by making even more simplifying assumptions than those made for the purposes of "bottom-up" models.

This means that the results of the analysis have to be interpreted with considerable caution in the light of those simplifying assumptions. The conclusions reached are only as good as the assumptions that have had to be made to reach those conclusions. Unfortunately, the results of empirical analyses are often accepted at their face value, with little regard for the validity of the underlying assumptions.

As noted by Branson and Lovell, two key assumptions underlie the working papers on taxes and growth:

> Two assumptions underlie our analysis. The first assumption is that in evaluating the structure of the tax system the driving policy objective is one of maximising the rate of growth of real GDP. It is possible that different policy objectives could lead to different evaluations. The second assumption is that the tax structure is adequately characterised by two dimensions: the tax burden, or the effective tax rate, and the tax mix, the ratio of indirect to direct taxes. Although a more detailed breakdown of each type of tax would be desirable, the second assumption implies that it would not impact significantly on our findings.[6]

We do not consider these assumptions are realistic. As discussed below:

- the ratio of tax revenue to GDP is a poor proxy for the distortions created by the tax system; and
- the rate of growth of GDP is not a particularly good indicator of national welfare.

[6] Branson, J. & Lovell, K. (1997) *A Growth Maximising Tax Structure for New Zealand*, Working Paper No.30, Inland Revenue, March, p.21.

The ratio of tax revenue to GDP is a poor proxy for the distortions created by the tax system

In order to determine the impact that changes in the tax system are having on national welfare in New Zealand, it is necessary to have an accurate indicator of those tax changes.

As outlined above, the working papers assume that the structure of the tax system can be described adequately by:

- the ratio of total tax revenue to GDP, which is used as an indicator of the "tax burden" (also referred to in the working papers as the "average level of tax", or the "effective tax rate"); and
- the ratio of indirect tax revenue to direct tax revenue, which is used as an indicator of the tax mix.

Unfortunately, as discussed below, the ratio of tax revenue, or components of tax revenue, to GDP is not an adequate indicator of the distortions created by the tax system. In particular:

- The ratio of tax revenue to GDP may not reflect major changes in the tax system.
- Vastly different tax reforms can have the same effect on the ratio of tax to GDP.
- The ratio of tax revenue to GDP can fall as a result of decreases in the efficiency of the tax system.
- The ratio of tax to GDP can fall even when there are no changes in tax distortions.

The ratio of tax revenue to GDP may not reflect major changes in the tax system

As noted by the OECD in its report *Taxation and Economic Performance* (1997),[7] the ratio of taxation revenue to GDP does not reveal much about the microeconomic distortions caused by taxation. The structure of the tax system, and the manner in which individuals respond to that system, is much too complex to be described adequately by a macro-level indicator such as the ratio of tax revenue to GDP (See Box 1).[8]

This is because the "tax burden", as measured by the ratio of tax revenue to GDP, is not a particularly good indicator of the factors that actually determine the size of the "excess burden" or "deadweight costs" of taxation. These factors include:

- the extent to which the tax system distorts the relative rates of return from substitutable consumption, production and investment activities (which depends on the types of taxes used to raise revenue and the effective marginal tax rates applying to the returns from different activities); and

[7] Leibfritz, W., Thornton, J. & Bibbee, A. (1997) *Taxation and Economic Performance* Economics Department Working Paper No.176, Organisation for Economic Co-operation and Development, Paris.
[8] Leibfritz, W., Thornton, J. & Bibbee, A. (1997) *Taxation and Economic Performance* Economics Department Working Paper No.176, Organisation for Economic Co-operation and Development, Paris.

- how responsive decisions are to those distorted rates of return (which depends on consumer tastes as well as the preferences of producers and investors).

As a result, major changes in the tax system and the level of distortions it creates may not produce significant changes in the ratio of tax revenue to GDP.

For example, a revenue-neutral package of tax reforms will have no effect on the ratio of taxation revenue to GDP even though it might significantly reduce distortions, improve efficiency and hence economic growth.

OECD views on macro indicators of tax distortions

The difficulties with assessing tax distortions at the macro-level arise from the complex nature of these distortions. Tax distortions must be defined with reference to a neutral tax system, which is generally not observable empirically. In theoretical studies, the lump-sum tax (which is an equal tax amount per person) is used as a reference case for a neutral tax, as this tax provides government revenues without changing relative prices.

Virtually all existing taxes are potentially distortionary in the sense that they change relative prices between factors of production (labour and capital) and/or between current consumption and future consumption (which corresponds to current savings), between different goods and/or services or between labour or leisure. However, the economic implications of these distortions depends on the response of economic agents: a given tax system will have large distortionary effects on the economy (i.e. high deadweight losses or excess burden) when the elasticities of substitution are high and small distortionary effects when the elasticity of substitution is low.

As the elasticity of substitution generally differs across the economy (for example, between labour and capital or between different goods or between demand and supply of similar factors of production or goods), the tax burden may be shifted to those parts of the economy (or to those economic agents) where the elasticity of substitution is low (for example, the tax burden may be shifted from capital to labour); it may take some time until all tax effects have worked through the system and are noticeable in the data. …

These considerations suggest that any analysis of the effects of taxation on growth and employment should focus on the overall effects of taxation including all secondary effects across factor and product markets.

This is a major problem with the "top-down" approach adopted by the working papers given that most of the major reforms to the tax system since 1984 have been relatively revenue neutral packages of reforms aimed at broadening the tax base and lowering tax rates.

In particular, there is a risk that the "top-down" approach adopted in the working papers will understate the improvements in growth arising from tax reforms that have not resulted in significant falls in the ratio of tax revenue to GDP. Any increases in the rate of economic growth that are the result of those largely revenue-neutral reforms will not be attributed to improvements in the efficiency and equity of the tax system.

Vastly different tax reforms can have the same effect on the ratio of tax to GDP

In addition, tax reforms that have vastly different effects on the overall efficiency of the tax system can have the same effect on the ratio of taxation revenue to GDP.

For example, the introduction of a $100m package of highly distortionary tax concessions, or a $100m increase in tax avoidance and evasion, would have the same effect on the ratio of tax revenue to GDP as a $100m tax cut package that considerably reduced distortions.

The ratio of tax revenue to GDP can fall as a result of decreases in the efficiency of the tax system

The ratio of taxation revenue to GDP can fall as a result of decreases, rather than increases, in the efficiency of the tax system.

For example, increases in administrative and compliance costs that do not produce additional tax revenue will tend to reduce the ratio of taxation revenue to GDP.

The ratio of tax to GDP can fall even when there are no changes in tax distortions

The ratio of taxation revenue to GDP can change even when there are no changes in the tax system or the distortions it creates in the economy. This is because not all activities face the same rates of taxation.

As a result, different patterns of economic growth can have different effects on the level of taxation revenue raised. For example, economic growth that is predominantly due to an increase in the production and consumption of goods and services that are exempt from GST (such as financial services, or exports which are subject to a zero rate of GST) would not produce any additional GST revenue.

By contrast, there would be an increase in GST revenue if that economic growth was predominantly due to an increase in the production and domestic consumption of consumer goods and services that are subject to GST. Simply dividing the amount of tax revenue by GDP is not a particularly accurate method of ensuring the estimated tax burden does not change simply as the result of economic growth.

The rate of growth of GDP is not a good indicator of national welfare

In order to monitor the effects of changes in the tax system on national welfare, we also need to have a good indicator of national welfare. In particular, that indicator needs to reflect both the costs and benefits of all government expenditure financed by tax revenue. In practice, however, it is extremely difficult to measure the benefits of government expenditure.

As noted above, the working papers assume that the sole objective of a Government is to maximise economic efficiency. This assumption enables the working papers to use the real rate of growth in GDP as a proxy for national welfare.

It is important to note that it is highly unrealistic to assume that the sole objective of any Government is to maximise economic growth. Government expenditure is aimed at objectives other than just increasing the rate of economic growth. These objectives include improving the equity with which income is distributed in New Zealand as well as the quality of the environment within which New Zealand residents live.

The objectives of taxation are to raise revenue in the most efficient, or least distortionary, manner possible, while meeting the expenditure requirements of Government. In this respect, the level of taxation is driven as much by the Government's expenditure requirements as it is by meeting particular GDP growth targets.

Although the rate of growth of GDP might be easy to observe, as explained below, it is not a particularly good indicator of the net benefits of government spending financed by tax revenue.

The rate of growth of GDP does not adequately reflect the benefits of all government expenditure financed by taxation revenue

One of the major problems with using the rate of growth of GDP as an indicator is that it does not adequately reflect the benefits of all government expenditure financed by taxation revenue.

As noted by Slemrod,[9] many of the benefits of government expenditures financed by tax revenue are not adequately reflected in national account data because of measurement problems. Included are the benefits derived from government expenditure on the environment, social welfare assistance, and government regulation.

In particular, most goods and services provided by the Government are valued at cost, which can either under or overstate their true benefit to the community. In addition, there is a risk of undervaluing the benefits arising from services that involve little or no government expenditure. These include the benefits from enforcement of regulations including property rights, quarantine regulations, health regulations, and environmental standards (see Box 2).[10]

Problems also arise when valuing the benefits arising from Government expenditure that is not directed at increasing the rate of economic growth. This includes expenditure on social welfare programmes which is predominantly aimed at achieving a more equitable distribution of income in New Zealand. These benefits will not be reflected adequately by changes in the rate of growth of GDP.

[9] Slemrod, J, 1995. "What Do Cross-Country Studies Teach about Government Involvement, Prosperity, and Economic Growth?" *Brookings Papers on Economic Activity*, 2:1995: 402-403.
[10] Slemrod, J, 1995. "What Do Cross-Country Studies Teach about Government Involvement, Prosperity, and Economic Growth?" *Brookings Papers on Economic Activity*, 2:1995: 402-403.

Problems associated with measuring the value of goods and services provided by the government

An immediate problem is how to measure the value of goods and services provided by government. National income accounts generally value them at cost, since there are no market prices to refer to. National income accounts make no attempt to value the leisure time of a country's residents, even though it is clear that individuals themselves place a value on their leisure. Among other things, this means that income comparisons will overstate the welfare cost of government involvement that tends to reduce labor supply (that is, increase leisure). A similar, but slightly different, issue relates to the quality of the environment. This does not enter into national income, which therefore reflects only the cost of government programmes designed to improve it. The difference between environmental quality and leisure is that increasing the former reflects an explicit policy goal, while increasing the latter represents an unintended consequence of other goals that require tax revenue.

Environmental quality is only one example of a social goal whose achievement is not reflected in standard measures of national income. It is widely accepted that redistributional programs exact some cost in terms of reduced incentives to work. Measures of economic success based on average income do not capture the degree to which such programs succeed, although they capture, with error, the costs they engender. The same can be said of social insurance programs, whose objective is to reduce the uncertainty of citizens faced with risks that are not adequately handled by private insurance markets. Measures of national income are likely to accompany the costs that accompany the moral hazard of social insurance, albeit imperfectly, but they certainly do not account for the reduction in uncertainty that they allow.

… A much more difficult problem is that many of the important avenues by which the government affects the economy have little or no budgetary consequence. Consider such critical aspects of policy as the enforcement of property rights, competition and regulation policies, the extent of government enterprise, minimum wage rules, and trade restrictions. These nonbudgetary aspects of government economic involvement have the potential to introduce bias into any observed relationship between prosperity or growth and the level of measured government activity. The direction of bias is not, a priori, clear.

By using the rate of growth of GDP as an indicator, the approach adopted in the working papers considers the costs of raising the tax revenue required to finance social welfare expenditure, but it fails to take into account adequately the benefits of that expenditure. This has the potential to bias the observed relationship between the tax burden and the rate of economic growth.

The Government's expenditure needs change over time

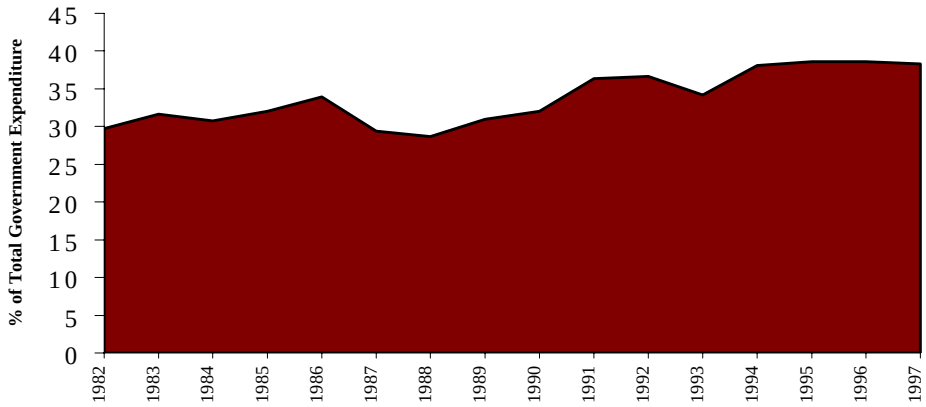
The problem outlined above is compounded by the fact that the Government's expenditure needs, and its pattern of expenditure, change over time in response to a range of factors including changes in demographics, technology, the needs of the community, as well as community attitudes about the appropriate distribution of income.

For example, a county's infrastructure needs are not constant over time. Depreciation brought about by physical deterioration, or technological obsolescence, can change the rate at which New Zealand needs to replace its existing infrastructure. Similarly, demographic changes, such as ageing of the population, increased immigration, and the movement of the population into major cities, can dramatically change New Zealand's infrastructure needs over time.

This makes it difficult to establish a stable, longer-term relationship between changes in the tax burden and the rate of growth in GDP.

Of particular significance is the increase in the proportion of government expenditure on social welfare programmes over the period of analysis. This has the potential to exacerbate the bias arising from excluding the benefits of social welfare expenditure financed by taxation revenue.

FIGURE 2: SOCIAL WELFARE AS A PERCENTAGE OF TOTAL GOVERNMENT EXPENDITURE



SOURCE: The Budget (1984 - 1998)
Statistics New Zealand (GDP 1991-92 current prices, expenditure based).

