James A. Baker III Institute for Public Policy
Rice University

Working Paper

Computable General Equilibrium Modeling of Tax Reform in New Zealand

by

John W. Diamond, Ph.D.
Edward A. and Hermena Hancock Kelly Fellow in Public Finance
James A. Baker III Institute for Public Policy
Rice University

and

George R. Zodrow, Ph.D.
Allyn R. and Gladys M. Cline Chair of Economics at Rice University
Baker Institute Rice Scholar

March 31, 2012

I. Introduction

The tax system in New Zealand is generally highly regarded in the international tax community, and indeed is often described as a model tax structure, especially in the broadness of the base of its Goods and Services Tax. Nevertheless, numerous elements of the tax system are ripe for reform. Indeed, the recent report of the Victoria University of Wellington Tax Working Group (TWG) (2010, pp. 5-6) concludes that "the current tax system is not working effectively and that reform is necessary if New Zealand is to have a fair tax system that minimizes the cost of raising taxes, reduces barriers to productivity and growth and positions it well for future challenges." In particular, the TWG report stresses that, "The current system is incoherent, unfair, lacks integrity, unduly discourages work participation and biases investment decisions." As part of the ongoing debate regarding the tax structure in New Zealand, several approaches to reform have been proposed, especially in the area of capital income taxation, which the TWG report identifies as a particular area of concern. This report, prepared at the request of—and with considerable assistance from—the New Zealand Treasury, provides computer simulations of the potential macroeconomic effects of numerous such reform proposals. The simulations use a dynamic, large-scale, overlapping generations, computable general equilibrium (CGE) model that we have developed—the Tax Policy Advisers (TPA) model—which was extended in several ways to more accurately model the effects of tax reform in the New Zealand context.

The report proceeds as follows. The following section provides a brief overview of the ongoing tax reform debate in New Zealand, drawing on the 2010 report of the TWG and Benge and Holland (2010) as well as Zodrow (2010b) and then, given this context, describes the specific tax changes and reform proposals that are analyzed in the report. Section III describes the TPA model, including the various features of the model that are especially important to accurately capture the effects of reform in New Zealand; this section includes a discussion of the parameter values used in constructing the initial equilibrium of the model, which is a stylized representation of the New Zealand economy in 2007. The model simulation results are presented and discussed in Section IV, and Section V concludes.

II. The Tax Reform Debate in New Zealand

Although many factors have prompted the recent interest in reforming the tax system in New Zealand, much attention has been focused on the implications of the high degree of international capital mobility in the modern globalized economy, and the attendant international tax competition, especially in statutory tax rates (Zodrow 2010a). These factors have put increasing pressure on the corporate tax rate in New Zealand, as well as what traditionally has been one of its traditionally most important characteristics—alignment of the corporate income tax rate and the top marginal rate under the personal income tax. In addition, two somewhat unusual features of the New Zealand tax system—the exemption of most capital gains under its otherwise rather comprehensive personal income tax and the absence of a payroll tax—create some interesting complications.

In general, however, the problems and tensions that characterize the tax system in New Zealand are typical of those facing any relatively small open economy in the modern economy.[1] These reflect two sets of opposing factors that must be weighed carefully in determining the appropriate structure of taxation.

On the one hand, New Zealand faces significant international competition as it attempts to attract highly mobile investments by large multinationals that generate firm-specific rents, attributable to factors unique to the firm such as specialized technological knowledge, superior managerial skills or production techniques, or valuable product brands, trademarks, reputations, and other intangible assets. Such investments are highly prized by many countries, and intense competition to attract them puts downward pressure on New Zealand's corporate tax rate. This pressure is reinforced by empirical evidence which suggests that such investments are both increasingly responsive to tax factors, especially statutory and average tax rates, and are an increasingly important source of worldwide corporate profits. Indeed, at least partly due to international tax

[1] The following discussion draws heavily on Zodrow (2010b), which should be consulted for further details and an extensive list of references; see also New Zealand Inland Revenue Department and New Zealand Treasury (2009a).

competition, statutory corporate tax rates have been declining around the world in recent years. Because these declines have often been accompanied by corporate base broadening measures, effective marginal tax rates have declined to a much smaller extent, although marginal rates have declined in many countries as well, especially relatively small developing economies. These factors suggest that the corporate tax rate in New Zealand should be relatively low. Indeed, some simple economic models that consider only tax competition for mobile capital that generates firm-specific rents suggest that the optimal corporate or company income tax rate is zero.

This pressure for a lower corporate tax rate is reinforced by the income shifting possibilities available to large multinationals. A growing body of empirical evidence suggests that multinational corporations (MNC) are quite aggressive in using financial accounting manipulations to minimize their tax liabilities, primarily by shifting income across jurisdictions in response to differences in statutory corporate income tax rates. A wide variety of mechanisms, including transfer pricing, judicious allocation of loans, and the assignment of rights to intellectual property and other intangible assets to low tax jurisdictions, are used to shift income by moving revenues to low tax jurisdictions and deductions to high tax jurisdictions. Moreover, these efforts appear to be increasingly successful despite the arsenal of governmental measures designed to limit such attempts at income shifting, including advanced pricing agreements that regulate transfer pricing, thin capitalization rules, interest allocation rules, and special treatment of passive investment income.[2]

The downward pressure on corporate tax rates due to these factors is further reinforced by evidence, most recently due to much-cited research by the Organisation for Economic Co-operation and Development (OECD, 2008), which compares different types of taxes in terms of their effects on economic growth. The OECD study concludes that corporate taxes are the most harmful to growth, followed by personal income taxes (including payroll taxes); high marginal personal income tax rates are also shown to discourage entrepreneurial activity. By comparison,

[2] A related issue is that the existence of such tax avoidance opportunities creates the perception that the tax system is fundamentally unfair and thus may reduce tax compliance (TWG 2010; New Zealand Inland Revenue Department 2008; New Zealand Treasury 2008).

consumption taxes have smaller negative effects on growth, while property taxes are estimated to be the least harmful. These results are broadly consistent with a large body of research which argues that consumption-based taxes are generally more efficient than income-based taxes.[3]

On the other hand, however, the case for lower corporate tax rates is by no means straightforward, as several arguments favoring maintaining current rates (or even increasing them) are potentially important in the New Zealand context. The first reflects the fact that not all economic rents in New Zealand are firm specific. Although New Zealand can be approximated as a small open economy, it is also geographically isolated; this may result in firms earning location-specific economic rents—rents that reflect some monopoly power but are tied to producing within the country—for at least two reasons. First, it is possible that firms in certain industries earn location-specific economic rents because they are at least partly shielded from international competition due to the country's geographical isolation.[4] Second, access to local markets may be both critical and limited in certain markets for an island economy, for both foreign and domestic producers; these might include the domestic markets in banking and finance, communications and media, automotive, insurance, retail wholesale distributors, industry and community services, construction and trade services, and activities requiring access New Zealand's natural resources (primary food production, food processing, oil, gas, minerals and electricity). In marked contrast to the case of firm-specific rents, the taxation of location-specific economic rents provides an efficient and thus highly desirable source of revenue—and, like most business taxation, is likely to be politically popular as well, especially if the rents accrue to foreign owners, so that the tax burden can be "exported."

---

[3] See Zodrow (2007) for a recent review of this literature. Diamond and Zodrow (2008) provide a simulation analysis of the effects of a consumption tax reform in the United States. The New Zealand Inland Revenue Department and New Zealand Treasury (2009b) and Creedy (2010) examine the efficiency costs of the New Zealand tax system.

[4] Other factors that might give rise to location-specific economic rents include local economies of agglomeration, productive government infrastructure, easier access to consumers, lower transport costs, and inexpensive but relatively productive local factors of production, including skilled labor, as well as the ability to avoid trade barriers such as tariffs and quotas.

The second argument favoring relatively high corporate taxes is the traditional "alignment" argument noted above—a corporate income tax at a rate equal (or close) to the maximum personal tax rate is essential to limit avoidance of the personal income tax; that is, if the corporate tax rate is significantly lower than the top individual rate, individuals could incorporate and defer personal income tax on labor income by retaining the earnings in corporate form while financing consumption with loans from their companies. In New Zealand, the fact that the top individual marginal tax rate has declined from 39 to 33 percent,[5] relative to a 28 percent tax rate on corporations (and portfolio investment entities),[6] creates only modest incentives for income shifting, although concern about increased income shifting due to the deviation from the traditional policy of rate alignment often permeates discussions of reducing the corporate statutory rate (see, for example, New Zealand Inland Revenue Department, 2008). A key factor in determining the importance of this argument is whether the labor earnings are likely to be exempt from individual level tax or taxed eventually when distributed to the owners of the corporation. In the latter case, the central issue is whether the combined tax burden due to current taxation at the statutory corporate income tax rate and eventual individual level taxation of capital income falls significantly below the tax rate applied to individual labor income.