Inland Revenue does not consider that the approach adopted in the working papers on taxation and economic growth pays sufficient attention to the Government's expenditure needs and changes in those needs over time.

Government expenditure requirements over the period of analysis changed significantly in response to changing economic, demographic and social conditions. Since the level of taxation is essentially a function of the level of expenditure planned by government, the appropriate level of taxation should also vary with economic conditions.

A useful example is the fiscal pressure arising from demographic trends illustrated in the *Retirement Income Report* (1997) of the Periodic Report Group.[11] The report forecasts a variety of scenarios demonstrating the policy options for the future superannuation and health requirements of New Zealand's ageing population. The report shows that the future projection of gross expenditure on New Zealand Superannuation based on current policies will double over the next 50 years, from 5% to 11% of GDP (assuming the superannuation surcharge was abolished in April 1998).[12]

[11] Periodic Report Group (1997) *1997 Retirement Income Report – A Review of the Current Framework*, Interim Report, July, Chapter 6.
[12] This applies to both gross and net expenditure measures of New Zealand Superannaution as a percentage of GDP. Net expenditure, which nets off the estimated income tax and surcharge associated with NZ Superannuation, is forecast to increase from 4% to 9% of GDP (p.102-103).

This example demonstrates how changing economic and social conditions can significantly change the Government's requirements for tax revenue over time. This makes it difficult to estimate the "growth maximising" ratio of taxation revenue to GDP, as it is constantly changing over time.

The rate of growth of GDP reflects the benefits of government spending financed from sources other than tax revenue

Another problem with the rate of growth of GDP is that it reflects the benefits of government spending financed from sources other than tax revenue, such as increased government debt and increased government charges for those goods and services. However, the approach adopted in the working papers does not consider the costs of raising that revenue.

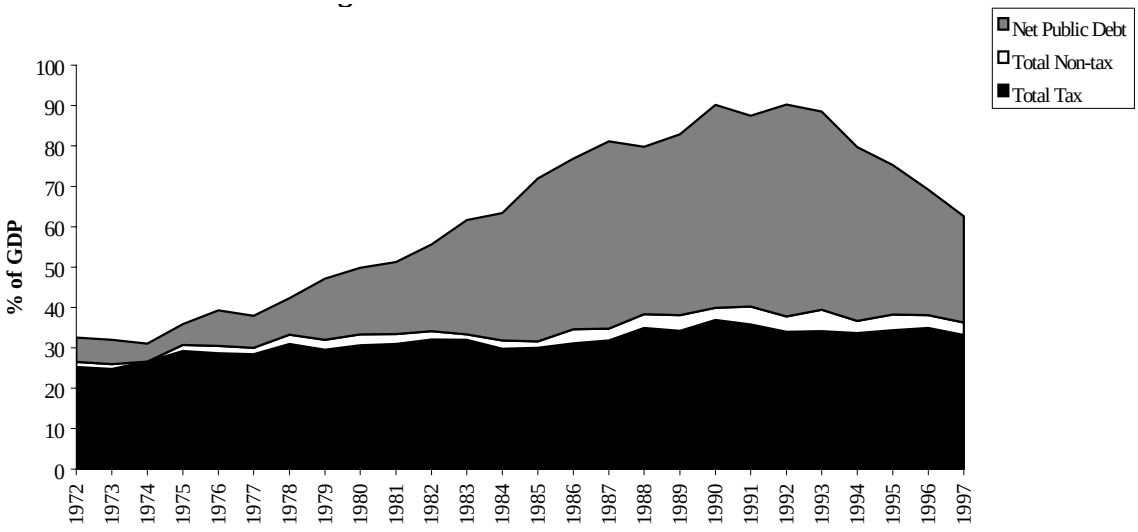
This inclusion of the benefits of such expenditure, and exclusion of the costs of financing that expenditure, have the potential to bias the observed relationship between the tax burden and the rate of economic growth.

The proportion of government expenditure financed from tax revenue has changed over time

The problem outlined above is compounded by the fact that the proportion of government expenditure financed from tax revenue has changed considerably over the period of analysis.

As indicated in figure 3, over the period 1974 to 1992 an increasing proportion of government expenditure was financed by increased government debt, whereas more recently the government has been running surpluses and repaying debt and making greater use of government charges to raise revenue.

FIGURE 3: SOURCES OF GOVERNMENT FINANCE



SOURCE: The Treasury

Once again, this makes it more difficult to establish a stable, longer-term, relationship between the tax burden and the rate of growth of GDP.

It also has the potential to exacerbate the bias arising from excluding the costs of raising the non-tax revenue required to finance that expenditure.

Concerns about the methodologies used

We are also concerned about some of the methodologies used in the working papers. These methodological concerns, which are outlined briefly below, are discussed in more detail in the appendices to this report.

Effects of taxation on the rate of economic growth

Professor Scully's working paper *Taxation and Growth in New Zealand* attracted considerable attention both in the media, and from other academics.[13]

Most of the comments made related to the methodology employed by Professor Scully.

A number of significant problems were raised in relation to that methodology including the following:

- The absence of a well developed theory underlying the model.
- The inability of the model to:
  - properly capture the impact of expenditure on public goods that are used as inputs by the public and private sectors of the economy;
  - accommodate the consequences of transfer payments, despite their growing importance over the period of analysis;
  - allow for the different effects of the various types of taxes that are used to raise revenue; and
  - accommodate the impact of taxes on the proportion of income saved and invested.
- The use of only one explanatory variable (the tax burden) in the model to explain variations in the rate of growth in GDP. This means that all of the other determinants of the rate of economic growth are included in the error term in the estimation equation. This might not be a problem if there was no correlation between the tax burden and other determinants of the rate of economic growth. In reality, however, it is highly likely that the tax burden does have an influence on other determinants of the rate of economic growth such as the rate of growth of employment.

[13] Scully, G. (1996) *Taxation and Economic Growth in New Zealand*, Working Paper No.14, Inland Revenue, March.

- Data problems.
- Problems with the econometrics including:
  - the poor statistical performance of the "unrestricted" regression;
  - the possibility of reverse causation between the rate of growth and the tax burden (for example, increases in the rate of growth in GDP might result in fiscal drag which would increase the tax burden); and
  - concerns that the 20 percent growth maximising tax burden result is not robust over shorter periods of analysis.
- Use of the CPI to deflate GDP.
- Misuse of the concept of deadweight cost.
- Problems with the algebra in the working paper.

In view of the considerable contention surrounding the work of Professor Scully, Inland Revenue commissioned an independent review of the econometrics from Professor Phillips. Professor Phillips is a renowned econometrician at Yale University and the Cowles Foundation for Research in Economics. His views on that research are set out in Appendix 4.

Professor Phillips identified a wide range of econometric issues in Professor Scully's work that require resolution, including:

- Tax/GDP ratios are the outcome of tax law and millions of economic decisions within the economy. They are not external to the economy, as the paper requires.
- The effect that the Great Depression of the 1930s has on the results, and whether an unusual event from so long ago should be accorded such influence.
- The effects of human capital accumulation and technological improvements over the years which are omitted from the equations.
- How dependent the answers obtained are on the practice of averaging GDP growth rates over rolling nine-year periods in the model. Averaging over some other period of years could yield different results.

In view of the concerns outlined above, we do not accept the results of Professor Scully's Working Paper No.14. In particular, we do not consider that Professor Scully has established that a tax/GDP ratio of 20% would maximise the rate of growth in GDP in New Zealand.

Effect of changes in the tax mix on the rate of economic growth

This research inherits many of the problems associated with the research into the effects of taxation and growth. Indeed, in some instances, the same structural model is employed to estimate the mix of taxes that would maximise economic growth. Many of the criticisms of the use of the tax/GDP ratio also apply to the use of the direct tax/GDP and indirect tax/GDP ratios.

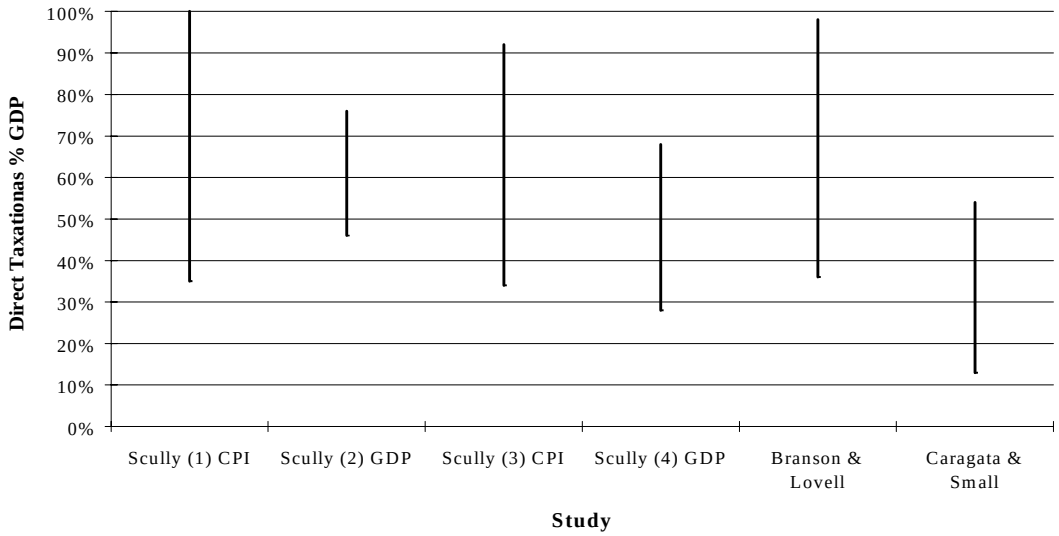
There are three main concerns with this work.

- There is a noticeable lack of theory, and it simply searches for a correlation between particular tax types and the growth rate.
- Although the results are unanimous in concluding that a greater emphasis on indirect taxation (GST) is less obstructive to economic growth, there is an alarming variation in the "optimal" tax mix that has been estimated by the various models.
- The results offer no evidence of the distortions arising from shifting towards indirect taxation. The real policy issue is how do people alter their decisions between consumption and savings or work and leisure as the tax mix changes.

In particular, the wide variation in the results makes it difficult to draw any specific conclusions from the work. This is evident from figure 4, which compares the confidence intervals for six models on the effect of the tax mix on economic growth and the size of the hidden economy.

From figure 4, it is clear that there is only a high level of confidence in a range for the growth-maximising share of direct taxes/GDP. For the model Scully (1), for example, to have 95% confidence in the result for the growth-maximising ratio of direct taxes to GDP, the estimates range from 35% to 100%. To know that the growth-maximising ratio of direct taxes to GDP falls in this range is not a particularly useful result.

FIGURE 4: VARIATION IN THE DIRECT TAX/GDP RATIO REQUIRED FOR 95% CONFIDENCE INTERVALS FOR STUDIES ON THE GROWTH-MAXIMISING TAX MIX



SOURCE: Scully, G (1997) Reconciling Different Estimates of the Optimal Tax Mix, Working Paper No.35, Inland Revenue[14]

[14] The confidence intervals for the indirect tax/GDP and total tax/GDP growth-maximising ratios were not available.

Interpretation of the results of the research

The results of the research into the effects of taxation on economic growth need to be interpreted carefully in the light of the objectives of the research, and the inherent limitations of the approach adopted.

The research does not determine the "optimal" tax burden or "tax mix" for New Zealand

As noted in several working papers, the objective of the research into taxation and economic growth was not to determine the optimal ratio of tax revenue to GDP and tax mix for New Zealand. Rather, the research sought to calculate the "growth maximising" tax burden, and tax mix, in order to develop indicators of the extent to which taxation has been imposing costs on New Zealand by retarding the rate of economic growth:

> There are several different objectives that governments take into consideration, aside from the maximisation of economic growth, such as increasing spending on health, education or various social benefits in order to correct perceived existing deficiencies.[15]

Since the Government has numerous objectives other than maximising the rate of economic growth, the working papers recognised the possibility that the Government may need to raise revenue in excess of the estimated "growth maximising" ratio of tax revenue to GDP:

> With such multiple objectives, rather than just growth maximisation, the political process may well prefer a tax rate above 20% or 25% of GDP. The intent here is not to advise on policy. Rather, it is to use performance benchmarks for measuring the current consequences of taxation. The optimal range for the tax/GDP ratio in a multi-objective framework cannot be identified until all the research on equity and efficiency has been completed.[16]

As a result, we do not consider the research has established that:

- The "optimal" rate of tax for New Zealand is 20% of GDP.
- The "optimal" tax mix for New Zealand is 63% from direct taxation and 37% from indirect taxation.
- Tax rates and government expenditure should be reduced to achieve those optimal ratios.

Consequently, it would be inappropriate to use the estimated "growth maximising" tax burden and tax mix as targets for tax policy purposes.

This is best illustrated by tracing through the implications of pursuing those targets.

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[15] Caragata, P. (1997) *The Economic and Compliance Consequences of Taxation: A Report on the Health of the Tax System in New Zealand*, draft paper presented to the Policy Advice Division of Inland Revenue, p.142.
[16] Caragata, P. (1997) *The Economic and Compliance Consequences of Taxation: A Report on the Health of the Tax System in New Zealand*, draft paper presented to the Policy Advice Division of Inland Revenue, p.142.

For example, consider the implications of reducing the level of tax revenue to 25% of GDP.

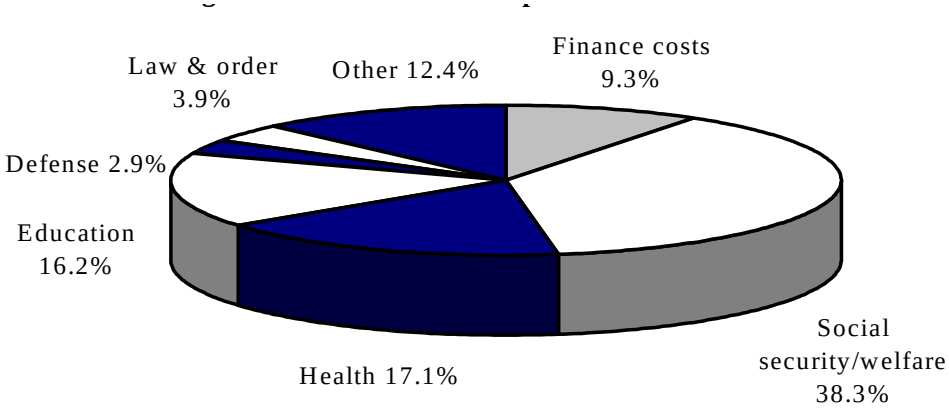
Figure 5 shows the breakdown of government expenditure for 1996-97. This chart offers broad indication of the expenditure cuts required to meet the growth-maximising level of taxation. To meet a tax/GDP ratio of 25%, for example, would require pruning Government expenditure by approximately 31%. This could be achieved by reducing expenditure in all areas in equal proportions (for example, spending on social security and welfare would fall to 26% of GDP and health down to 12% of GDP).

However, the assumptions underlying the working papers imply that such an across-the-board approach reduction in the total level of government expenditure would not maximise economic growth. This is because the working papers, in effect, assume that there are no benefits from government expenditure that is aimed at objectives other than increasing the rate of growth of GDP (for example, expenditure that seeks to redistribute income such as social welfare expenditure).

As a result, if the Government were to use the results of the working papers as targets for tax policy reform, it would have to:

- eliminate all government expenditure that is primarily directed at redistributing income (for example, all social welfare expenditure); and
- increase government spending on projects designed to improve the rate of economic growth.

FIGURE 5: GOVERNMENT EXPENDITURE 1996-97



SOURCE: The Budget (1998) and Statistics New Zealand

The research does not establish a clear relationship between the effects of taxation on economic growth

At best, the research suggests that the level of taxation in New Zealand (the ratio of tax revenue to GDP) has been too high, and the share of direct taxes in total tax revenue has been too high as well, if the government's policy objective is to maximise the rate of growth in real GDP.

Even if the Government's sole objective was to maximise the rate of economic growth, however, the problems inherent in the "top-down" approach adopted by the working papers are such that the results of the research should be interpreted with considerable caution.

As outlined earlier, the tax burden (as measured by the ratio of taxation revenue to GDP) is a very poor indicator of the structure of the tax system and the extent to which it distorts economic decisions. Many of the increases in the rate of economic growth that are due to relatively revenue-neutral packages of tax reform will not be attributed to changes in the tax system.

In view of these problems, we do not consider that the working papers have established a clear relationship between the effects of taxation on economic growth in New Zealand. We share the OECD's concerns about the merits of "top-down" research and agree with its view that current research on the relationship between taxation and economic growth is far from conclusive.

> It is clear from the literature review and from the additional results presented here that the effects of taxes on economic performance are ambiguous in some areas and unsettled and controversial in others.[17]

However, we do consider that the overall level of taxation in New Zealand is high by historical standards and is likely to be imposing considerable costs on the community as a whole.

[17] Leibfritz, W., Thornton, J. & Bibbee, A. (1997) *Taxation and Economic Performance* Economics Department Working Paper No.176, Organisation for Economic Co-operation and Development, Paris, p.11.

Chapter 3

Size of the Hidden Economy

Objective of the research

The research commissioned by Inland Revenue from Professor David Giles represents the first major study of the size of the "hidden" economy in New Zealand, and its interaction with the tax system.

The size of the tax base, its maintenance and the level of unreported income are fundamental issues for any tax authority.

The "hidden", or "underground", economy is comprised of economic activity that is not captured by official GDP statistics. Such activities may range from small cash jobs to the large scale trade in illegal goods. In practice, the precise definition of the hidden economy tends to vary across empirical studies, depending upon the methodologies used and the purpose of the study.

Approach adopted

Some approaches to measuring the size of the hidden economy involve detailed surveys of tax compliance and are designed only to capture tax evasion.

By contrast, the research commissioned by Inland Revenue sought to estimate the economy-wide level of unmeasured *market* activity. That measure does not include non-market activities such as housework.

Since the level of unreported income is not recorded, is has to be indirectly observed. In order to overcome these difficulties, the research adopted a "latent variable" approach to estimating the size of the hidden economy. This approach enables a number of indicators of the size of the hidden economy ("indicator" variables), and causes of the hidden economy ("causal" variables), to be used to ultimately "explain" the size of the hidden economy (the "latent" variable).

This approach produced an "index" of the size of the hidden economy which was then converted into dollar terms using an estimate of the long-run average size of the hidden economy. Since much underground activity is conducted in cash, the long run demand for currency was used to obtain an estimate of the long-run average size of the hidden economy expressed as a proportion of real. This long run ratio was then used in conjunction that index and actual GDP figures to derive estimates of the annual value of the hidden economy in each year. Estimates of the revenue loss from tax evasion on income from hidden economy activities were then obtained by applying estimated effective tax rates to the estimated size of the hidden economy.

Key results

Estimated size of the hidden economy

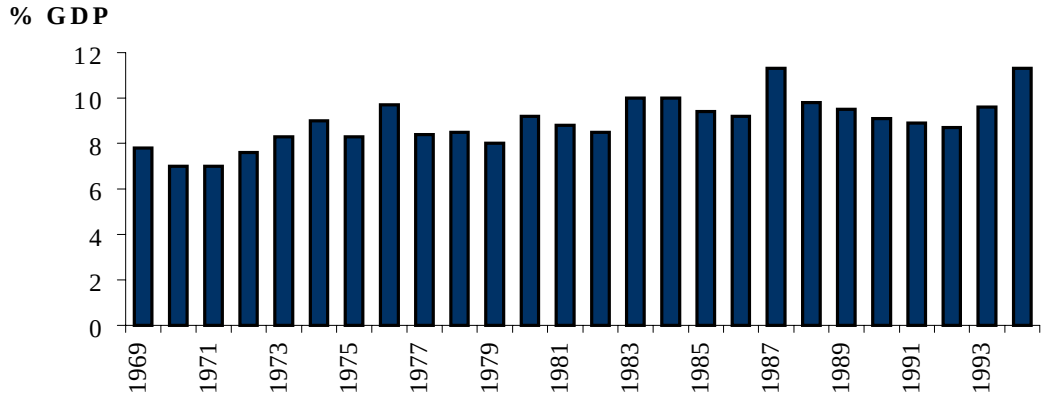
The size of the hidden economy was estimated in proportion to GDP over the period 1968 to 1994.

The estimated long-run average size of the hidden economy was 8.8% of GDP while in 1994 it was 11.3%.

A casual examination of the time series reveals that the size of the hidden economy fluctuates over time about a rising trend, as shown in figure 6.

The research established a positive correlation between the business cycle and the hidden economy, so it is not surprising that the hidden economy was large in 1994 when the business cycle was near its peak, as it was in 1987.

FIGURE 6: HIDDEN ECONOMY AS % GDP



SOURCE: Inland Revenue Department (NZ)

There are no estimates of the size of the hidden economy or the level of tax evasion in New Zealand after 1994.

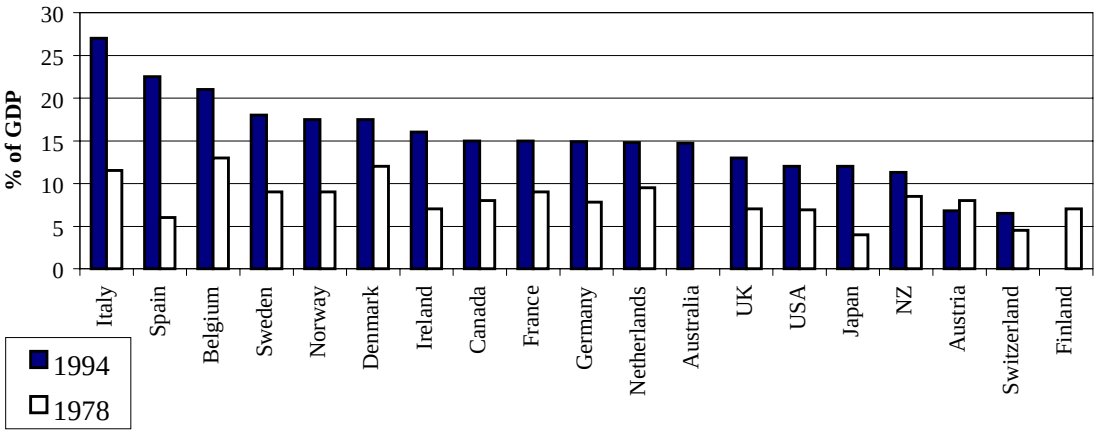
A reliable estimate of the size of the hidden economy for the years after 1994 would entail re-estimating the model using the data for those years.

Any attempts to estimate the size of the hidden economy after 1994 without re-estimating the model using the updated data require making an assumption as to the proportionate size of the hidden economy in those later years.

International comparisons

New Zealand's hidden economy is of an average size for most OECD countries, as illustrated by figure 7.

FIGURE 7: SIZE OF HIDDEN ECONOMY AS % OF GDP IN VARIOUS COUNTRIES



SOURCE: Giles, D. (1998). *The Underground Economy: Minimising the Size of the Government, Department of Economics*, University of Victoria, Victoria, B.C.

The comparison in figure 7 shows New Zealand to have a hidden economy in the lower half of countries with similar economies. At the top end of the scale is Italy, with a hidden economy of approximately 27% of GDP in 1994, compared to Switzerland, with 6% of GDP. Figure 7 also shows the hidden economy to be growing in most OECD countries.

Comparisons between studies and across countries, however, must be treated with some caution. There is a wide variation in the estimated size of the hidden economy which depends upon the country concerned, the availability of data and the method employed in estimating it.

Park (1979) and Feige (1982), for example, estimated the size of the hidden economy in the US at 4% and 33% of GDP respectively for 1978.[18] These results show, as noted by Professor Giles in his paper, that not only does the evidence "suggest variation over time and across countries for the relative size of the hidden economy, but it is also rather imprecise".[19]

[18] Feige, E. (1982) "A New Perspective on Macroeconomic Phenomena: The Theory and Measurement of the Unobserved Economy in the United States: Causes, Consequences and Implications", in M. Walker (ed.) *International Burden of Government*, Vancouver, 112-136.
Park, T. (1979) "Reconciliation Between Personal Income and Taxable Income 1947-77" mimeo, Bureau of Economic Analysis, Washington D.C.
[19] Giles, D. (1996) ""Measuring the Size of the Hidden Economy and the Tax Gap in New Zealand: an Econometric Analysis", Working Paper 5a, Inland Revenue Department (NZ).

Effect of taxation on the size of the hidden economy

The research looked specifically at the relationship between the level and mix (direct and indirect taxation as a share of total taxation) of taxation and the size of the hidden economy.

With respect to the level of taxation (as measured by the tax/GDP ratio), the research found that:

- A decrease in the tax/GDP ratio reduces the hidden economy ratio.[20]
- A one percentage point reduction in the tax/GDP ratio causes a 0.2 percentage point fall in the hidden economy for recent levels of tax/GDP.[21]
- Below a tax/GDP ratio of 21%, the hidden economy decreases at a slower rate.[22]
- If the Government were to reduce tax rates to zero, the hidden economy would still remain at 4%-4.5% of GDP.[23]

In other words, substantial tax revenue must be sacrificed for only marginal gains arising from less unreported income. These results point to some interesting conclusions.

First, on its own, reducing the tax/GDP ratio is not a particularly effective means of reducing the size of the hidden economy. This means that, for GDP of $100 billion and a tax/GDP ratio of 34%, reducing the tax/GDP ratio to 33% results in a loss of $1 billion in tax revenue for a gain in $200 million from a smaller hidden economy, of which only some is taxed.

Second, getting rid of taxation does not get rid of the hidden economy. This implies that a significant proportion of income is unreported for reasons other than taxation, such as criminal activity or avoiding other forms of government regulation. The research concludes that most of the tax evasion over and above this criminal component is due to individuals, small businesses and the self-employed. While anecdotal evidence from audit experience suggests this is true, the research provides weak empirical evidence to support this conclusion.

The research shows that modifying the tax mix combined with reductions in the tax/GDP ratio will reduce the importance of the hidden economy. But to achieve large reductions in it, very large changes are required in both level and mix of taxation. The research exploring the effect of changes in the tax mix on the size of the hidden economy concluded the following:

- An increase in the share of indirect taxes to direct taxes reduces the hidden economy.[24]

[20] Giles, D. (1996) *The Learning Path of the Hidden Economy: Tax and Growth Effects in New Zealand*, Working Paper No.21 Inland Revenue, December, pp.13-14.
[21] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, p.21.
[22] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, p.22.
[23] *Giles, D. (1996)* The Learning Path of the Hidden Economy: Tax and Growth Effects in New Zealand*, Working Paper No.21 Inland Revenue, December, p.13-14.*
[24] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, p.21.

- Reducing the tax/GDP ratio is more effective at decreasing the size of the hidden economy than changing the tax mix.[25]
- GST reduced the relative size of the hidden economy by approximately one percentage point in each of the years up to 1994. Note that introducing GST also increased the tax/GDP ratio but changed the tax mix towards indirect taxation. There were thus two opposing influences on the hidden economy that came into effect.[26]

This means that a substantial reversal of the tax mix is required to affect the same reduction in the hidden economy/GDP ratio as would be realised by moderate reductions in the tax/GDP ratio. For example, if the share of personal and indirect taxation as a proportion of total tax revenue were interchanged in 1994, the hidden economy would have fallen from 11.3% to 10% of GDP. If the tax/GDP ratio had then been cut by 40% in addition to this, the hidden economy would have fallen further to 7.3% of GDP. These major policy changes, therefore, yield only a four percentage point reduction in the level of unreported income.[27]

The introduction of GST in 1986, however, had a noticeable impact on the hidden economy. Evidently, more than doubling the proportion of tax revenue collected through indirect taxation had a stronger effect than the increase in the total level of taxation.[28]

Inland Revenue comment

Professor Giles' research constitutes the first serious attempt to estimate the size of the hidden economy in New Zealand.