Two factors limit the relevance of the backstop argument for a corporate income tax. First, the scope of the argument is limited as it applies only to self-employed individuals or the owners of closely held corporations. Second, the extent to which the corporate tax serves as an effective backstop to the personal income tax is unclear, as it depends on the uncertain degree of income tax compliance of sole proprietors and small businesses. Nevertheless, some empirical evidence from the United States and the European Union suggests that income shifting between the personal and corporate tax bases is potentially a serious problem. Thus, the backstop argument provides a potentially important rationale for high corporate tax rates in New Zealand, and underlies its tradition of rate alignment.

---

[5] As stressed by the TWG, effective tax rates at relatively low incomes can also be quite high, due to the phase out of various credits, such as the Working for Families Credit, and indeed in some cases exceed 50 percent (see also New Zealand Inland Revenue Department 2008; New Zealand Treasury Department 2008).

[6] The tax rate on retail investment vehicles such as unit trusts and superannuation trusts is also 28 percent, but the tax rate on closely held trusts such as family trusts is 33 percent.

A third argument supporting high corporate tax rates is related to the discussion of multinational tax avoidance presented above. Specifically, if income shifting opportunities are readily available to multinational firms, then the deleterious effects of foreign direct investment associated with high corporate tax rates may be largely mitigated. Indeed, to the extent that such tax avoidance opportunities are available primarily to multinationals and such firms are more mobile than domestic companies, a relatively high statutory rate may be desirable under an "optimal capital income tax" strategy that attracts foreign direct investment at minimal revenue cost by imposing a high tax burden on relatively immobile domestic capital but a low effective tax burden, taking into account tax avoidance activities, on relatively mobile international capital. Of course, such a strategy will understandably be viewed as highly inequitable by domestic firms, and may be difficult to maintain politically.

Finally, an often-invoked rationale for relatively high corporate tax rates is that they impose tax on multinationals based in countries that tax their firms on a residence basis but allow credits for foreign taxes paid—primarily the United States, given recent reforms in the United Kingdom and elsewhere. As a result, under the appropriate circumstances, corporate taxes at rates less than or equal to the tax rate of the multinational's home country tax rate essentially transfer revenues from the treasury of the home country to the treasury of the host country without having any deleterious effects on foreign direct investment; this result obtains because the rate increase in the host country is offset by foreign tax credits which reduce the final domestic tax liability of the MNC. However, given that the main source of foreign investment in New Zealand is Australia, which operates a territorial corporate income tax system and thus does not grant any foreign tax credits to its multinationals, this argument is of limited relevance. Moreover, even in the case of investment from the United States, several factors limit the importance of this "treasury transfer" argument,[7] so in our view it should play little if any role in the determination of corporate income tax policy in New Zealand.

[7] Zodrow (2010b) provides details of these arguments, which primarily reflect the facts that (1) many U.S. firms are in an excess foreign tax credit position and thus get little benefit from additional credits, and (2) the value of foreign tax credits is limited because they are deferred until funds are repatriated to the U.S. parent firm.

The TWG report carefully weighs these and other arguments in making its recommendations for tax reforms in New Zealand. Specifically, among other issues, it identifies the following areas of concern in the existing tax system:

(1) Too much revenue is raised with corporate and personal income taxes, especially on capital income, which are particularly harmful for economic growth, as noted in the OECD (2008) report discussed above. Moreover, the absence of a payroll tax in New Zealand implies that the rates under other taxes, including those assessed on capital income, must be higher than they otherwise would be.

(2) The corporate income tax rate of 28 percent is still moderately high among OECD countries and is problematical in a world of increasing tax competition for capital and pervasive international income shifting. The current top tax rate on labor income of 33 percent (formerly at 39 percent) is not especially high by OECD standards, but applies at relatively low levels of income, and thus creates similar problems in the competition for skilled labor (especially with Australia).

(3) The phasing out of tax credits, especially the Working for Families credit, implies that some households, including many at relatively low income levels, face extremely high marginal tax rates, discouraging labor supply and saving. In addition, the absence of inflation indexing of personal income tax brackets implies that inflation has gradually pushed more individuals into the highest income tax rate bracket.

(4) Differential taxation of different forms of capital income, due in large part to the exemption of almost all capital gains, results in overinvestment and low (or often negative) taxable incomes in the tax-favored sectors, especially in residential rental properties.

(5) Differential taxation of individuals and trusts has resulted in significant income shifting, reducing the base of the personal income tax.

(6) Differential taxation of the return to savings, depending on whether the investment is made through a portfolio investment entity (PIE) or other saving entity, distorts saving decisions.

(7) The perception that the tax system is unfair may create serious problems by reducing compliance, at a time when revenue needs are likely to be significant.

(8) The aging of the population in New Zealand implies that the sustainability of the current tax system is in question, as ever-increasing tax rates on capital and labor income will increase the distortions associated with those taxes.

The TWG report made numerous recommendations for reform. In particular, it generally supported the traditional broad-base, low-rate approach, but noted that differential tax base mobility, especially international capital and labor mobility coupled with the forces of international tax competition, may require deviations from a fully aligned tax system. Many of the TWG recommendations are directly or indirectly reflected in the reform options analyzed in this report. In particular, the report generally recommended that the corporate tax rate, the top personal income tax rate, and the tax rates on saving (trust rates, PIE rates, and rates on other savings vehicles) be aligned if possible, but noted that concerns about international tax competition may require a lower corporate tax rate, that personal income tax rates should be reduced with the resulting revenue loss offset by an increase in the GST, and that consideration should be given to the introduction of both a capital gains tax and a low-rate land tax.[8]

For purposes of this report, the New Zealand Treasury specified two sets of tax changes and potential reforms for us to simulate, most of which closely reflect both the general discussion above and the recommendations of the TWG report. In each case, the reform is assumed to be revenue neutral in each period. In most cases, lump sum government transfers are assumed to adjust to balance the government budget. This approach allows the analysis to focus on the substitution (or allocative) effects of the price changes associated with a single tax change or tax

[8] Because the TPA model does not include land as a factor of production, we are not able to analyze the land tax option in this report.

reform, since the change in lump sum government transfers largely offsets the income effects of the tax changes; this makes it unnecessary to simultaneously analyze the effects of other offsetting tax changes or changes in the government budget and separate them from the effects of the reform being analyzed. In the cases of a few tax reforms, however, we assume that another tax or group of taxes is adjusted to balance the budget, as these reforms would typically be expected to consist of simultaneous changes in all of these taxes (e.g., the introduction of a capital gains tax under the personal income tax is assumed to be accompanied by a reduction in all other personal income tax rates and the corporate income tax rate).

The first set of simulations is designed to provide a general understanding of the effects of some simple tax changes in the model. Specifically, we consider—from a stylized equilibrium that broadly reflects the New Zealand economy in 2007 and is described further below—the following 13 tax changes:

(A) A reduction in the corporate income tax rate from 33 percent to 25 percent, with the revenue loss offset with a reduction in government transfers

(B-1) A reduction in average and marginal tax rates under the personal income tax of 5 percentage points, with the loss in revenues offset with a reduction in government transfers

(B-2) An increase in average and marginal tax rates under the personal income tax of 5 percentage points, with the increase in revenues offset with an increase in government transfers

(C-1) A reduction in the GST rate that generates a revenue loss roughly equivalent to that in option (B-1), with the loss in revenues offset with a reduction in government transfers

(C-2) An increase in the GST rate that generates a revenue increase roughly equivalent to the revenue increase in option (B-1), with the increase in revenues spent on an increase in government transfers

(D-1) The introduction of a realization-based tax on capital gains on all business assets with the revenue increase offset with an equiproportionate reduction in all personal income tax rates and the corporate income tax rate

(D-2) The introduction of a comprehensive realization-based tax on all capital gains on all assets (including business assets and owner-occupied housing), with the revenue increase

offset with an equiproportionate reduction in all personal income tax rates and the corporate income tax rate

(E) The combined effects of the reforms that were enacted in the period 2007–2011 (with government transfers adjusted to ensure revenue neutrality), including (a) a reduction in the company tax rate from 33 to 28 percent; (b) a reduction in personal income tax rates as shown in Table 1 in Section IV below; (c) an increase in the GST rate from 12.5 percent to 15 percent; (d) a change in the taxation of retirement savings from a flat rate tax of 33 percent applied currently to income earned in superannuation schemes and life insurance plans to the introduction of the Portfolio Investment Equity (PIE) regime and the Kiwisaver plan; and (5) less generous depreciation deductions.