Size of the hidden economy and the level of tax evasion

Although the estimated size of the hidden economy in New Zealand is well below the European Union average, this is not a reason to be complacent.

The overall size of the hidden economy is still significant, and Inland Revenue is committed to reducing that level.

It is reassuring, however, to learn that New Zealand does not suffer from an unusually high level of unreported income, and that much of this activity would occur regardless of the level or rate of taxation.

[25] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, p.21.
[26] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, p.22.
[27] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, Table 4, p.16.
[28] Giles, D. (1996) *Simulating the Relationship Between the Hidden Economy and the Tax Mix in New Zealand*, Working Paper No.22, Inland Revenue, December, Table 4, p.16.

Relationship between taxation and the size of the hidden economy

Both the level of tax to GDP and the tax mix were found to have an influence on the size of the hidden economy, but not sufficiently to advocate their use in deterring tax evasion. This is particularly so given the revenue loss associated with the necessary reductions in taxation required to have any significant impact on unreported income.

Although the research reveals that the individual effects of changing the tax mix and lowering the level of taxation are less effective than jointly introducing these policies, very large modifications to the tax system would be required to achieve a significant reduction in tax evasion.

The relationship between taxation and the size of the hidden economy does pose an interesting dilemma for policy makers.

To the extent that it is possible and desirable for the Government to do so, lowering the tax/GDP ratio may have two offsetting effects on the hidden economy. In itself, the research shows that such a policy would decrease tax evasion. However, because tax evasion and economic growth are positively correlated, it would also encourage tax evasion. The net effect remains ambiguous. This adds to the recommendation that addressing tax evasion through the level and mix of taxation is not appropriate.

Finally, there are many other influences on the size of the hidden economy that proved significant in the research. Aside from the rate of economic growth, unemployment, inflation and government regulation were found to be significant contributors to the size of the hidden economy.

It is important to note that reducing tax rates, and broadening the tax base produce numerous benefits in addition to reducing the size of the hidden economy. These include improving the overall efficiency and equity of the tax system. As a result, it is better to view reductions in the size of the hidden economy as being one of the many potential benefits from tax reductions, rather than the main reason for wanting to cut taxes.

Inland Revenue's initiatives to address tax avoidance and evasion

The recent report by the Committee of Experts on Tax Compliance reviewed Inland Revenue's approach to tax evasion.[29] While supporting its current initiatives, the committee also provided some recommendations for additional measures to tackle non-compliance. What follows is a review of Inland Revenue's current initiatives to reduce tax evasion, as well as the committee's recommendations of further action.

[29] Committee of Experts on Tax Compliance (1998) *Tax Compliance*, Report to the Treasurer and Minister of Revenue.

Since 1984, successive governments have introduced a range of initiatives that have reduced the scope for tax evasion in New Zealand.

For example, reductions in the rates of income tax, in combination with the introduction of GST, significantly reduced both the incentive and opportunities for many taxpayers to evade tax. In particular, these changes discouraged the willingness of businesses registered for GST purposes to pay cash to suppliers of their inputs, as this would result in the loss of their input tax credits.

The broadening of the tax base, and reduction in tax rates, also enabled a significant extension of withholding tax. This extension included the introduction of the dividend imputation rules, and the subsequent introduction of a resident withholding tax on interest and dividend income. These measures significantly reduced the scope for individuals to evade tax on their interest and dividend income.

More recently, Inland Revenue has been seeking to encourage compliance by simplifying the tax system. This process involves a range of activities including:

- The implementation of phase 1 of the tax simplification project. This project improved the accuracy of the resident withholding tax system in order to reduce the number of taxpayers required to file tax returns.
- The beginning of phase 2 of the project, which is directed at reducing compliance costs for businesses, especially small businesses.
- The rewriting of the Income Tax Act to improve the ability of taxpayers to determine, calculate and satisfy their income tax obligations.
- The introduction of a system of binding rulings to help taxpayers determine how the tax system applies in particular circumstances.
- The planned introduction of legislation to codify the practice of self-assessment.

In addition, Inland Revenue has been pursuing a range of initiatives aimed at discouraging non-compliance. These initiatives include:

- Introducing more effective penalty provisions.
- Making more effective use of information provided through the binding rulings system to identify potential threats to the tax base.
- Implementing legislation to ensure that stolen money is taxable.
- Implementing a wide range of compliance improvement initiatives.

The department's Compliance Improvement Strategy is designed to identify key risks and compliance improvement opportunities and to maximise net revenue over time. The factors considered in the assessment of risk include the revenue at risk, the number of taxpayers involved, the opportunity for non-compliance, and the likelihood of the risk continuing.

As part of the priorities under the Compliance Improvement Strategy, Inland Revenue has planned the following initiatives.

- Investigate improving society's attitudes toward tax compliance by promoting to the community the consequences to the evader and to society generally of people cheating on their tax obligations.
- Improving Inland Revenue presence by, for example, co-locating staff with other agencies and enabling staff to work from home in areas where there is no office presence by the department.
- Improving detection capability and investigating the effectiveness of conducting random audits.
- Utilising intelligence collected from the several customer segments of the department.
- Conducting research into the compliance of immigrants who have English as their second language by testing the extent to which their businesses are included in the tax system.
- Improving staff capability by training new staff and retaining those audit staff with existing experience and by being more competitive in the employment market for these skills.

The audit selection process complements the Compliance Improvement Strategy by a continuous review of large corporations and by individually selecting taxpayers for audit. The selection criteria include abnormal financial ratios or trading results, prior audit results and selected industry audits based on risk.

The Special Audit section of the department audits illegal activities (such as drug dealing, white-collar crime). The resources of Special Audit doubled in 1996 and is under review at present with a view to increasing it given the section's heavy workload.

As shown in table 1, Inland Revenue collects considerable revenue from its audit activities.

TABLE 1

	Special Audit	All Other Audit areas	Total Audit	Total Audit as a % of Total Tax Revenue collected by Inland Revenue
1995/96	$17.6m	$436.8m	$454.4m	1.7%
1996/97	$35.3m	$528.6	$563.9m	2.1%
1997/98	$15.2m	$569.6m	$584.8m	2.1%

NB: "All Other Audit Areas" is all audit functions except Special Audit. The Special audit figure is for additional tax assessed, measured on a cash basis, while the figure for all other audit areas is for non-compliance detected, which is measured on an accruals basis and omits taxpayer errors, voluntary disclosures and objections and cases stated.

Recommendations by the Committee of Experts on Tax Compliance on reducing tax evasion

In reviewing Inland Revenue's measures to reduce tax evasion, the committee presented its own set of recommendations. Specifically, the committee recommended that Inland Revenue should:

- adopt a goal of sustained accretion of improvements, that steadily whittle away at the amount of tax that is evaded and that enable the department to respond quickly to new business techniques or to new systems of concealment that offer opportunities for new methods of evasion;
- not simply target audits based solely on the amount of potential tax evasion, but target many taxpayers evading small amounts of tax as a means of deterrence;
- continually identify opportunities for evasion;
- continually look for new opportunities for the efficient operation of withholding tax methodologies, whether of existing or new design;
- develop a strong community awareness of the cost to the community of tax evasion in terms of facilities, benefits and opportunities forgone, and the increased cost of existing services and facilities;
- review the law relating to non-cash transactions, and effectively communicate the law to those sectors of the community where non-cash transactions are prevalent.

The committee's recommendations are being worked through as part of Inland Revenue's continuing revision of its approach to tax evasion. The recommendations relating to the operational and audit aspects of Inland Revenue reinforce its existing strategic direction. Essentially, the department must concentrate more resources into the area of evasion.

Chapter 4

Implications for Future Research

Practical constraints on our ability to monitor the efficiency and equity of the tax system

As noted in the Commissioner's forward to the department's second Health Report, Inland Revenue is committed to improving the quality of the purchase information available to the Minister and the department's senior management. It sees the Health Report as playing a major role in that process:

> Inland Revenue is committed to improving the quality of the purchase information available to the Minister and the department's senior management. The Health Report, along with the Compliance Improvement Strategy, forms a significant part of the basis for the priorities identified in the department's purchase advice and proposed output mix for 1998/99.[30]

At the same time, however, Inland Revenue recognises the practical constraints associated with monitoring the efficiency and equity of the tax system, and the implications those constraints have for the development of the Health Report. As noted by the Commissioner:

> … the development of the Health Report as a long term project. The kind of information required to make assessments of the health of the tax administration is, in some cases, very difficult to collect. However, the quality of the information available will continue to improve over time, enabling the Health Report to more fully meet its purpose. Although I believe the second report represents significant progress towards achieving this purpose, I expect further progress to be made over the course of the next year.[31]

Although it is highly desirable to monitor the overall efficiency and equity of the tax system, the experience of Inland Revenue suggests that there are numerous factors that constrain our ability to do so.

In particular, research into the efficiency and equity of the tax system:

- **Requires large amounts of information that is often not available.** In the absence of such information, numerous simplifying assumptions need to be made which may not be realistic.
- **Produces results that can be difficult to interpret.** The need to make numerous simplifying assumptions can make it difficult to interpret the results of the analysis. In many instances it is necessary to qualify those results heavily in the light of the simplifying assumptions that have had to be made, and the methodologies adopted, to get around those information constraints. This severely limits the usefulness of those results for the purposes of tax policy development and tax administration.

[30] Inland Revenue Department (1997) *The Health Report*, December.
[31] Inland Revenue Department (1997) *The Health Report*, December.

- **Consumes considerable resources.** Research into the efficiency and equity of the tax system is typically complex, costly and takes considerable time to complete, given an adequate process of consultation.

These practical constraints do not mean that we should not attempt to monitor changes in the efficiency and equity of the tax system. However, as discussed further below, they do suggest:

- The need for caution when interpreting macro performance indicators of the costs of taxation and the size of the hidden economy. In particular, we should be careful not to place too much emphasis on those macro performance indicators in the tax policy development process.
- The need for more practical research. Much of the "top-down" research undertaken to date on the effects of taxation on economic growth in New Zealand is of little practical use for the purposes of tax policy development and administration. As a result, the Policy Advice Division intends to discontinue that research and focus on other areas of the current research programme that are of greater practical use to tax policy development and administration.
- The need to explore alternative methods of monitoring the progress that the Government's tax policy work programme is making towards improving the overall efficiency and equity of the tax system.

Need for caution when interpreting and using macro performance indicators

In view of the complexity of the tax system, and the numerous simplifying assumption that have to be made in order to develop indicators of the overall efficiency and equity of that system, considerable care needs to be exercised when interpreting changes in those indicators.

Importance of underlying assumptions

The temptation with indicators is to ignore all of the assumptions that have had to be made to derive those indicators, and to ascribe much greater accuracy and relevance to those indicators than is warranted.

Indicators should be used to assist the policy development process, rather than become the entire focal point of that process. In particular, we need to avoid making the indicators the end objective, and forgetting about the real objectives. At the end of the day, tax policy formulation still involves a considerable amount of judgement, both on behalf of advisors and the Government. Indicators can assist in that process, but cannot replace it.

Limitations of empirical analysis

It is appealing to think that it might be possible to develop a model that would be capable of determining what rates of tax should apply in New Zealand, and what proportion of tax mix should be raised by direct, as opposed to indirect, taxes.

In reality, however, empirical models are incapable of providing answers to these complex questions. The tax system, and the manner in which it affects the operation of the economy, is extremely difficult to model in a realistic manner. Inevitably, it is necessary to make numerous simplifying assumptions that abstract from reality in order to overcome data limitations and ensure the model can be solved.

Tax policy design also involves some important and complex trade-offs that cannot, and should not, be made by an empirical model. For example, practical tax policy formulation inevitably involves trade-offs between the efficiency and equity of the tax system which can, and should, only be made by the Government.

Tax policy development is not, and is unlikely ever to be, a science. It requires decisions to be made often in the presence of considerable uncertainty and incomplete information. Ultimately, tax policy formulation requires complex judgments to be made by both officials and the Government. While empirical analysis can assist the Government in making those decisions, it cannot, and should not, seek to make those judgements.

Advantages of a "broad-base, low-rate" approach to tax reform

Tax reform to date has been designed to deal with these severe information constraints. It has not involved the use of extensive empirical analysis to determine the "optimal" rates of tax to apply to different activities in order to minimise the costs of taxation.

Rather, the approach has been to improve the overall efficiency of the tax system. This has not required detailed information on differences in effective marginal tax rates, and the manner in which taxpayers are responding to those different tax rates. This approach has been endorsed, for example, by the Committee of Experts on Tax Compliance in its report *Tax Compliance* in reference to policy measures to reduce the level of tax evasion in New Zealand.[32] The committee noted, in particular, that the level of tax evasion would have been much higher than its current estimate had previous governments not decided to a broaden the tax base and lower tax rates.

[32] Committee of Experts on Tax Compliance (1998) *Tax Compliance*, Report to the Treasurer and Minister of Revenue.

Need for more practical research

In view of the problems outlined in chapter 2, much of the "top-down" research commissioned into the economic effects of taxation is of little use for the purposes of purposes of tax policy development and administration, or for inclusion in the department's Health Report.

As a result, the department's Policy Advice Division intends to discontinue that research and focus on other areas of the current research programme that are of greater practical use to tax policy development and administration.

Current research programme

It is important to note that the research commissioned by Inland Revenue that is the subject of this report is not the only research currently being conducted by officials into the efficiency and equity of the tax system.

Rather, it is only a small part of an extensive programme of research being undertaken by in support of the Government's tax policy work programme, and in the course of administering the tax system.

In effect, the tax policy work programme involves two main categories of research:

- research directed at improving our understanding of the overall performance of the tax system, and the progress that is being made towards a better tax system (including research into the costs of taxation, as well as overall compliance with the tax system); and
- detailed research aimed at identifying problems with the current tax system, and possible options for reform (including changes to the administration of the tax system).

The first category of research includes the work commissioned by Inland Revenue that is the subject of this report. That research is directed at improving our understanding of the overall performance of the tax system, and the progress that is being made towards a better tax system. Other research in this first category includes:

- The project being carried out by Professor Erwin Diewert and Dr Denis Lawrence for the Treasury. These consultants undertook the first major study of the deadweight costs of taxation in New Zealand for the Business Roundtable in 1994. Their first study, however, looked only at the deadweight costs arising from the taxation of labour income and consumption. Their current study extends their original analysis to include an estimation of the deadweight costs arising from the taxation of income from capital.

- The joint work being undertaken by officials and the Investment Savings and Insurance Association (ISI) on savings issues. This involves research into the factors influencing the quality of investment and savings decisions in New Zealand, and the role of housing as a vehicle for retirement savings. Institutional structures, such as differences in the tax treatment across different types of investment, have the potential to reduce the overall efficiency and equity of the tax system by distorting savings and investment decisions.

The second, and by far the largest, category of research into the efficiency and equity of the tax system involves a wide range of projects aimed at reducing the overall costs of taxation, and improving compliance with the tax system including:

- The base maintenance work programme. In the course of developing and continually updating the base maintenance work programme, the Policy Advice Division closely monitors the nature and extent of tax avoidance using information sent to us from other areas of the department (such as the Corporates unit and the Rulings and Adjudication unit). This allows us to identify different types of tax avoidance activity, and assess their relative importance both from the point of view of overall economic efficiency, and potential revenue loss. This helps us prioritise the order in which these issues should be addressed.
- Post-implementation reviews of specific tax legislation, including that relating to depreciation, accruals, GST, and the trading stock rules. These reviews all involve an assessment of the extent to which these regimes impose deadweight costs on the community, and provide avenues for tax avoidance, and the manner in which they can be reformed in order to reduce those costs.
- The tax simplification project involves a detailed assessment of the extent to which the tax system is being administered in a manner that minimises the deadweight costs (particularly compliance costs) associated with raising tax revenue.

Many of Inland Revenue's administrative activities undertaken by other areas of the department also involve monitoring and, where possible, improving the efficiency and equity of various aspects of the tax system. Examples include:

- Inland Revenue's audit activities. In effect, this involves surveys of the extent of non-compliance with the tax system (monitoring the extent of tax evasion) and the application of penalties for non-compliance.
- The provision of taxpayer services to help taxpayers comply with their legal obligations.
- The binding rulings system, which once again seeks to help identify and clarify legal ambiguities, thereby reducing compliance costs, reducing uncertainty concerning the tax treatment of certain transactions, and improving the overall efficiency of the tax system.

Direction of future research

Over the next twelve months, the Policy Advice Division intends to focus its research on those areas of the Government's tax policy work programme that have been accorded the highest priority. This includes further research aimed at:

- **Identifying those areas of the tax base that are being eroded by tax planning activities and developing possible solutions to those problems.** Such tax base erosion reduces the overall efficiency and equity of the tax system by encouraging inefficient patterns of consumption, production and resource use, as well as a less equitable distribution of income. The recent discussion document on the post-implementation review of GST identified a number of tax planning activities that are eroding the consumption tax base, and proposed solutions to these problems. Other base maintenance initiatives will be proposed for inclusion in future tax bills.
- **Simplifying the tax system for businesses, particularly small businesses.** Unnecessary complexity in the tax system also reduces its overall efficiency and equity by increasing both compliance and administrative costs. Phase 1 of Inland Revenue's tax simplification project has resulted in significant reductions in the number of individuals required to file tax returns, thereby improving the overall efficiency and equity of the tax system by reducing compliance costs. Phase 2 of the project will focus on identifying aspects of the tax system applying to businesses, particularly small businesses, which would benefit from simplification.

In the medium term, we also intend to explore the possibility of updating the research into the size of the hidden economy, and the overall level of tax evasion. While it is not feasible to update that data on an annual basis, it may be possible to provide an update on a less frequent basis, say every three years.

As noted above, we have also decided to discontinue "top-down" research into the effects of taxation on economic growth. We share the concerns expressed by the OECD about "top-down" research into the effects of taxation and economic growth, and agree that such research needs to be supplemented with further "bottom-up" research.

> The "top-down" approach has several shortcomings as a reliable basis for the assessment of tax effects on the economy. The analysis in the paper suggests that it is necessary to supplement it with a "bottom-up" approach which examines the various channels through which taxation affects economic growth, in particular via distortions in saving, physical and human capital formation and labour supply. Thus, in addition to the literature survey, the tax effects on economic growth were simulated by applying econometric models which incorporate these channels of transmission. While the results are model-dependent, one of the endogenous growth models finds that a cut in the tax-to-GDP ratio by 10 percentage points of GDP (accompanied by a deficit-neutral cut in transfers) may increase annual growth by 1/2 to 1 percentage points (a somewhat larger effect than that found by the "top-down" approach).[33]

[33] Leibfritz, W., Thornton, J. & Bibbee, A. (1997) *Taxation and Economic Performance* Economics Department Working Paper No.176, Organisation for Economic Co-operation and Development, Paris, p.10.

As a result, we will be continuing to assist the Treasury with the research currently being undertaken by Professor Erwin Diewert and Dr Denis Lawrence into the deadweight costs arising from the taxation of income from capital. At the same time, however, we agree with the OECD that caution needs to be exercised when interpreting the results of such "bottom-up" models since they inevitably do not capture all of the complexities of the actual tax system and the economy in which it operates.

> As such simulation models do not capture the complex structural features and linkages of real world economies, these results must be viewed with caution. Nevertheless, they indicate that there may be some room for tax policy to improve economic performance.[34]

We also intend to continue our involvement in the joint work on savings issues with the ISI.

As explained further below, we also intend to pursue other, more practical ways of monitoring the efficiency and equity of the tax system.

Need to explore alternative ways of monitoring the efficiency and equity of the tax system

In view of the difficulties associated with developing annual indicators of the overall efficiency and equity of the tax system, Inland Revenue's Policy Advice Division has been considering alternative ways of providing key decision makers with an overview of the tax system, and the progress that is being made to improve that system.

Complexity of the tax reform process

The continuing process of tax reform in New Zealand is extensive and complex. Each year, a large number of detailed proposals for tax reform are proposed and implemented.

In the course of working through those detailed proposals for tax reform proposals, it is relatively easy to lose sight of the current tax system, the overall tax policy objectives, and the progress that is made each year towards the implementation of that work programme.

In particular, it is often difficult to see how the various proposals for tax reform fit together to form a consistent approach to tax reform. Often the detailed reforms can appear to be piecemeal, even though they are part of a consistent strategy for improving the overall efficiency and equity of the tax system.

[34] Leibfritz, W., Thornton, J. & Bibbee, A. (1997) *Taxation and Economic Performance* Economics Department Working Paper No.176, Organisation for Economic Co-operation and Development, Paris, p.11.

Regular tax policy communication

The process of tax reform could be improved by raising the overall level of public understanding of the Government's tax policy work programme, and the progress that is made each year towards implementing it.

To this end, the Policy Advice Division intends to provide up-to-date information on the process of tax reform on our tax policy web site and will update that information at least once a year.

This will provide both Ministers and other interested parties with an overview of New Zealand's tax system, and a qualitative discussion of the progress made over the previous year to improving that system.

In particular, we intend to outline the Government's revenue strategy, the announced tax policy work programme, and progress towards implementing that work programme.

Appendix 1

Key Methodological Concerns

Introduction

The research into the economic effects of taxation by Inland Revenue's Policy Advice Division comprises 38 working papers. The papers cover a wide range of research areas and vary significantly in their quality.

The purpose of this appendix is to highlight some of the key methodological concerns regarding some, not all, of the working papers. This coverage is considered important to avoid taking some of the conclusions on these papers at face value. Some of the working papers were technically competent, but their conclusions not useful. Much of the sound work undertaken is not covered here for this reason. A comprehensive review of all the papers was undertaken by the Policy Advice Division, and this appendix draws upon some of its conclusions.

Some of the criticisms are specific to individual working papers and should not be carried over to the wider papers in that research area. Other concerns encompass methodologies adopted by groups of papers and therefore apply to all the papers that have followed that particular methodology.

The appendix is divided by area of research. Specifically, the areas of research discussed are:

- taxation and economic growth;
- effective tax rates (including data issues);
- compliance; and
- firms' costs and taxes;

A full list of all the working papers can be found in Appendix 5.

The analysis of these areas of research concludes that there are some significant methodological problems with some of the papers serious enough to undermine their results.

Taxation and economic growth

This section highlights some important concerns with Professor Scully's Working Paper No.14, *Taxation and Economic Growth in New Zealand*, referred to in chapter 3. The approach adopted by the research, on the relationship between taxation and economic growth, is discussed in some detail there. The following technical issues should be considered in addition to the problems discussed earlier.

We retained Professor Phillips of Yale University and the Cowles Foundation for Research into Economics to comment generally on Working Paper No.14 as well as provide feedback on a specific technical disagreement that was raised at the time of the first draft of the paper in 1995. The disagreement continued until 1998.

Our objection to the paper was modified, refined and extended while Professor Phillips was part of the way through his assessment. In the event, he reviewed both of our notes. These notes, as well as Professor Phillips' entire report, are attached to the end of this appendix (see Appendices 2, 3 and 4).

We explain the approach of Working Paper No.14 before summarising Professor Phillips's critique. In a given year, GDP is assumed to be produced by the previous year's government expenditure and lagged private sector output in a Cobb-Douglas production function. In the obvious notation,

$$Y_t = aG_{t-1}^{b}[(1-\tau)Y_{t-1}]^{c}$$

τ is the tax/GDP ratio so the square bracket is private sector output in the previous period. The government's budget is assumed to be continuously balanced so government expenditure is replaced by tax revenue in the production function.

The growth factor, 1+g, is set equal to the ratio of consecutive year's output. The previous equation can then be shown to become:

$$1+g = Y_t/Y_{t-1} = a\tau^{b}(1-\tau)^{c}Y_{t-1}^{b+c-1}$$

This expression is maximised with respect to τ to obtain the expression for the tax/GDP ratio which would maximise the GDP growth rate:

$$\tau^* = b/(b+c)$$

Two real GDP series were used, one obtained from the GDP deflator and the other from the CPI. The coefficients were estimated and the constant returns to scale hypothesis could not be rejected, hence b+c=1.

The effect of this is that the growth maximising tax/GDP ratio, τ^*, equals b and b had already been econometrically estimated.

We reject the results in Working Paper 14. The practical reason is that the econometric methods are poor so the results cannot be relied upon. The econometric deficiencies are set out by Professor Phillips in Appendix 4 and are informally summarised below. In addition to the specific econometric objections, there are other reasons for scepticism about the work. The model is not a proper description of the New Zealand economy and it is internally contradictory. In general terms, the other reasons are:

- The model does not recognise that market equilibrium or disequilibrium are major issues in macroeconomic modelling that have to be confronted.
- The business cycle, foreign shocks, regulatory, speculative or inflationary periods and growth theory are all omitted from the model.
- The tax/GDP ratio is not a direct policy variable.
- The distributional consequences of taxation and government expenditure are central aspects of the role of government which are side-stepped in the *formal* model.

On the econometric issues, Professor Phillips has informed us that Working Paper 14, in brief:

- treats the tax/GDP ratio as exogenous when it is an endogenous variable;
- should have distributed the effects of tax rates over a number of years because a nine-year moving average of GDP growth rates was used;
- inadequately treats the effects of taxation on government expenditures on education and health;
- cannot claim to be a reduced form estimate of the effects of otherwise omitted variables because the tax/GDP ratio should be endogenous;
- requires a more sophisticated structural model to incorporate the foregoing effects;
- does not provide reliability measures for to 20% figure (is unreliable, as another paper shows);
- requires a sensitivity analysis of the effects of using the nine-year moving average of GDP rates;
- is heavily dependent of the effects of the 1920s and 1930s;
- should be extended to more recent years past 1994.

On the points raised in our two notes, Professor Phillips:

- considers that Working Paper 14 applies only to an economy with an unchanging growth rate over time and constant returns to scale, as Inland Revenue claimed;
- notes, on the presence or otherwise of constant returns to scale in the New Zealand economy, that robust tests should have been conducted;
- concurs that Inland Revenue showed that there are some technical deficiencies in the development of the model, although the econometric considerations noted the previous set of bullet points are considered to be much more important; and
- advises that a disequilibrium growth model would be superior to Professor Scully's model, about which Professor Phillips concurs with the drift of Inland Revenue's comments.

The two notes and Professor Phillips's full report are contained in Appendices 2, 3 and 4.

Effective Tax Rates

What is an effective tax rate?

When people refer to rates of tax, they are usually referring to the statutory marginal tax rates as set out in Schedule 1 of the Income Tax Act 1994. For example, the statutory marginal tax rate applying to companies is 33%. This means that tax is imposed at a rate of 33% on every additional dollar of net taxable income earned by a company.

In practice, however, statutory marginal tax rates provide a somewhat misleading indication of:

- the amount of tax actually paid by each company on the total net amount of economic income derived from their activities; and
- the amount of tax actually paid by a taxpayer on an extra dollar of income from a particular economic activity.

For example, consider the 33% statutory marginal tax rate applying to companies. At first sight, it would appear that all companies pay the same rate of tax on their net income.

On closer inspection, however, it is clear that this is not the case. Indeed, there are considerable differences in the actual rates of tax that apply to companies engaging in different types of economic activity. Companies deriving the same amount of economic income can be paying different amounts of income tax. Similarly, an additional dollar of income from one economic activity can be taxed at a different rate than an additional dollar of income from another activity.