The second set of simulations examines the effects of several proposed reforms of the current tax system are under discussion. These include:

(F) The introduction of the taxation of the "risk-free" component of the returns to equity investment in rental residential properties (the risk-free rate of return method (RFRM) of taxation), with the revenue increase offset with a equiproportionate reduction in all personal income tax rates and the corporate income tax rate.

(G) The introduction of an "allowance for corporate equity" or ACE, which would exempt the risk-free return to capital at the corporate level by allowing an additional deduction equal to the product of the value of the company's equity capital and the risk free rate of return, coupled with a "rate of return" allowance (RRA) at the personal level (as recommended by the Mirrlees Review) which exempts the risk-free return on debt and equity investments in the corporate and noncorporate business sectors; the loss in revenues would be offset with a equiproportionate increase in all personal income tax rates and the corporate income tax rate.

(H) The replacement of the existing system of capital income taxation with a Nordic "dual income tax," under which capital income is taxed at a relatively low flat rate while labor income is taxed at proportionately higher progressive rates to achieve revenue neutrality.

(I-1) The introduction of a relatively low flat rate on interest income (60 percent of the current rate), with the revenue loss offset by a reduction in transfers, and

(I-2) The introduction of a relatively low flat rate on interest income with the same reduction in transfers as in option (I-1), coupled with a business capital gains tax as in option (D-1), with revenue neutrality achieved by lowering the flat rate tax on interest income from the 60 percent level analyzed in option (I-1) until it equals the business capital gains tax rate.

The extent to which these various reform options satisfy the criteria noted above is considered in the discussion below of the results of simulating each option, and summarized in the conclusion.

III. The TPA Model

This section provides a brief description of the TPA model (a detailed description is provided in the appendix), and then discusses some special features of the model that are particularly important in accurately capturing the effects of reform in New Zealand. It then turns to a discussion of the parameter values used in the model, and describes the initial equilibrium, which is a stylized representation of the New Zealand economy in 2007.

A. *The TPA Model*

The TPA Model is a dynamic computable general equilibrium model of the U.S. economy. It builds on several other well-known general equilibrium models, but includes important features that facilitate the analysis of the short- and long-run economic effects of tax policy changes. The discussion below outlines the model; a detailed description is provided in the appendix. Versions of the model have been used in analyses of tax reforms by the U.S. Department of the Treasury (President's Advisory Panel on Federal Tax Reform 2005), the Congressional Joint Committee on Taxation (Joint Committee on Taxation 2006), and in a number of other recent tax policy studies (Diamond 2005; Diamond and Zodrow 2007a, 2007b, 2008; Diamond and Viard 2008; Cline, Carroll, Diamond, Neubig, and Zodrow 2010).

Overview

The distinguishing feature of the analytical approach used in the TPA model is the treatment of both corporate and noncorporate composite consumption goods and owner-occupied and rental

housing markets in the context of a dynamic, overlapping-generations, life-cycle, computable general equilibrium model that explicitly calculates reform-induced changes in all asset values during the transition to a new equilibrium, as well as all long-run equilibrium values. The model has four production sectors: corporate and noncorporate composite good production sectors that include all nonhousing goods and services, and separate owner-occupied housing and rental housing production sectors. The time path of investment demands in all production sectors is modeled explicitly, taking into account capital stock adjustment costs. On the consumption side, consumer demands for all housing and nonhousing goods and for a bequest are modeled using an overlapping generations structure in which a representative individual in each generation maximizes lifetime utility, and has a "target" bequest motive, implying that individuals wish to leave a specific dollar bequest to their heirs (which is received as an inheritance at an economic age of 28). The model does not include inflation. The TPA model combines various features of other similar and well-known models, especially those constructed by Auerbach and Kotlikoff (1987), Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001), Goulder and Summers (1989), Goulder (1989), Keuschnigg (1990), Fullerton and Rogers (1993), and Hayashi (1982).

Individual Behavior

On the individual side, the model has a dynamic overlapping generations framework with 55 generations alive at each point in time. There is a representative individual for each generation, who has an economic life span (which begins upon entry into the workforce) of 55 years, with the first 45 of those years spent working, and the last 10 years spent in retirement. Individual tastes are identical so that differences in behavior across generations are due solely to differences in lifetime budget constraints. An individual accumulates assets from the time of "economic birth" that are used to finance both consumption over the life cycle, especially during the retirement period, and the making of a bequest.[9]

The consumer is assumed to choose the time paths of consumption (including the bequest) and leisure to maximize rest-of-life utility, which is a discounted sum of annual utilities characterized

[9] In the absence of data on the importance of bequests in New Zealand, we use U.S. data; specifically, we assume that the total present value of expected bequests accounts for 50 percent of the capital stock.

by a constant intertemporal elasticity of substitution, subject to a lifetime budget constraint which requires that the present value of lifetime wealth, including inheritances, equals the present value of lifetime consumption, including bequests. Annual utility is assumed to be a CES function of consumption of an aggregate consumption good, leisure and the bequest. The aggregate consumption good is modeled as a CES function of the composite good and aggregate housing services, with aggregate housing services in turn modeled as a CES function of owner-occupied and rental housing services.

The model includes government purchases of the good produced by the competitive corporate sector and transfer payments, both of which grow at the exogenous growth rate of the economy in the steady state. Government purchases are treated as separable from individual utility functions and always grow each period at the growth rate. By comparison, government transfers, which are modeled simply as lump sum increases in lifetime resources available to each generation, are used to balance the government budget in many of the reforms analyzed; these transfers thus vary over the transition period after the enactment of reform, but eventually again resume a steady state growth path. Note that these transfers include the superannuation program in New Zealand, which is not modeled explicitly but is subsumed in government transfers and thus becomes part of the lifetime resources that households consider when making their decisions regarding labor supply, consumption, saving, etc.

The representative individual in each cohort is assumed to face an exogenously specified hump-backed wage profile over the life cycle. This wage profile, which follows the median value used by Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001), peaks at an economic age of about 20, at which point wages are approximately 30 percent higher than when the individual enters the workforce. The wage at retirement (age 45) is approximately 33 percent lower than the peak wage.

The personal income tax system consists of a progressive tax on wage income, and constant average marginal tax rates applied to interest income, dividends, and capital gains (if subject to the individual level tax). The progressive tax on wage income is modeled as a linear/quadratic

function of taxable income (which implies that the marginal tax rate increases linearly with taxable income) with its two parameters set to approximate the progressive rates under the New Zealand income tax structure and raise the required level of revenue from labor income taxation.[10]

The Composite Good Production Sectors

Firms in the two composite good production sectors produce output using a constant elasticity of substitution (CES) production function with capital and labor as inputs. One business sector is subject to the corporate income tax, while the other business sector reflects noncorporate production and is subject to pass-through tax treatment, with all income taxation occurring at the individual level. Beyond different tax treatments, the two sectors differ only in the fact that their CES production functions can have different parameters.[11] Both types of firms are assumed to choose the time path of investment to maximize the present value of firm profits or, equivalently, maximize firm value, net of all taxes and subject to quadratic costs of adjusting the capital stock. Total taxes assessed on the composite good production sectors include the corporate income tax, subnational property taxes, and individual level taxes on capital income. Each firm is assumed to maintain a fixed debt-asset ratio and pay out a constant fraction of earnings after taxes and depreciation as dividends in each period.

The model assumes individual level arbitrage in the absence of uncertainty about rates of return, which implies that the after-tax return to bonds must equal the after-tax return received by the shareholders of the firm. The values of the firms in the composite good sectors equal the present value of all future net distributions to the owners of the firm.

---

[10] Thus, it is this marginal tax rate that is reduced by five percentage points in the simulation described in Section IV.B below.

[11] For example, in the simulations described below, the elasticities of substitution in the corporate and non-corporate production sectors are assumed to be the same (0.5) but, consistent with data provided by NZT, the non-corporate sector is assumed to be more than twice as capital intensive as the corporate sector. Thus, the primary effects of reform-induced reallocations between the two sectors result from the differences in tax treatments and capital intensities between them. In particular, the model does not assume that there are any inherent differences in productivity between the two sectors.

The Owner-Occupied and Rental Housing Production Sectors

Housing services are produced in the owner-occupied and rental housing production sectors where, following Goulder and Summers (1989) and Goulder (1989), rental housing services are produced by noncorporate landlords and owner-occupied housing services are produced by homeowners. The technology used in the production of rental housing and owner-occupied housing services is assumed to be identical—capital and labor combined in the same CES production function. Landlords and owner-occupiers are also are assumed to choose time paths of investment to maximize the equivalent of "firm" value, net of total taxes.