These differences in actual tax rates arise because:

- Not all forms of economic income and expenditure are respectively assessable and deductible for tax purposes (for example, gains made on the sale of shares that are not purchased with the intent of resale).
- Different "timing" rules apply to the recognition of different forms of income and expenditure. For example, some forms of income and expenditure are recognised for tax purposes as they accrue, whereas other forms of income and expenditure are not recognised until the payments are actually made.

"Effective tax rates" are intended to provide a more accurate indication of the actual (or "effective") rates of tax being paid by taxpayers, and the actual rates of tax applying to an additional dollar of income from a particular economic activity.

For example, *average effective tax rates* provide an indication of the amount of tax actually being paid by a particular taxpayer on total net economic income. As a result, average effective tax rates can be useful when considering issues such as how equitable the tax system is, and whether individual taxpayers are paying their "fair share" of tax.

By contrast, *effective marginal tax rates* provide an indication of the actual rate of tax applying to an additional dollar of revenue from a particular economic activity. As such, effective marginal tax rates can be useful for the purposes of determining the efficiency of the tax system – that is, the extent to which the tax system is capable of raising revenue without distorting decisions of consumers, and producers.

Objectives of the research and approach adopted

A number of the working papers commissioned by Inland Revenue sought to study differences in the tax burdens borne by companies, and whether those tax burdens were in accordance with the ability to pay.

In order to resolve these issues, the research involved the calculation of average effective tax rates for companies.[35] The estimated average effective tax rates were then used to estimate econometrically the relationship between company performance and the tax burden.

As discussed below, Inland Revenue does not accept the results of the research since:

- The methods used to calculate average effective tax rates do not result in accurate estimates of the actual tax burdens imposed on taxpayers.
- The data used in the research are not appropriate for the purposes of calculating average effective tax rates.

These problems are discussed further below.

Problems with the methods used to calculate average effective tax rates

As noted above, the most appropriate concept of effective tax rates to use for this purpose is the average effective tax rate. The average effective rate of tax paid by a particular taxpayer is equal to the total amount of tax actually paid expressed as a proportion of the total economic income the taxpayer derives from all activities. In other words, the average effective tax rate indicates the amount of tax actually paid "averaged" over the total net income of the taxpayer.

By contrast, the research involved the calculation of a number of ratios which were described in the working papers as "effective tax rates" including:

- current tax paid/accounting profit;
- current tax paid/total corporate costs;
- current tax paid/total corporate revenue; and
- current tax paid/total assets.

[35] Working Papers No.2(Rev), No.6, No.10, and No.11 explicitly calculated effective tax rates, while Working Paper No.1 considered the appropriateness of using financial reporting data for calculating effective rates

Of these, only the first ratio is a potential indicator of the average effective tax rate imposed on a company.

The other ratios appear to have been included in view of concerns that accounting profits are "to some extent, at choice, partly by virtue of management decisions to modify timing of profits and because there is, to a degree, some freedom in accounting conventions across companies".[36]

However, this argument ignores the fact that many of the problems associated with obtaining consistent measures of accounting profit actually stem from differences in the methods used to measure corporate revenue, corporate costs, and the value of company assets. For example, Sawyer (1994)[37] outlined the reasons for the significant differences across companies in the accounting practices used to compile their annual public accounts.

It also ignores the fact that these other ratios can vary considerable across firms for a variety of normal commercial reasons, including differences in the nature of the business in which the company engages, and the types of production technologies employed. This makes it extremely difficult to compare these ratios across companies.

For example, high value-adding companies will tend to exhibit lower ratios of current tax paid to total corporate revenue than high turnover, low value adding companies. As a result, a supermarket will inevitably have a much higher ratio of current tax paid to sales revenue than many other companies since it derives net income from earning small profit margins on a high volume of turnover. However, this does not necessarily mean that supermarkets have a high tax burden.

Similarly, companies that use capital-intensive production technologies will tend to exhibit lower ratios of current tax paid to total assets than companies that use labour-intensive production technologies. However, this does not mean that companies that use labour-intensive production technologies face a higher tax burden than companies using more capital-intensive production technologies.

Since many of the indicators used in the research do not provide an accurate indication of the tax burden facing companies, this raises the question as to what the results of the research really show. Working Paper No. 11, *The Determinants of Effective Tax Rates*, reconciles the reported profits of a sample of firms with their taxable income. The paper shows the difference between the statutory and effective tax rate to be composed of timing and permanent differences between accounting and tax policy, as well as other specific tax policy elements such as losses carried forward.

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[36] McCann, E., Small, J. & Caragata, P. (1995) *Effective Tax Rates for Corporations: A New Econometric Approach to Assessing Their Tax Payment Behaviour*, Working Paper No.2, Inland Revenue (December) (p1).

[37] Sawyer, A. (1994) *An Analysis of the "Tax Gap" of Listed Public Companies in New Zealand: 1984-1993* Consultative Report for the New Zealand Treasury.

Problems with the data used to calculate average effective tax rates

The New Zealand Corporate Database (NZCDB) was used to estimate the effective tax rates of companies and their relationship with the economic efficiency in a number of the working papers.

The NZCDB is a sample of data collected from the financial reports of approximately 800 companies over the period 1982-94. The data had been collected directly from the financial reports submitted by firms held at the Company Offices around New Zealand. The data were specifically collected for the study of "ETRs, debt/equity ratios and other financial indicators and [they] must also reflect the true measurement of the variables that are applied in the calculation of those ratios".[38]

Working Paper No.1, *Financial Ratios and Tax Policy Development: Investigating Accuracy Issues of the New Zealand Corporate Database*, examined the problems associated with using financial data for this purpose. It clearly demonstrates that the NZCDB is inappropriate for analysing effective tax rates, despite the concluding chapter in that paper stating otherwise.

The principal reasons that financial data were problematic for the calculation of effective tax rates are summarised below.

Accounting definition of tax paid

Tax data recorded in financial statements and the actual tax paid as recorded by Inland Revenue records differ markedly. The reporting entry adopted in the working papers is current tax paid, thus omitting the deferred component of the tax figure. This figure is expected to differ from the Inland Revenue tax calculations because in calculating the income upon which tax is levied:

- Certain items are considered income in accounting terms, but not for tax purposes.
- Certain items are recorded as expenses for accounting purposes but not for tax purposes.
- There exist timing differences between tax and accounting policies.

Working Paper No.1 and associated research comparing accounting and Inland Revenue tax data fails to demonstrate any reasonable consistency between the tax liability calculated by Inland Revenue and that shown in the financial report of the company.[39] Working Paper No.1, for example, showed that comparing the parent company tax figure as per Inland Revenue records with that of the consolidated financial report resulted in an average discrepancy of 65%. However, the Inland Revenue and financial report tax paid figures from 401 companies were aggregated and then compared for discrepancies, rather than examined on a company by company basis. Such a comparison did not demonstrate the accuracy of the reported tax figure of an individual firm.

[38] Gillion, C., Aldersley, D. & Caragata, P (1995) *Financial Ratios and Tax Policy Development: Investigating Accuracy Issues of the New Zealand Corporate Database*, Working Paper No.1, Inland Revenue.
[39] The "associated research" is summarised in a memorandum entitled "Comparing Tax Variables and Accounting Variables" from Shee Boon Law, Financial Analyst, to Dr Patrick Caragata dated 4 August 1997.

The associated research investigated the difference between a range of tax and accounting variables, including current tax expense. The analysis of these variables relied on the differences between tax and accounting values as a percentage of total assets measured using accounting rules. That is:

$$\text{Difference} = [\text{Financial Variable (tax)} - \text{Financial Variable (accounting)}] / \text{Total Assets (accounting)}$$

The results showed generally small discrepancies between the tax and accounting variables with the exception of total assets that had a discrepancy of 36% across all firms.

However, the main problem with this approach is that it uses a particularly large base for comparison – namely, the value of total assets. Any discrepancies will appear small when measured against such a large base. It might have been more appropriate to use the value of each respective variable as the basis for comparison. In addition, the use of an accounting variable as the basis for comparison also tends to bias the results obtained.

The problems associated with using accounting data to calculate effective tax rates are not restricted to problems arising from the use of a tax figure in the numerator. The denominators themselves (accounting profit, sales, costs and assets) all suffer from inconsistencies in their estimation by each individual firm, depending upon the accounting conventions each one has adopted. An example of this is the accounting method for valuing a company's assets. There is significant flexibility in the accounting regulations for companies to adopt quite different asset valuation methods. Little can be done about this, except recognise that such differences will implicitly flow though to effective tax rates adopting assets as a base.[40]

Sample selection bias

The NZCDB contained some 800 firms in for 1994 and fewer than 200 in 1982. This sample of firms was collected from those registered at the Companies Office and therefore was not a randomly selected. There exists a degree of sample selection bias in the sample because:

- The sample was over-represented with respect to some sectors and under-represented by others. The manufacturing sector, for example, provided, on average, 50% of the sample over the 1982-94 period.[41]
- Companies were included on the basis that they had available data for the 1982-94 period. In other words, only companies that had survived over the period were selected.

[40] Gillion, C., Aldersley, D. & Caragata, P. (1995) *Financial Ratios and Tax Policy Development: Investigating Accuracy Issues of the New Zealand Corporate Database* Working Paper No.1, Inland Revenue, (June) (p.35-41).

[41] The disaggregation of the sample into sectors was compared to the entreprise and activity units by industrial classification of *Business Activity 1992-93* by Statistics New Zealand. Manufacturing only comprised of 10% of enterprises and activity according to that data. See Table 5.5 in Gillion, C., Aldersley, D. & Caragata, P. (1995) *Financial Ratios and Tax Policy Development: Investigating Accuracy Issues of the New Zealand Corporate Database* Working Paper No.1, Inland Revenue (June).

Any extension of the conclusions reached from studies using the NZCDB to the corporate population should, therefore, be treated with considerable caution.

In addition to Working Paper No.1, a consultative report prepared for the Treasury by Sawyer (1994) also undertook to verify and standardise the treatment of financial data for 40 companies over the 1985-92 period.[42] The study therefore investigated the degree to which financial data could be compared across companies and across years as a result of substantial differences in their accounting policies.

Sawyer "standardised" the raw reported data to enable cross-company comparisons. This involved checking for simple coding errors, correcting for variances in the choice of disclosure items, readjustments to provide consistency both between companies and from year to year, with a standard classification and calculation procedure.

Sawyer concluded that "inter-company distortions are not insubstantial and inconsistencies are present between various income years". These conclusions applied to the Net Profit figures and the Income Tax Expense variables, which were key in the calculation of effective tax rates in the working papers. An example given by Sawyer was Fernz Corporation's 1988 Net Profit Before Tax figure, which was $16.6 million but appeared as a loss of $(1.2) million after standardisation.[43]

Compliance

The research on tax compliance comprised three types of studies, all of which estimate some definition of compliance either as a function of the financial characteristics of the firm or through the measurement of effective tax rates. The types of studies are those that estimate:

- the probability of a firm being compliant or non-compliant given its financial characteristics;[44]
- the probability of a firm paying no tax;[45]
- the deviation from a benchmark tax burden (as measured by some defined effective tax rate) by companies.[46]

[42] Sawyer, A. (1994) *An Analysis of the "Tax Gap" of Listed Public Companies in New Zealand: 1984-1993* Consultative Report for the New Zealand Treasury.
[43] Sawyer, A. (1994) *An Analysis of the "Tax Gap" of Listed Public Companies in New Zealand: 1984-1993* Consultative Report for the New Zealand Treasury (p.74).
[44] Giles, D. (1997) *Modelling the Tax Compliance/Non-compliance Profiles of Audited New Zealand Firms: Evidence From the ORACLE Database*, Working Paper No.28, Inland Revenue, May.
[45] Rogers, A. (1995) *Effective Tax Rates: Zero Payments and the Migration of Firms Across Tax Bands*, Working Paper No.15, Inland Revenue, December and Heiler, A. (1997) *Establishing the Risk Profiles of Corporate Tax Behaviour: FIRST System Taxpayer Database*, Working Paper No.26, Inland Revenue, April.
[46] Law, S.B. (1997) *Risk Profiling of Corporate Taxpayers: New Zealand Corporate Database*, Working Paper No.27, Inland Revenue, May and Caragata, P. & Heiler, A. (1997) *Towards the Development of a Tax Avoidance Model for New Zealand*, Working Paper No.37, Inland Revenue, March.

The objective of the research on compliance was to identify firms that pay less tax than they might be expected to pay. The causes of less-than-expected tax may be the financial health of the company or tax planning, tax avoidance or evasion. This was an ambitious exercise, particularly for those studies that sought to estimate the extent to which firms over or under pay tax.

Estimating the probability of compliance

Working Paper No.28 used Inland Revenue's audit outcomes to predict, in advance of a tax audit, the probability that an individual firm will be tax compliant, tax avoiding or tax evading.[47] The probability prior to a tax audit of a firm falling in one of the three audit outcomes, were an audit undertaken, depends on various financial variables available to Inland Revenue and on the firm's industrial sector.

Working Paper No.28 used a very large random sample of 51,000 observations drawn from Inland Revenue's IR10 and taxpayer audit database (ORACLE).[48] The random sample was extremely important in evaluating this paper. That feature of the research substantially strengthens the results of the paper. It reduces, without eliminating, the adverse effects of random errors in the data. The random sampling of companies means that the effects of random understatements in some companies' data will be offset by the overstatements in others' data.

Audits are conducted with different of degrees of intensity. Each classification of an audit outcome used in Working Paper No.28, such as "tax compliant" for example, could be the result of a limited perusal of a firm's records, or it could be the outcome of a detailed examination of a firm's affairs. The closer is the audit, the more reliable the classification will be in a particular case. Stringent audits can be expected to yield accurate classifications. Mild examinations are more likely to result in mis-classified outcomes than strict audits.

A number of data quality issues arose from the use of IR10 and ORACLE data:

- The sample of firms is drawn from the taxpayer audit data and therefore includes only firms that have, in the past, been audited. There will be some sample selection bias because of this.
- The classification of firms as "avoiders" in the audit database is not based on any consistent scientific reasoning; it is simply an outcome of the judgement of the investigating officer.
- Taxpayers may simultaneously be classified as "evaders" and "objectors" given those objections have yet to be settled. This raises the possibility of double counting between the two groups.

[47] See Giles, D. (1997) *Modelling the Tax Compliance/Non-compliance Profiles of Audited New Zealand Firms: Evidence From the ORACLE Database*, Working Paper No.28, Inland Revenue, May.
[48] See Giles, D. (1997) *Modelling the Tax Compliance/Non-compliance Profiles of Audited New Zealand Firms: Evidence From the ORACLE Database*, Working Paper No.28, Inland Revenue, May, p. 2.

Legitimate concerns about the quality of the data should be kept in perspective and of themselves need not be over riding. The concerns are balanced by the sheer volume of the data and the methodology employed.

The preliminary results of the paper are that the revenue/assets ratio, sector, year, revenue and tax/assets are useful predictors of the probabilities of compliance, avoidance and evasion. Of particular interest is the result that the greater is a firm's revenue the greater is the probability that it will be tax compliant, other things equal.[49]

If the difficulties concerning the data can be overcome and the method re-worked, this model of compliance might provide a useful addition to the current audit selection procedures in place.

Estimating the probability of being a zero or positive taxpayer

Working Papers No.15 and No.26 examine the probability of a firm not paying any tax and the factors that affect this probability. The papers differ slightly in their approach.

Working Paper No.15 considers the probability of a firm moving to a position of paying no tax to one of paying a positive amount of tax given the length of time it has paid no tax. Weights are allocated to a selection of financial variables (assets, costs, revenue and profits), so we know the leverage each has on the probability of moving to a positive tax position.

The paper uses the NZ Corporate Database, whose problems have been discussed in some detail previously. Although the statistical technique employed is of good quality, the concept of splitting taxpayers into "zero" and "positive" taxpayers must be questioned. It is not clear why the zero or positive split is more meaningful than, say, the split above or below the $2 million tax payment line. The purpose of the paper was to "establish the range and boundaries of normal commercial behaviour with respect to tax payment practice".[50] The concept of normal commercial behaviour is never properly defined in the study and it is hard to see how such behaviour could be defined by distinguishing between positive and zero taxpaying firms.

Working Paper No.26 separates companies into two groups: those whose median tax payments were zero and those whose median tax payments were positive over the 1991-95 period. This "tax" or "no-tax" status was thought to be caused by three sets of relationships: (i) activity ratios (sales/net assets), sales and residence status; (ii) interest costs, depreciation and losses carried forward; (iii) the combined variables in (i) and (ii).

As with Working Paper No.15, there seems little reasoning behind the division of taxpayers into positive and zero taxpaying categories. Further, the study uses only five years of tax data (1991-95), so the probability of the *median* tax payment being zero over this period requires only three years of losses. Many companies would be expected to find themselves in a loss position for tax purposes following the recession period of the earlier 1990s. Therefore defining

[49] See Giles, D. (1997) *Modelling the Tax Compliance/Non-compliance Profiles of Audited New Zealand Firms: Evidence From the ORACLE Database*, Working Paper No.28, Inland Revenue, May, (conclusions a-f, p.p. 22-24).
[50] Rogers, A. (1995) *Effective Tax Rates: Zero Payments and the Migration of Firms Across Tax Bands*, Working Paper No.15, Inland Revenue, December, p 2.

"high-risk" companies as those whose median tax payment is zero over this period seems inappropriate.[51]

Unfortunately, the paper contains a fundamental flaw that undermines the results. The tax or no-tax status was separately related to three sets of variables.[52] This is a non sequitur. We cannot simultaneously have:

$$y = f(x)$$

and

$$y = g(z)$$

and

$$y = h(x,z)$$

All we can have is:

$$y = h(x,z)$$

The paper estimates the three separate equations. It is h(x,z) that is relevant and the paper provides it. f(x) and g(z) are regressed and statistically analysed. The paper does not say which equations the graphs and econometric results are based on. They should be based on h(x,z).

Estimating the deviation from a benchmark effective tax rate

The final set of research on compliance estimated the deviation from a benchmark tax burden (as measured by a defined effective tax rate) by companies. The two papers in this section have very different objectives. The first, Working Paper 27, is a regression of tax paid on the probability of financial distress along with other financial variables.[53] Estimated coefficients for each of the financial variables are obtained. Those coefficients can then be applied to the financial variables for a particular firm to predict the tax it is expected to pay. A firm whose tax deviates from this estimate would be scrutinised by a tax audit.

The methodology for estimating the deviation from the mean tax/asset ratio is used. The results, however, rest on some fundamental assumptions that are themselves difficult to accept:

- The model assumes that the tax/asset ratio is a good proxy for the expected tax burden of the firm. The research demonstrated that total assets measured for tax purposes differed significantly from that measured for accounting purposes.[54] Assets are not a reliable denominator for calculating effective tax rates using financial reporting data and yield little useful information regarding a company's tax burden.

[51] Heiler, A. (1997) *Establishing the Risk Profiles of Corporate Tax Behaviour: FIRST System Taxpayer Database*, Working Paper No.26, Inland Revenue, April, p4.
[52] Rogers, A. (1995) *Effective Tax Rates: Zero Payments and the Migration of Firms Across Tax Bands*, Working Paper No.15, Inland Revenue, December, p 8.
[53] Law, S.B. (1997) *Risk Profiling of Corporate Taxpayers: New Zealand Corporate Database*, Working Paper No.27, Inland Revenue, May.
[54] The research was a memorandum titled "Comparing Tax Variables and Accounting Variables" from Shee Boon Law, Financial Analyst, to Dr Patrick Caragata dated 4 August 1997.

- A selection of variables was used to estimate the predicted or "normal" tax/asset ratio (depreciation, deferred tax, net interest and a group of financial distress variables) for each firm. Any deviations from the predicted tax/asset ratio were attributed to "strategic" behaviour and pointed to a "high-risk" taxpayer. In reality, the deviation from the prediction is the error term in the regression. This error is required to be random by the definition of the least squares' estimator. It cannot be systematic, so the deviation cannot be classified as strategic tax evasion.[55]

Although the methodology is reliable, there remain significant problems with the study.

The methodology used in the final study, Working Paper No.37, has fundamental problems. The paper also presents misleading conclusions.[56] It attempts to estimate the aggregate level of corporate tax avoidance for New Zealand for the period 1969-94.

The method of calculating company tax avoidance is to take the highest company tax/company sales ratio in the years 1968-1994 (which was 1968) and to subtract each year's tax/sales fraction from it. The difference in the ratios is then applied to each year's aggregate company sales to give the avoided tax.

The paper uses gross company sales, 1992-1994, and the annual change in gross output for all New Zealand firms, to construct a series for company sales, by extrapolating annually back to 1969.[57] This long extrapolation from so few points is unjustifiable, particularly since the arithmetic extrapolation is highly non-linear.[58]

The study uses 1969 as the "benchmark for corporate taxpaying behaviour", when tax avoidance was claimed to be at its lowest.[59] The reasons given for choosing 1969 are that "there was less incentive and opportunity to avoid tax due to low inflation, a small tax/GDP ratio, protection of markets and heavy regulation of the NZ economy and its interactions with the rest of the world".[60] There is no empirical evidence presented to justify 1969 being used for "identifying a best practice frontier" with respect to tax avoidance. This was also the year with the highest aggregate tax/sales ratio. The fallacy here is that the companies' best profit year, on which tax was paid, indicates they are avoiding. This is one of the key criticisms of using the tax/sales ratio generally as a measure of a firm's tax burden.

In view of the problems outlined above, we have serious reservations about the results obtained.

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[55] The author makes this point, see Law, S.B. (1997) *Risk Profiling of Corporate Taxpayers: New Zealand Corporate Database*, Working Paper No.27, Inland Revenue, May, p 16.
[56] Caragata, P. & Heiler, A. (1997) *Towards the Development of a Tax Avoidance Model for New Zealand*, Working Paper No.37, Inland Revenue, March.
[57] Caragata, P. & Heiler, A. (1997) *Towards the Development of a Tax Avoidance Model for New Zealand*, Working Paper No.37, Inland Revenue, March, p.12.
[58] Caragata, P. & Heiler, A. (1997) *Towards the Development of a Tax Avoidance Model for New Zealand*, Working Paper No.37, Inland Revenue, March, see figures 1, 2, 4, 5, and 6.
[59] Caragata, P. & Heiler, A. (1997) *Towards the Development of a Tax Avoidance Model for New Zealand*, Working Paper No.37, Inland Revenue, March, p 12.
[60] Caragata, P. & Heiler, A. (1997) *Towards the Development of a Tax Avoidance Model for New Zealand*, Working Paper No.37, Inland Revenue, March, pp 12-13.

Conclusions

The outcome of the research on compliance is varied. Although some of the studies adopted sophisticated statistical techniques that were well applied, the other models were built on weak foundations. An example is the work on the positive and zero taxpayers. Establishing the reasons firms make losses (and carry them forward) reveals less about their taxpaying behaviour than it does about their performance as a company. In this sense, much of the research was misdirected.

Working Paper No.28 provides a useful approach to estimating the probability of compliance by firms. The only serious obstacle to its application is the availability of reliable data. The paper shows that it is possible to use individual tax return information to calculate the probabilities that a firm is a tax evader, a tax avoider or is tax compliant. The statistical advantages of the variation of firms and the reductions in standard deviations following from the large sample enhance the quality of the results.

Working Papers No.15, No.26, and No.27 all suffer from conceptual flaws, if not from data problems. The study of taxpayers by positive and zero taxpaying groups has as much to do with the performance of individual firms and the wider economic conditions as it does the design of the tax system. No real policy proposals emerge from these papers.

Working Paper No.37 has fundamental shortcomings in both its purpose and execution.

Firms' costs and taxes

The purpose of the research on firms' costs and taxation was to establish a relationship between a firm's efficiency and its tax burden. The general hypothesis is that more efficient firms pay less tax.

As outlined below, we have a number of concerns about the methodology employed to test this hypothesis.

Quartile analysis

There are three working papers that wholly or partly apply an unorthodox method it calls quartile (sometimes "quartal") analysis.[61] Quartiles are a standard way of grouping sets of data used to indicate the range and skewness of their distributions. Conventionally they do little more than that.

[61] See Caragata, P. (1996) *The Impact of the Revenue and Profit Efficiency Performance of Firms on Taxation*, Working Paper No.19, Inland Revenue, December, Table 1; Caragata, P. & Heiler, A. (1997) *The Life-cycle Analysis of Corporate Taxpaying Behaviour: Implications of Integrating the Learning Curve and the Production Frontier*, Working Paper No.36, March, Tables 1,3,4,5 and Caragata, P. & Heiler, A. (1997) *The Tax and Labour Hiring Trade-off: A Study of the Non-durable Retail Sector in New Zealand*, Working Paper No.34, Inland Revenue, March, p 13.

The papers unsuccessfully attempt to put quartiles to a different use. Data are grouped into their quartiles for different years and the median[62] of each quartile is compared with the median of the same quartile year by year. Inferences are drawn from the behaviour of the medians of, say, the first quartile over time. Firms may be becoming more or less efficient, for example,[63] if the median of a quartile increases.

The interpretations are questionable. To see this, suppose that some firms near the top of the first quartile raise their efficiency, exchanging places with those at the bottom of the second quartile, whose efficiency has also improved but insufficiently to preserve their rankings. Efficiency in the industry has clearly improved if other firms' efficiencies are unchanged. However, the medians of each of the quartiles will be unaltered from one year to the next and it will be falsely concluded that efficiency is unchanged.

A change in the number of firms in the industry usually changes the medians. The change in the medians then implies nothing about the efficiency of pre-existing firms, in that case. Firm numbers change in an industry through reclassification, the amalgamations of firms and the growth of an industry. Amalgamations occurring to obtain a modicum of market power reduce economic efficiency.

The use made of the quartiles does not allow for the reshuffling of firms within a quartile in succeeding years. The conclusions of papers substantially relying on this self-styled quartile analysis must, therefore, be discarded.

These problems raise doubts about the following conclusions emerging from the working papers:

- New Zealand companies with higher activity ratios had higher probabilities of paying no tax than companies with lower activity ratios, when no such conclusion is possible from use made of quartiles.[64]
- There is an inverse relation across countries between companies' return on net assets and their effective tax rates.[65]
- The tax system favours established firms and is biased against new firms.[66]

One of the papers also contains unwarranted conclusions on revenue efficiency and effective tax rates in the electricity industry.[67]

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[62] Working Paper No.19 uses medians within quartiles. Working Paper No.36 takes the fractional differences of the bounds of each quartile.
[63] Working Paper No.34 defines stagnant, threshold, ascending and efficient firms by their quartals (sic) (paragraph 78, Tables 5.5 - 5.7).
[64] Caragata, P. (1996) *The Impact of the Revenue and Profit Efficiency Performance of Firms on Taxation*, Working Paper No.19, Inland Revenue, December, p 29.
[65] Caragata, P. (1996) *The Impact of the Revenue and Profit Efficiency Performance of Firms on Taxation*, Working Paper No.19, Inland Revenue, December, p 27.
[66] Caragata, P. (1996) *The Impact of the Revenue and Profit Efficiency Performance of Firms on Taxation*, Working Paper No.19, Inland Revenue, December, p 30.
[67] Caragata, P. & Heiler, A. (1997) *The Life-cycle Analysis of Corporate Taxpaying Behaviour: Implications of Integrating the Learning Curve and the Production Frontier*, Working Paper No.36, March, p 21-22.

These criticisms arise from the weaknesses of quartile analysis.

Learning curves and bulk line costing

This method approaches the efficiency of firms by using their average costs. The average costs of different firms are ranked in ascending order and graphed, usually against cumulative industry output, though this is not always clear. Extensive informal argument ensues on managerial efficiency, X-inefficiency, learning, (average cost reduction) and technological change.