In the case of the rental housing sector, the firm is modeled as a noncorporate entity, which implies that landlords are simply taxed at the individual level, with rents taxable and depreciation, maintenance expenses, interest, and property taxes deductible. In the owner-occupied housing sector, the tax burden takes into account the facts that imputed rents are untaxed and depreciation, maintenance expenses, and property taxes are not deductible under the individual income tax. Similarly, in contrast to the situation in some countries such as the United States, mortgage interest on owner-occupied housing is not deductible; thus, interest deductions are not tax deductible to the household in its role as the "firm" providing owner-occupied housing. In both rental and owner-occupied housing, the optimal investment path is calculated as above.

Initial and Final Steady State Equilibria in the Model

The model assumes that the economy is initially in a steady state, with all variables—outputs, capital stocks, investment levels, consumption levels, government services and transfers, the labor endowment, etc.—growing at an exogenously specified growth rate equal to the sum of the population and productivity growth rates. As described in more detail in the appendix, each individual's labor endowment grows at the exogenous growth rate, so that the "effective" units of both labor and leisure grow at this rate, as is required to achieve steady state growth. Output per effective unit of labor is thus constant in the steady state, but output per capita, and thus lifetime endowment resources and per capita lifetime utility, grow at the labor productivity growth rate. Note that since the labor endowment (the number of labor/leisure efficiency units)

grows at the growth rate, the economy-wide wage, which is the price of an efficiency unit of labor, is not affected by productivity growth.

The enactment of any of the reforms analyzed implies that the economy is no longer at a steady state equilibrium. Consumers and firms must adjust to the new tax system, which is reflected in the new tax parameters they face in their optimization problems, as well as their new (and accurate) projections of how the economy, including all prices and tax variables, will evolve endogenously over time in response to the enactment of the tax reform. The transition to a new steady state equilibrium that completely reflects the new tax system is lengthy, especially if the costs of adjusting the capital stock are relatively high—on the order of 100 years or more—but much of the adjustment occurs within 20 years or so.

B. *Special Features of the TPA Model*

Many CGE models follow the Auerbach and Kotlikoff (AK) model in assuming a closed economy. It is clear, however, that such an assumption is inappropriate for an analysis of New Zealand, which is more reasonably modeled as approximating a small open economy. Moreover, the effects of "opening" the economy to international flows of goods and factors of production may be significant, especially when considering the taxation of capital income. Accordingly, the TPA model has several features that capture international mobility of factors of production (capital and labor) and international trade in goods and services (in the competitive corporate sector in the model, which produces tradable goods as described below). These and other features especially relevant to modeling the New Zealand economy are described in this section.

<u>Migration of Labor</u>

Tax reform in New Zealand may induce migration of labor, especially from neighboring Australia, but potentially from anywhere in the world. For example, reduced taxation of capital income in New Zealand would typically lead to increased investment and greater capital accumulation, which would increase wages and lifetime utility in the long run, and could induce

immigration. On the other hand, New Zealand is fairly isolated geographically, so the potential for reform-induced immigration may be relatively limited.

We assume that immigration responds to tax-induced changes in living standards in New Zealand, as captured by changes in long-run lifetime utility (which is proportional to lifetime endowment resources), and that the resulting change in population is permanent. The magnitude of this response is determined by a parameter, the immigration elasticity, which will be defined below. We assume that utilities in the rest of the world (ROW) are not affected by changes in tax policies in New Zealand, so that migration responds solely to tax-induced changes in the long-run lifetime utility in New Zealand. To simplify the modeling of the immigration process, we assume that migration occurs immediately in response to the changes in tax policy in New Zealand; that is, we assume that potential migrants are farsighted in predicting the changes in lifetime utilities that will occur in response to reform and move immediately if immigration is desirable. Following the general approach used by Fehr, Jokisch, Kallweit, Kindermann, and Kotlikoff (forthcoming), we assume that immigration is reflected as an equiproportionate increase in the existing population, that is, immigration proportionally increases the size of the population at all ages. Immigrants thus replicate the existing residents of New Zealand, with identical tastes and wage profiles (and thus identical labor supply behavior, asset ownership, saving behavior, etc.).

Specifically, we assume that immigration is determined by

$$\frac{P_{LR}^{NZ}(a) - P_0^{NZ}(a)}{P_0^{NZ}(a)} = \varepsilon_P \left(\frac{LI_{LR}}{LI_0} - 1 \right), \quad 0 \le \varepsilon_P < \infty,$$

where $P_0^{NZ}(a)$ is the initial population of age a in New Zealand, $P_{LR}^{NZ}(a)$ is the long-run population of individuals of age a in New Zealand, LI_{LR} / LI_0 is the ratio of long-run lifetime incomes (including the value of leisure) in New Zealand after and before reform, and ε_P is defined as the immigration elasticity. Thus, with a constant rate of population growth of n in the absence of immigration, the population in period $s=2$, the year after the enactment of reform, is

$$P_2^{NZ}(a) = P_1^{NZ}(a)(1+n) + P_1^{NZ}(a)\varepsilon_P \left(\frac{LI_{LR}}{LI_0} - 1 \right),$$

where $P_s^{NZ}(a)$ is the population of New Zealand of age *a* in period *s*. The population of New Zealand is assumed to resume its steady state rate of growth at rate *n* beginning in period *s=3*; that is, reform induces a one-time immigration in the year after enactment, and the population resumes growing at the steady state growth rate in all subsequent years.

Migration of Capital

We also consider international capital mobility, although we focus solely on new investments in physical capital in New Zealand by foreigners. Specifically, we consider only changes in foreign direct investment (FDI), and do not model changes in portfolio investment, that is, changes in the ownership of existing capital in New Zealand (which can be owned by either residents of New Zealand or foreigners). Reduced taxation of capital income in New Zealand will result in higher after-tax returns to capital in the short run, which will attract internationally mobile capital. And, if international capital is less than perfectly mobile, a modest difference between the rates of return to capital in New Zealand and the rest of the world can persist in the long run. We also model the responsiveness of international capital supply as a constant elasticity relationship, which can capture any degree of capital mobility from a fixed domestic capital stock to perfect international capital mobility. The treatment is similar to that of immigration, as capital imports (or exports) occur at a single point time immediately after the enactment of reform, and depend on relative rates of return in New Zealand and the ROW in the long run. Specifically, the stock of foreign-owned capital in New Zealand is given by

$$K_2^F = (K_1^F + \Delta K_1^F)(1+g) + K_1^{ROW}\left[1-(r_0 / r_{LR})^{\varepsilon_K}\right], \quad 0 \le \varepsilon_K < \infty,$$

where K_s^F is the stock of foreign-owned capital in New Zealand in period s, K_s^{ROW} is the capital stock in ROW in period *s*, r_0 is the fixed rest-of-the-world return to capital after corporate taxes, r_{LR} is the long run return to capital after corporate taxes in New Zealand after the enactment of reform, and ε_K is defined as the constant (positive) capital supply elasticity that determines the extent of international capital flows in the model, and is assumed to be large to reflect New Zealand's status as an open economy. Once the new capital is invested in New Zealand, we assume that foreign investors continue to invest (including covering depreciation) so that the

foreign-owned capital stock grows at the steady state growth rate, as is required for the economy to eventually reach a steady state equilibrium; this in turn implies that the subsequent capital income paid abroad will finance the purchase of New Zealand exports, as specified in the balance of payments equations shown below. Because we assume that the supply of foreign capital to New Zealand is relatively elastic, the ratio of i_0 / i_{LR} will always be close to one in the long run.

Capital imports are treated as perfect substitutes for domestic capital in all production functions; although imperfect capital substitutability could be added (analogously to the treatment of imported and domestically produced consumption goods described below), the assumption of perfect substitutability for capital goods seems reasonably plausible and simplifies the analysis. The foreign-owned capital stock is assumed to be financed with the same debt-asset ratio as domestically-owned capital, the income earned by foreign capital owners is taxed only under the corporate income tax (this point is discussed further below), and foreign-owned capital is assumed to be initially distributed equally across the two corporate sectors.

Ownership of Capital

A closely related issue is the ownership of capital. Total foreign-held capital in New Zealand significantly exceeds the amount of foreign capital held by residents of New Zealand, and the amount of foreign investment in New Zealand typically significantly exceeds the amount of investment abroad by New Zealand residents. For example, in 2006, net foreign investment income in New Zealand was a negative $11.1 billion, and over the last few years foreign investment in New Zealand has generally been two to four times greater than foreign investments made by New Zealanders.

Accordingly, the TPA model includes foreign capital holdings by New Zealand residents K_s^{NZF} and, as described above, foreign ownership of capital located in New Zealand K_s^F. To simplify the analysis, we assume that foreign holdings of New Zealanders (and thus the income on such holdings) simply grow at the exogenous growth rate of the economy. In the initial equilibrium, foreigners thus hold all domestic capital not owned by New Zealand residents. Changes in the

foreign ownership of capital invested in New Zealand are governed by the equation above describing foreign exports of capital into New Zealand. The asset market equilibrium equations in the TPA model are modified to reflect both the fixed level of ownership of foreign capital by New Zealanders, and the endogenous foreign ownership of capital located in New Zealand.

Imports and Exports of Consumption Goods

To model imports and exports of consumption goods, we must first specify the production sectors analyzed in the model. We model the New Zealand economy as consisting of five production sectors: (1) a competitive corporate sector that produces a tradable good (C); (2) an imperfectly competitive sector—described further below—that produces a non-tradable good and is thus isolated from international competition (M); (3) a competitive noncorporate business sector that produces a non-tradable good (N), and two non-traded housing production sectors; (4) a competitive owner-occupied housing sector (H); and (5) a competitive rental housing sector (R).

For the tradable good produced in the competitive corporate sector, we follow a standard single-country open economy approach (e.g., as described by Shoven and Whalley [1992]) and use a simple specification of trade in this good with the rest of the world. In particular, we assume that imports of the competitive corporate good are imperfect substitutes for domestically-produced competitive corporate sector goods; that is, we make the common "Armington" assumption that imported and domestic tradable goods are close but not perfect substitutes (and thus avoid corner solutions for tradable goods). We model the imperfect substitutability of imported and domestically produced goods using a CES function for the tradable good. Specifically, consumption of the competitive corporate good by an individual of age *a* in period *s* is

$$C_s(a) = \left\{ (\alpha_F)^{1/\sigma_F} [C_s^D(a)]^{(\sigma_F - 1)/\sigma_F} + (1-\alpha_F)^{1/\sigma_N} [C_s^F(a)]^{(\sigma_F - 1)/\sigma_F} \right\}^{\sigma_F/(\sigma_F - 1)},$$

where $C_s^D(a), C_s^F(a)$ are domestically-produced and foreign (imported) versions of the competitive corporate sector good, α_F and $(1-\alpha_F)$ measure the relative intensities of household preferences for the domestic and foreign versions of the corporate competitive corporate good, and σ_F is the elasticity of substitution between domestic goods and imports (which is assumed to

be relatively large, as the goods are assumed to be relatively close substitutes). Import demand must equal import supply, which is also assumed to be governed by a constant elasticity relationship

$$C_s^F = C_s^{F0}(p_s^{CD} / p_s^{CF})^{\varepsilon_{CF}} ,$$

where C_s^{F0} is the original level of imports in the initial equilibrium, p_s^{CD} and p_0^{CF} are the domestic and foreign prices of the competitive corporate good, and ε_{CF} is the elasticity of import supply from abroad, which is also assumed to be relatively high (on the order of $\varepsilon_{CF} = 10$), consistent with the assumption that New Zealand can be approximated as a small open economy.

Given the levels of imports of capital and imports of the competitive corporate consumption good calculated above, the total value of exports of the competitive corporate good is determined from the balance of payments equation. The balance of payments equation requires that the sum of (1) the current account—exports less imports plus net foreign capital income, that is, income earned by New Zealand residents on their existing foreign capital holdings less income earned by foreigners on their existing capital holdings in New Zealand, and (2) the capital account—the difference between new investment in New Zealand by foreigners and investment abroad by New Zealand residents, be equal to zero. Since foreign returns to capital are assumed to be constant, we can assume that they equal the domestic return in the initial equilibrium. This implies that in period *s*, with all prices expressed in the domestic currency,

$$\left[p_s^{CD} C_s^{EXP} - p_s^{CF} C_s^F\right] + \left[r_0 K_s^{NZF} - r_s K_s^F\right] + \left[\Delta K_{s+1}^F - \Delta K_{s+1}^{NZF}\right] = 0 ,$$

where C_s^{EXP} is New Zealand exports of the competitive corporate good. Note again that we consider only changes in FDI in our analysis (the capital account terms reflect only changes in FDI), and neglect changes in portfolio investment, that is, we assume that asset ownership remains unchanged or exhibits no net change.

Imperfectly Competitive Sector

As suggested above, the model includes a perfectly competitive corporate sector characterized by normal returns and an imperfectly competitive corporate sector that is characterized by above normal returns, even in the long-run steady state equilibrium. This is essential because some

industries in New Zealand are likely to be characterized by location-specific rents, attributable to serving a geographically isolated market that tends to limit foreign competition, and modeling the effects of reforms of capital income taxation must consider the taxation of such rents. In particular, reductions in company tax rates will lose revenue by lowering the taxation of location-specific rents, offsetting to some extent the other benefits of corporate income tax rate reductions.

In the imperfectly competitive corporate sector, the equilibrium price of output is assumed to reflect a markup at a fixed rate m_M, that is, the gross price of output in this sector p_s^M received by firms in period s is $p_s^M = p_s^{CD}(1+m_M)$. The remainder of the profit function for firms in this sector is the same as in the perfectly competitive sector. These above-normal returns to the capital invested in this sector (which is assumed to grow at the steady state growth rate) are assumed to persist in the long run, so that in the steady state the after-tax return to such capital always exceeds the analogous return to capital in the perfectly competitive sector by the same factor, which equals the after-tax revenues attributable to the price markup, expressed as a percentage of firm value in the imperfectly competitive corporate sector. The ownership shares of this capital, including the foreign ownership share, are determined in the initial equilibrium and are assumed to remain constant. In particular, domestically-owned shares of capital in the imperfectly competitive sector are passed on to an individual's heirs as part of the bequest. Note, however, that the owners of this capital may purchase additional capital in response to the enactment of reform at the competitive rate of return. That is, although additional capital may be invested in the imperfectly competitive sector, all of the above-normal returns accrue to the owners of the initial capital stock in that sector (who increase their investment at the steady state growth rate).[12]

The TPA model thus has five sectors: (1) a competitive corporate sector (C), with both domestically-produced (C^D) and foreign-produced goods (C^F); (2) an imperfectly competitive

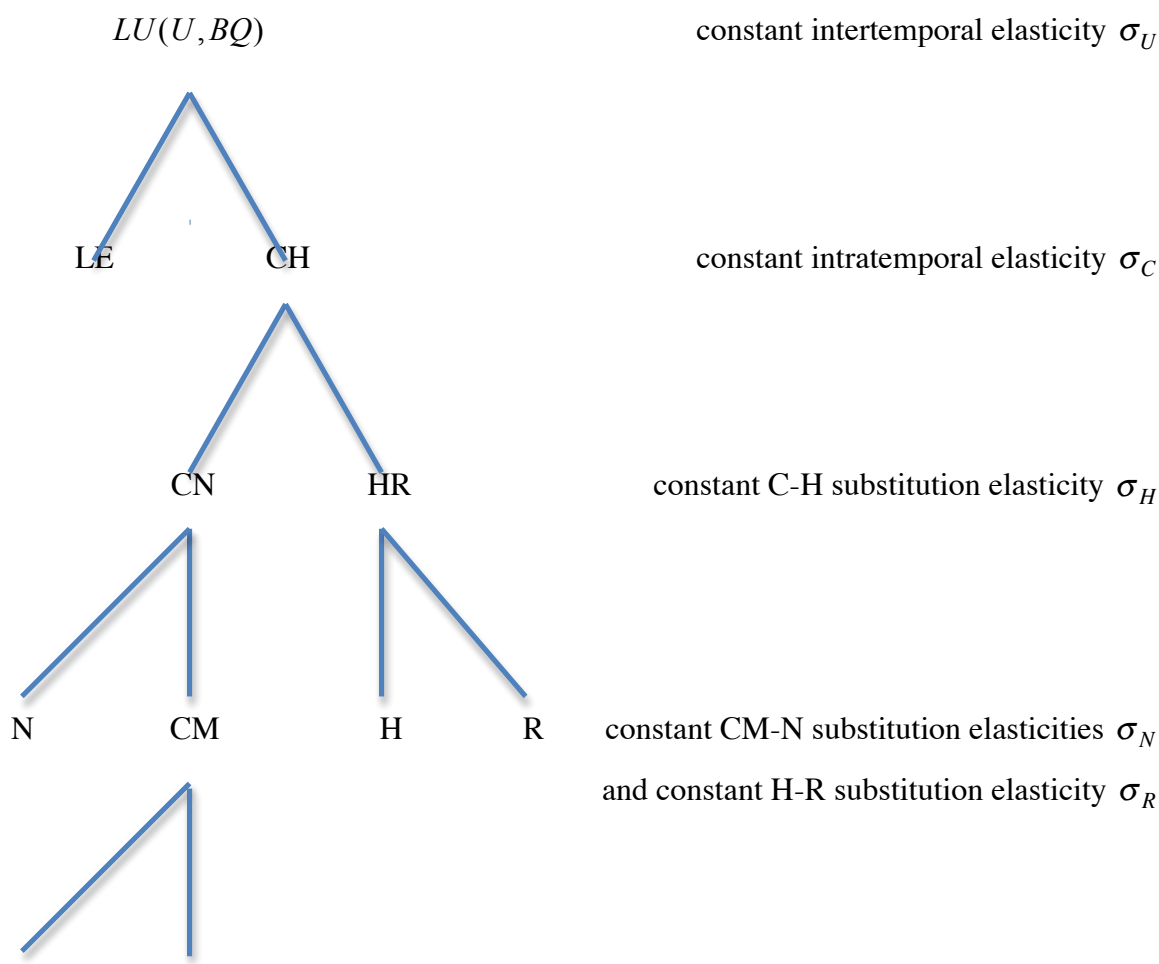
[12] Note that we thus understate the reform-induced increase in foreign capital invested in New Zealand, relative to the case in which such capital could earn above-normal returns in the imperfectly competitive sector.