We are particularly concerned about the graphing procedure. The initial ascending[68] ranking ensures that the curve will be positively sloped regardless of the shapes of firms' average cost curves. The positive slope is consistent with firms having average cost curves of any shape, including U-shaped, because of the construction of the diagram.

To illustrate this problem, suppose that each firm or plant has a continuously falling average cost curve. We select the output point for each firm and obtain its unit costs. All of those unit costs are ranked, from smallest average cost to largest, and graphed.[69] The graph can be nothing but positively sloped because of the ranking. Yet every firm had decreasing average costs. The graph conveys no information on the cost structures of firms. The same argument applies for firms with differing cost curves of a variety of shapes.

As a result, little can be concluded from the cumulative average cost diagram. It contains little information on the nature of firms' cost curves in an industry.

Although the concept of unit cost is relatively straightforward for single product firms, it is much more complex in the case of multi-product firms. This is because the total cost of a firm producing two goods depends on the output level of each. Unit costs of the first good, therefore, vary with the output of the second. Little can be said about the efficiency of the first good by looking at its "average" cost. The notion of "ray average cost" was developed for this reason.

In any event, if a cost criterion of efficiency for the single product firm is to be adopted, it is the marginal cost, not average cost, that should be applied.

Working Papers No.7(rev) and No.19 are somewhat disorganised papers, over 200 pages in total, whose empirical work rests on the questionable graphical treatment of firms' average cost curves described above. The working papers cover optimal cost structures, differentiated firms, unit cost analysis, learning curves and bulk line costing. Each concept returns to the problematic cumulative average cost diagram devoted to optimal cost structures. Duality methods and distance functions, incisive in these problems for multi-product firms, were not considered in those papers. All of the conclusions and assertions on learning curves and

[68] Descending order in the case of learning curves to obtain a negative relation.

[69] Unit costs are graphed against the cumulative fraction of the industry's output or the industry's total output in Working Paper No.19, Figures 2, 3, 4, 5 and apparently Figures 6 and 7. Falling unit cost diagrams attributed to Wright in Working Paper No.7(rev) (for example, at paragraph 520 and elsewhere) are obtained by ranking plants' unit costs in descending order. Working Paper No.7(rev) calls these learning curves (see paragraph 520 also).

efficiency, based on unit cost analyses and dispersed through the papers, are highly questionable. As a result, we do not accept the results of Working Papers No.7 (rev) and No.19.

The relationship between the activity ratio and the effective tax rate

Working Paper No.36 is a preliminary examination of firms in the New Zealand electricity generation industry, 1989-1995. The industry became liable for tax in 1989.

The study examines the relationship between the activity ratios (sales/net assets) and the effective tax rates (tax/sales) of electricity generating companies. A firm with a high sales/net asset ratio is interpreted as an efficient firm. Low tax/sales ratios are interpreted as tax-efficient firms.

There are three main concerns with the results of this paper:

- The tax/sales ratios lie between 1.2 and 7.2. In other words a firm pays 120% to 720% of its sales in tax, on average over the years. This is far too high to be correct. The best that can be hoped is that somehow a ratio has been inverted. Were that the case the conclusions would be reversed.
- The conclusion that firms with high sales/net asset ratios will have low tax/sales effective tax rates (that firms more efficient at generating revenue are more efficient at minimising their tax burden) is redundant. Sales appear as the numerator in the activity ratio and in the denominator of the effective tax rate. A rise in sales will cause the activity ratio to rise and the effective tax rate to fall, all other things being equal. Hence the discovery of an inverse relationship between the ratios was almost inevitable.
- The learning curve discussion seems closely related to declining average costs, discussed in the previous section, which need not be the result of learning; the spreading of overheads is sufficient. The essential idea of learning is absent – of incorporating the outputs of previous periods as a measure of firms' expanding experience and learning how better to produce this period's output.

The inverse relation between the activity ratio and the effective tax rate is central to the paper. Consequently, we cannot validly conclude that:

- "Taken together, both figures indicate that as firms become more proficient at generating revenue per unit of total assets, their effective tax rates will decline."[70]
- "This suggests that as firms learn to generate revenue more efficiently, they learn to minimise their tax burdens more efficiently".[71]

The paper contributes little to the understanding of firms' efficiency and the relationship to their tax burdens.

[70] Caragata, P. & Heiler, A. (1997) *The Life-cycle Analysis of Corporate Taxpaying Behaviour: Implications of Integrating the Learning Curve and the Production Frontier*, Working Paper No.36, March, p 15.
[71] Caragata, P. & Heiler, A. (1997) *The Life-cycle Analysis of Corporate Taxpaying Behaviour: Implications of Integrating the Learning Curve and the Production Frontier*, Working Paper No.36, March, p 15.

Conclusions

The aim of this technical appendix was to highlight some of the more important concerns regarding specific methodologies adopted by some of the working papers. A comprehensive review of all the research was performed, and the issues raised here were those that were considered important enough to bring to the reader's attention. Much of the good work performed has not been commented here.

In summary, the areas of research with significant problems were:

- the relationship between taxation and economic growth (specifically Working Paper No.14);
- the measurement of effective tax rates (both the quality of the data used and the unconventional bases were unreliable);
- the measurement of compliance by corporate taxpayers;
- the relationship between firms' efficiency and their tax burden.

The exception was Working Paper No.28, which, data issues aside, showed the potential to forecast compliant and non-compliant companies. Also, the estimation techniques used in calculating effective tax rates were innovative and promising, but unfortunately undermined by data and conceptual problems.

From a policy perspective, there were no recommendations arising from the research covered here that would require amending our current work programme.

Appendix 2

INLAND REVENUE DEPARTMENT

Policy Advice Division

An Error in Professor Scully's Working Paper No.14

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11 May 1998

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We demonstrate that both variable and fixed growth rates in[72] Working Paper No.14 imply contradictions between the definition of the growth factor, $1+g_t$, and the production function.

The production function is set out in equation (1) of Working Paper No.14. It is:

$$Y_t = aG^b_{t-1}[(1-\tau)Y_{t-1}]^c \qquad (1)$$

Y_t, G_t and τ are respectively GDP, Government expenditure and the aggregate tax rate all at the variable time t.Equation (2) of Working Paper No.14 defines the growth rate, g_t:

$$1+ g_t = Y_t/Y_{t-1} \qquad (2)$$

where we have made explicit the time dependence of the growth rate. Similarly, the rate of growth for period t-1 is:

$$1+ g_{t-1} = Y_{t-1}/Y_{t-2} \qquad (2')$$

After substituting the balanced budget requirement, $G_{t-1}= \tau Y_{t-1}$, into equation (1), equation (7) of the paper is:

$$Y_t = a\tau^b(1-\tau)^c Y_{t-1}^{b+c} \qquad (7)$$

Use (7) to write Y_{t-1} as a function of Y_{t-2}:

$$Y_{t-1} = a\tau^b(1-\tau)^c Y_{t-2}^{b+c} \qquad (7')$$

Put equations (7) and (7') in (2). Upon cancellation obtain:

$$1+g_t = (Y_{t-1}/Y_{t-2})^{b+c}$$

Using (2'):

$$1+g_t = (1+g_{t-1})^{b+c} \qquad (A)$$

Equation (A) is for the variable growth rate situation, covering the constant growth rate possibility as a special case.

There are two cases to consider: (a) the steady state or long run equilibrium where $g_t = g_{t-1} = g_{t-2} \ldots = g$, a constant for all t, and (b) disequilibrium growth where g_t does not equal g_{t-1} in general. We examine the cases in turn.

[72] Scully, Gerald, W. **Taxation and Economic Growth in New Zealand;** Working Paper 14, Inland Revenue Department, March 1996. 17 pages plus diagrams.

Steady state

In the steady state equation (A) becomes:

$$1+g = (1+g)^{b+c}$$

which is a contradiction since, in general, $b+c \neq 1$ as Working Paper No.14 notes (p 6). The effect of this is that the model does not have a long run equilibrium outside the constant returns to scale situation.

We are confined to the steady state equilibrium in this instance. The econometric test used in Working Paper No.14 to determine whether or not b+c=1, fails. This is because it requires an estimate using unrestricted values for b+c (see Working Paper No.14, p 8), a situation which we have now shown to be contradictory in the steady state. This point on the statistical test does not apply with disequilibrium growth, which has its own problems, to which we now turn.

Disequilibrium growth

Disequilibrium growth is the condition where $g_t \neq g_{t-1}$ in general. We consider two cases, where b+c=1 and $b+c \neq 1$. Using equation (A) for b+c=1 yields:

$$1+g_t = 1+g_{t-1}$$

This violates the assumption of generally unequal growth rates in disequilibrium.

When $b+c \neq 1$ equation (A) holds and there are non-constant returns to scale. Equation (A) shows that unequal growth rates require $b+c \neq 1$. Yet Working Paper No.14 uses the condition that b+c=1 *along with* unequal growth rates in the disequilbrium growth situation. The simultaneous use of these two conditions is a contradiction.

Conclusion

The flaws in the mathematics of Working Paper No.14 mean that the paper does not demonstrate that the GDP growth maximising tax/GDP ratio is about 20%. Nor does the paper show that the losses in GDP are $1.17 trillion through not having that tax/GDP ratio.

Appendix 3

INLAND REVENUE DEPARTMENT

Policy Advice Division

An Error in Professor Scully's Working Paper No.14

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We demonstrate the error[73] in Working Paper No.14 by showing that the definition of the growth factor, 1+g, and the production function imply a contradiction.

The production function is set out in equation (1) of Working Paper No.14. It is:

$$Y_t = aG^b_{t-1}[(1-\tau)Y_{t-1}]^c \qquad (1)$$

Equation (2) of Working Paper No.14 defines the growth rate, g:

$$1+ g = Y_t/Y_{t-1} \qquad (2)$$

This must hold for incomes in any adjacent periods. After substituting the balanced budget requirement, $G= \tau Y$, into equation (1), equation (7) of the paper is:

$$Y_t = a\tau^b(1-\tau)^c Y_{t-1}^{b+c} \qquad (7)$$

This equation also holds for any adjacent periods. Use (7) to write Y_{t-1} as a function of Y_{t-2}:

$$Y_{t-1} = a\,\tau^b(1-\tau)^c Y_{t-2}^{b+c} \qquad (7')$$

Put equations (7) and (7') in (2). Upon cancellation obtain:

$$1+g = (Y_{t-1}/Y_{t-2})^{b+c}$$

The term in the brackets is the ratio of income in adjacent periods. From (2) it necessarily equals 1+g. Hence:

$$1+g = (1+g)^{b+c}$$

which is a contradiction. In general b+c does not equal unity, as Working Paper No.14 notes after equation (1) in the comment about first degree homogeneity.

Since we manipulated equation (2) by applying the balanced budget production function to it and found that there is a contradiction, the definition of g and the production function are inconsistent.

Divide (7) by Y_{t-1} and use (2) to obtain:

$$1+g = a\tau^b(1-\tau)^c Y_{t-1}^{b+c-1} \qquad (8)$$

[73] Scully, Gerald, W. **Taxation and Economic Growth in New Zealand;** Working Paper 14, Inland Revenue Department, March 1996. 17 pages plus diagrams.

The growth maximising tax rate is obtained by differentiating equation (8) with respect to τ and solving. This procedure yields the optimum value, τ^*:

$$\tau^* = b/(b+c) \qquad (10)$$

However, the contradiction between g and the production function shows that the two sides of equation (8) are inconsistent. Hence the formula for τ^* is wrong.

The logarithmic form of equation (8) was estimated as a part of the statistical test for constant returns to scale. To quote p 8 (emphasis added), "The log form of equation (8), *with and without* the (b+c-1) $\ln Y_{t-1}$ term was estimated." *i.e.* the statistical test at one point required an estimate of a transformation of (8) without a restriction on b+c. We have proved that this unrestricted version of equation (8) is incorrect, by virtue of the prior contradiction.

Hence, the statistical test of the restriction fails because it requires the invalid unrestricted form of equation (8). It cannot be concluded from this test that the data supports b+c=1. It has not been shown that constant returns to scale apply.

The subsequent econometrics builds on equation (8). The restriction b+c=1 is applied to (8). Using the restriction gives:

$$1+g = a\tau^{b}(1-\tau)^{1-b} \qquad (8')$$

There are two reasons why (8') is wrong. First, because its predecessor (8) rests on the contradiction, and second, because the restriction on placed on b+c has not been econometrically validated.

The logarithmic transformation of the incorrect equation (8') is econometrically estimated. The conclusions of the paper are drawn from an estimate of an invalid equation and are therefore unsubstantiated.

Thus, the growth maximising tax/GDP ratio has not been shown to be about 20% and the loss in GDP from the actual tax/GDP ratio has not been demonstrated to be $1.17 trillion. All of the conclusions of the paper are invalidated.

Appendix 4

Report on E. McCann (1998)
"An Error in Professor Scully's WP 14"

BY

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Cowles Foundation for Research in Economics
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13 May 1998

Appendix 5

Working Papers from the Taxation Economics Group

Working Paper Number

1. **Financial Ratios and Tax Policy Development: Investigating Accuracy Issues of the New Zealand Corporate Database:** June 1995, Chris Gillion, Daniel Aldersley, Patrick Caragata (Inland Revenue, NZ). 43 pages plus tables and diagrams.

2(Rev). Assessing Corporate Tax Payment Behaviour: A New Econometric Approach to Effective Tax Rates: December 1995, Ewen McCann (Inland Revenue, NZ) John Small (University of Auckland), Patrick Caragata (Inland Revenue, NZ). 25 pages.

3. **Monitoring the Tax Mix, Tax Shocks and Potential Economic Impacts: The PIC Model:** June 1995, Patrick Caragata (Inland Revenue, NZ) and John Small (University of Auckland). 73 pages.

3a. **Monitoring the Tax Mix, Tax Shocks and Potential Economic Impacts: The PICO-DISC Model Theoretical Framework:** June 1995, Patrick Caragata (Inland Revenue, NZ). 42 pages.

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