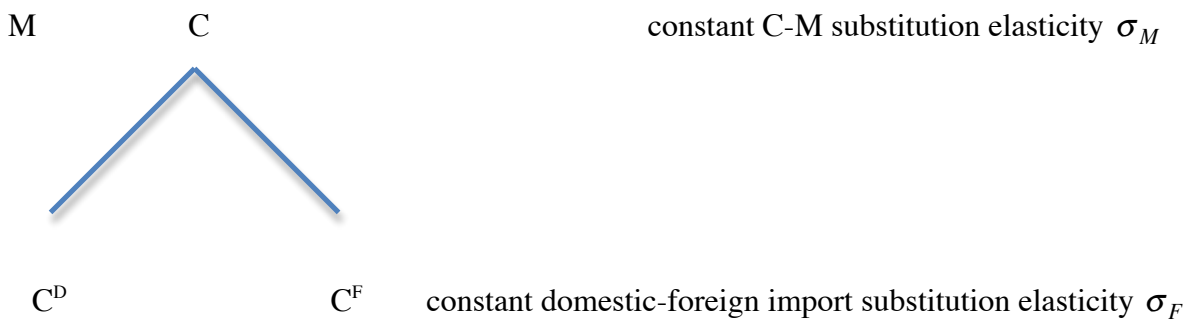
corporate sector (*M*); (3) a noncorporate sector (*N*); (4) an owner-occupied housing sector (*H*); and (5) a rental housing sector (*R*). A schematic diagram of the consumption structure is provided in Figure 1.

Figure 1. Structure of Consumer Component of the NZ Model

Five production sectors: C=competitive corporate, including domestically-produced (C^D) and foreign-produced (imported) (C^F) goods; M=imperfectly competitive corporate; N=noncorporate; H=owner-housing; R=rental housing

LU=lifetime utility; U=annual utility; BQ=bequest; LE=leisure; CH=composite nonhousing consumption and housing; CN=composite corporate and noncorporate; HR=composite owner-housing and rental housing; CM=composite corporate imperfectly competitive and corporate perfectly competitive





The Goods and Services Tax

We model the Goods and Services Tax (GST) (and excise taxes as well) as a flat rate tax on all final sales to consumers. Since the New Zealand GST is extraordinarily comprehensive (and is often held up as an international model of such taxes), we simply assume that it applies to all consumption goods, including imported goods (since the GST is assessed on a destination basis). This includes the services provided by both rental and owner-occupied housing. Both types of housing are subject to the same treatment—GST is paid at the full rate on construction and operating expenses, which serves as "prepayment" of tax on future rents (either actual or imputed), which are thus not included in the tax base. Because this approximates taxation of such rents, we simply assume that both actual and imputed rents are subject to tax under the GST as are all other consumption goods and services.

Imputation

The corporate and personal income tax systems are integrated in New Zealand, as shareholders receive credits for all corporate income taxes paid. The imputation system is modeled as follows. Corporations are assumed to have paid tax at rate t_C on distributed earnings *DIV*. Shareholders gross up their dividends received by $1/(1- t_C)$ to reflect the gross income associated with the dividend, and then apply the individual dividend tax rate, t_D. However, shareholders receive a credit for the corporate tax paid on the grossed-up dividends at a rate $t_C/(1-t_C)$. Thus, the effective tax rate applied to actual dividend income *DIV* is

$$\frac{t_D - t_C}{1 - t_C}$$

and the revenue raised at the individual level from a distribution of dividends *DIV* is

$$\frac{t_D - t_C}{1 - t_C} DIV \ .$$

NZT estimates that the average personal income tax rate applied to grossed-up dividend income $DIV / (1 - t_c)$ is $t_D = 30.8\%$.

Negative net tax liability can be used to offset tax due on other sources of income, and we assume that sufficient income is available to exhaust all credits. For foreign owners of capital in New Zealand, shareholder credits are assumed to eliminate all dividend taxes but are not refundable (and capital gains and interest are assumed to not be subject to tax).

Limitations of the Analysis

Despite these modifications and extensions, the model, of course, has numerous limitations in analyzing potential tax reforms in New Zealand. Some of these are inherent to the modeling approach.[13] For example, the model assumes very farsighted behavior on the part of consumers and firms; although this is a strong assumption, it can be justified by the standard rational expectations argument that it is preferable to the alternative assumption that households and firms, on average, systematically make decisions contrary to their own interests. Similarly, the model assumes that saving behavior is determined solely by life-cycle behavior, supplemented with a bequest motive; although one can posit alternative models of saving behavior, including those suggested in the precautionary savings and the behavioral economics literatures, the life-cycle approach is the most widely accepted and commonly used approach in neoclassical economics. Another issue is that the savings and labor supply responses that characterize life-cycle models are sometimes argued to be excessive; however, this issue can be addressed with the appropriate choices of parameter values, including relatively conservative choices for the intertemporal and intratemporal elasticities of substitution, as made in this report. Moreover, note

[13] For further discussion, see Diamond and Zodrow (2006).

that it is far from clear what an "excessive" response is, given the wide range of estimates for key model parameters in the literature, especially the relative large values for the intertemporal and intratemporal elasticities of substitution obtained in the recent empirical macroeconomics literature (Gunning, Diamond, and Zodrow 2008). In addition, the model is an equilibrium micro-based model; as a result, it cannot determine the effects of changes in tax policy on unemployment or inflation.

Also, as discussed above, the modeling approach requires that the initial equilibrium be a steady state, with all variables growing—outputs, exports and imports, capital stocks, investment levels, consumption levels, government services and transfers, the labor endowment, etc.—at an exogenously specified growth rate equal to the sum of the population and productivity growth rates. However, there is no reason to expect that any economy at any point in time will actually be in a steady state. As a result, the values of the macroeconomic variables in the initial equilibrium in the model can only approximate their actual values as they must satisfy all of the general equilibrium conditions dictated by the model structure. This issue is, of course, in addition to all the standard problems that arise because the model is only a highly stylized description of reality, there are typically many discrepancies in data used from different sources, various features of the economy are not considered in the model, some variable values may be inconsistent with the parameter values used in the model, etc. Nevertheless, it is important to note that the simulation results are reported as reform-induced percentage changes from the initial equilibrium, which are typically little affected by moderate differences between the values of macroeconomic variables in the model and those observed in reality.

It should also be noted that several features of the model make it difficult to analyze accurately some of the proposed reforms of the tax system in New Zealand evaluated in this report. In particular, the TPA model does not consider uncertainty, focusing instead on modeling the general equilibrium relationships between all the variables in the model under the assumption that all agents know with certainty their current and future values. This allows the model to incorporate many features of the New Zealand economy without becoming intractable. Nevertheless, it implies that it is difficult to simulate reforms that involve identifying the "risk

free" rate of return to equity, since the entire equity return in all competitive markets is essentially risk free. This, in turn, implies that reforms that exempt the risk-free return to equity, such as the allowance for corporate equity (ACE) or the risk-free rate-of-return (RFRM) for residential real estate, must be modeled as exempting all of the return to equity, rather than exempting only the risk-free rate of return while taxing equity returns to risk taking.

We also do not include inflation in the model, so that we cannot analyze any issues related to the absence of inflation indexing under the income tax, such as the taxation of inflationary capital gains under the income tax, or intersectoral distortions that arise because the way that inflation affects effective tax rates across different industries. This issue also complicates the calibration of the initial equilibrium, which is based on nominal values and thus includes inflationary components that we must treat as real—problems that are generally fairly minor given current relatively low inflation rates.

A separate issue is that the model has fixed debt-asset ratios and fixed payout ratios. It thus does not capture changes in financing mechanisms and payout behaviors that might occur in response to some of the reforms analyzed, such as the introduction of a capital gains tax or the taxation of interest income at preferential rates.

Finally, although the model has five production sectors, it has no industry differentiation within those sectors, and thus cannot analyze the effects of changes in inter-industry tax treatment within each production sector, such as the efficiency gains from more uniform treatment of tax depreciation.

C. *Parameter Values*

The parameter values used in our simulations, which are drawn from various sources in the literature, including especially Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001), Fullerton and Rogers (1993), and Fehr, Jokisch, Dallweit, Kindermann, and Kotloikoff (2011),

as well as from data provided by NZT, are specified in Table P1, as are the sources used for each parameter value.[14]

Our parameter choices can be summarized as follows. The population growth rate (1.2 percent) and the labor productivity growth rate (1.5 percent) are set at their mean values between 1990 and 2006, using data provided by Statistics New Zealand (SNZ). The international capital supply elasticity is set at a relatively large value ($\varepsilon_K = 5.0$), consistent with the assumption that New Zealand approximates a small open economy. The immigration elasticities used assume that a 1 percent increase in the ratio of lifetime utilities in New Zealand and the rest of the world results in either a zero, a 0.25 percent, or a 0.5 percent increase in the New Zealand population, under the assumption that the "rest of the world" source of immigration is Australia. The intertemporal elasticity of substitution, the key parameter in determining saving responses in the model, is set at 0.35, which is in the middle of the range of values used in other studies. The intratemporal elasticity of substitution, which is the key parameter in determining labor supply responses in the model, is set at 0.8, which generates an hours-worked elasticity that is roughly equal to 0.44, consistent with data provided by NZT. The elasticities of substitution in demand for the five consumption goods are drawn from various studies, with the value of the elasticity of substitution between owner-occupied and rental housing set at either 0.5, 1.0, and 1.5, given the unusually large degree of uncertainty about the value of this parameter. The elasticity of substitution between domestically produced and imported goods is a set at $\sigma_F = 5$, which is in the middle of the wide range of values found in the literature (higher values are typically associated with narrowly defined goods, while our imported goods sector is a broad aggregate). The rate of time preference $\rho = 0.01$ is chosen to generate a capital stock roughly consistent with that observed in the initial equilibrium.

Although many studies assume Cobb-Douglas production functions, recent evidence suggests that the elasticity of substitution in production between capital and labor is significantly less than

[14] For a general discussion on the choices of parameter values for CGE models, see Diamond, Gunning, and Zodrow (2008).

one. For example, the estimates by Chirinko, Fazzari, and Meyer (2004) suggest a value of 0.4, and Adams and Parmenter (2011) use a value of 0.5 for their CGE model of Australia; we use the latter value in our analysis. Because the elasticity of substitution between capital and labor in housing is likely to be quite limited (most substitution occurs between capital and land, but capital and land are effectively treated as a single factor of production in our model and are by far the most important production input), we assume a production elasticity of substitution of 0.4. The price markup in the imperfectly competitive sector is set at 0.25, following Bayoumi, Laxton, and Pesenti (2004). The adjustment cost factor in the nonhousing production sectors is set at 0.05, roughly in the middle of the range of values suggested by Hall (2004) and Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001).[15] The value of the adjustment cost factor in housing is set at 0.15, roughly consistent with Li, Liu, and Yao (2009). The debt-asset ratios in the corporate sectors are set at 0.55, based on data provided by NZT. The debt-asset ratios in the two noncorporate sectors (including rental housing) are set at 0.50, on the assumption that they are similar to those in the corporate sectors. The debt-asset ratio in owner-occupied housing is set at 0.25, based on data in the New Zealand household assets and liabilities balance sheet. Based on data in the initial equilibrium, the dividend payout ratio is set at $\zeta = 0.6$. The tax depreciation rate for residential rental housing in 2007 in New Zealand was 3 percent, so we set $\delta^H = 0.03$ in the two housing sectors, which implies, given total depreciation in the initial equilibrium of \$23.6 billion, that the tax depreciation rate in the nonhousing production sectors is $\delta^C = 0.06$, which is assumed to reflect acceleration of depreciation allowances at a 20 percent rate. This implies that economic depreciation in the nonhousing production sectors is 5 percent, and, following the 2011 reform, we assume that depreciation in the housing sectors is zero. Finally, the individual lifetime wage profile is assumed to follow the U.S. pattern, using the median wage profile used by Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001).

[15] As discussed in the appendix, the analysis assumes that investment in excess of the steady state level is subject to quadratic adjustment costs; the adjustment cost parameter is proportional to the marginal adjustment costs associated with such incremental investment.

D. *The Initial Equilibrium*

We begin by constructing an initial equilibrium that must meet two criteria: it must be broadly representative of the New Zealand economy in 2007, and it must be entirely consistent with a steady state general equilibrium in the context of all of the elements of the dynamic, overlapping generations structure of the model as well as plausible values of the various model parameters discussed above. Although numerous compromises must be made to meet the second criterion, the initial equilibrium nevertheless meets the first criterion reasonably well (with the major issues discussed below).

Specifically, the initial equilibrium is characterized by GDP of roughly $170 billion and total national tax revenues of roughly $55 billion, of which approximately $15 billion represents government transfers.[16] Aggregate consumption is about $120 billion and aggregate investment is nearly $20 billion. Total labor compensation is roughly $100 billion and total capital income is about $32 billion. The total working age population is 2.0 million, and the total capital stock is $618 billion.

Some specific features of the initial equilibrium are discussed below.

Tax Rates and Revenue Shares

Based on data on tax rates and tax bases provided by NZT, the tax rates under the personal income tax (PIT), corporate income tax (CIT), the Goods and Services Tax (GST), and excise taxes (ET) and the associated revenue shares are shown in the table below.

[16] The local property tax rate, which is assumed to be unchanged in the analysis, is set to raise $4.0 billion in 2007.

Tax Information

Tax	Tax Rate (%)	Revenue Share (%)
PIT on wages	23.4	43.1
PIT on interest	24.9	10.1
PIT on dividends (grossed-up; revenue includes imputation credit)	30.9	0
PIT on entrepreneurial income	27.9	1.8
PIT on transfers	17.3	4.6
CIT	33.0	17.0
GST and ET	12.5	23.4

Allocation of Capital and Output Across Business Sectors

We choose the factor weights in the production functions to generate the allocations of capital and output across industries shown below, which are roughly consistent with data on capital and output by industry provided by SNZ, coupled with an allocation of industries across the five production sectors in our model provided by NZT. The final panel shows that the capital-labor ratios vary dramatically across industries, with the housing sectors being extremely capital intensive, the competitive corporate sector having a relatively low capital intensity, and the imperfectly competitive sector and the noncorporate sector characterized by intermediate capital intensity.

Capital Allocation by Sector

Model Production Sector	M	C	N	R	H
Share of Total Capital (%)	24.4	27.3	6.0	9.2	33.1

Value of Output by Sector

Model Production Sector	M	C	N	R	H
Output as Share of GDP (%)	20.5	48.0	12.9	3.5	11.2

Capital/Labor by Sector

Model Production Sector	M	C	N	R	H
Capital-Labor Ratio	2.604	0.934	2.161	531.0	475.6

M = Imperfectly competitive corporate good

C = Perfectly competitive corporate good

N = Noncorporate business sector

H = Owner housing

R = Rental housing

Depreciation

Tax depreciation rates were reduced in 2011, with the depreciation rate under the declining value method of calculating depreciation allowances reduced from 3 percent to zero for buildings with a life longer than 50 years (including existing buildings) and accelerated depreciation of 20 percent eliminated for all other assets (with existing assets continuing to receive accelerated depreciation deductions). We model these changes by assuming that tax depreciation in the initial equilibrium equals 3 percent for housing capital (where the economic depreciation rate is zero), and tax depreciation for all other capital assets, which is calculated as the difference between total depreciation deductions and those taken on housing capital, reflects a weighted average of a 3 percent depreciation rate for nonresidential buildings (37.9 percent of the non-

residential capital stock) and a 7.87 percent depreciation rate for other nonresidential capital (62.1 percent of the nonresidential capital stock), which implies a tax depreciation rate for all nonhousing capital of 6.03 percent. The depreciation rate for other nonresidential capital of 7.87 percent is assumed to be accelerated by 20 percent relative to the economic depreciation rate of 6.30 percent. (Recall that the model does not include land, which is typically assumed to have a depreciation rate of zero.)

Treatment of Imports and Exports

Note that our model has only a single sector that is open to international trade, the competitive corporate sector, while in reality some trade in goods and services occurs in the noncompetitive corporate and noncorporate sectors. As a result, we significantly scale back imports of the competitive corporate consumption good, as well as capital income earned in New Zealand by foreigners and income earned abroad by New Zealand residents, from their observed values so that they are consistent with our initial equilibrium. (Note also that capital imports and exports are modeled separately as described above.) In the initial equilibrium, imports of the corporate consumption good are approximately $12 billion, and exports are $19 billion. These assumptions imply that we both understate the importance of imports and exports overall, especially in sectors other than the competitive corporate sector, and overstate the effects of changes in trade in the corporate sector, since all adjustments (e.g., to changes in foreign capital flows) must occur in that sector.

IV. Simulation Results

The results of our simulation analyses for each of the reforms noted above are provided below. We focus on percentage changes in the main macroeconomic variables, as well as changes in firm values. The baseline is the steady state growth path of the stylized representation of the New Zealand economy described above; that is, the economy is in the initial equilibrium described above in year zero, and then grows at the steady state growth rate in each subsequent period. Each reform is enacted in period one, and the simulation results tables show the reform-induced

percentage changes in each of the variables, relative to the baseline growth path (with no reform).

Note that the good produced by the perfectly competitive sector (good C, which is also the investment good and the only traded good in the economy) is assumed to be the numeraire with a fixed price equal to one. We also calculate a price index, which corresponds to the price of the aggregate consumption good in the model (the composite consumption good that includes all five individual consumption goods).[17] Changes in this price index reflect changes in the prices of all consumption goods other than good C, relative to the fixed price of good C (and thus do not imply that any tax reform causes changes in inflation, which is not considered in the model).

A. *Corporate Income Tax Rate Reduction*

As discussed above, the current tax rate in New Zealand is moderately high by international standards, and concerns regarding (1) international competiveness in a globalized economy with mobile capital and labor, especially in terms of attracting firms with highly mobile investments that generate above-normal firm-specific economic rents, (2) income shifting into relatively low-tax jurisdictions using transfer pricing, loan allocation (thinly capitalizing New Zealand operations) and other techniques, and (3) the deleterious effects of corporate income taxes on growth, suggest that a reduction in the corporate income tax rate may be appropriate. These arguments, however, are mitigated by concerns that (1) a lower corporate tax rate will reduce the taxation of relatively immobile capital in New Zealand, especially investments that earn location-specific economic rents, (2) the need for a corporate income tax with rates aligned to the top rate under the personal income tax to act as a "backstop" to the latter tax, and (3) the sense that tax avoidance techniques are sufficiently available to multinationals that high statutory corporate tax rates are less problematical than they may appear.

Accordingly, the first reform analyzed is a reduction in the corporate income tax rate from 33 to 25 percent (holding depreciation rates constant), which initially loses $1.92 billion in revenues.

[17] See the appendix, where this price index corresponds to F_s^{c+h}.

To focus on the effects of this tax change in the model, the revenue losses associated with the rate reduction are offset with a reduction in government transfers, which are lump sum transfers in the model, and decline initially by 12.8 percent. Thus, the simulation focuses on examining the substitution effects of the corporate rate reduction, with its income effects roughly offset with the reduction in transfers.

The results of this simulation are shown in Table A. A corporate rate cut with no offsetting increase in other taxes has a positive effect on overall output. In particular, GDP increases by 0.6 percent two years after reform, by 1.1 percent in 10 years, and by 1.4 percent in the long run (modeled as 100 years). This increase is driven by increases in investment of roughly 5.5 percent, with increases in investment in the two corporate sectors (C and M) that benefit from the rate reduction outweighing declines in investment in the noncorporate sector (N) and the two housing sectors (R and H), which become relatively less attractive due to the reduction in the corporate tax rate (even though they are not directly affected by the tax change); the capital stocks in each of these sectors change analogously, reflecting these changes in investment (including the change in the foreign capital stock described below, which reflects the highly elastic supply of foreign capital to New Zealand). Most of the increase in investment occurs in the competitive corporate C sector (25.5 percent two years after reform, 21 percent in 10 years, and 17.5 percent in the long run). These effects are larger than the increases in investment in the imperfectly competitive corporate M sector (10.5, 8.7, and 7.3 percent), because all investment goods are assumed to be produced in the C sector and investment increases significantly in response to the corporate rate cut, and because the rate cut in the imperfectly competitive sector has less of an impact on investment since much of the corporate tax rate is a non-distortionary tax on location-specific rents earned in that sector. The declines in investment are most pronounced in the N sector (6, 4.1, and 4.6 percent), since the degree of substitutability between corporate and noncorporate goods is relatively large, but investment in the two housing sectors declines moderately as well (e.g., by 4.2, 1.5, and 0.5 percent in the owner-occupied housing H sector), reflecting the relatively more favorable treatment of investment in the two corporate sectors.

The patterns of the increases in output in the five sectors are similar, although naturally more modest; for example, output in the C sector increases by 1.3, 1.4, and 1.6 percent, and in the M sector by -0.1, 0.2, and 0.6 percent. Note that some of the increase in output is attributable to an increase in the supply of foreign capital of 1.1 percent in response to the reform.[18] Note also that despite significant changes in outputs and capital stocks, offseting changes in taxes and prices are such that output and capital income shares are virtually unchanged; this pattern obtains for all the simulations.

The increase in investment is accompanied by an increase in saving of 9.4 percent two years after reform, 5.6 percent in 10 years, and 2.8 percent in the long run. This forces down consumption initially (by 0.3 percent after two years), and only in the long run does consumption recover to its initial level. Imports decline slightly initially as the corporate rate cut lowers the relative price of the domestically produced tradable good (the C-sector good), but in the long run both imports and exports increase moderately, by .0.9 and 3.2 percent. Net exports increase by slightly more than 6 percent (the absolute amounts are shown in the second panel of the table), and capital income flows and changes in capital stocks both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown in the second panel of the table). Labor supply increases initially (by 0.6 percent after two years) as the marginal product of labor increases due to increased investment, and declines slightly in the long run (by 0.1 percent), as real wages also decline slightly (by 0.1 percent).

The changes in firm values reflect the relatively favorable treatment of corporate investment, as the value of firms in the C sector increases by 20 percent initially and the value of firms in the M sector increases by 8.3 percent. By comparison, firm values in the other three sectors fall modestly initially (by 2.7-3.6 percent), and then the declines moderate over time. In all cases, these declines are driven primarily by changes in the values of the cash flows attributable to the capital stock rather than by changes in the capital stocks, which are relatively modest in all cases.

---

[18] The increase in the supply of foreign capital is initially allocated across the two corporate sectors in proportion to the original shares of capital in these two sectors. However, this initial allocation has no impact on the eventual allocation of capital across the various production sectors, which is determined by the investment decisions made by value-maximizing firms in each sector,

The relative price effects are driven by the reduction in corporate taxes (which drives noncorporate prices up) and the resulting surge in investment demand for the output of the C sector (which puts downward pressure on the prices of all other goods). All price effects are very modest—the largest changes in relative prices are the increases in the prices of the noncorporate goods, which do not benefit from the corporate rate cut, and are on the order of 0.9–1.9 percent in the long run. The overall price index increases by 0.8 percent in the long run (indicating that, on average, the prices of goods other than numeraire C good increase), and real wages fall slightly in the long run, which implies a small initial decline in population of 0.1 percent.

The welfare effects of each reform are examined by calculating the ratios of the lifetime utilities after and before reform for a representive individual in each age cohort, including future unborn generations. These lifetime utilities are proportional to the value of total rest-of-life resources, including the value of leisure, available to a representative individual within each cohort, so they are an endowment-based measure of relative welfare after and before reform. (Recall that immigrants are assumed to be identical to the existing population, so their pattern of changes in per capita lifetime utility are identical to those of residents of New Zealand prior to the reform.)

For example, ratios of the lifetime utilities after and before reform for each age cohort associated with these changes are shown in Figure A. This figure plots the remaining lifetime utility ratio for each cohort, including the 55 cohorts alive at the time of reform, and about 150 future generations, which are denoted as having negative ages at the time of reform. Since we include such a figure for each reform and, broadly speaking, each of these follows the same general pattern, we provide a detailed description of the pattern of welfare changes by generation for the corporate rate cut reform, and then focus only on the long run effects of reform in all subsequent figures.

The pattern of the intergenerational redistributional effects of each reform can be divided into two segments, reflecting welfare changes for those alive at the time of reform and future generations. The pattern for future generations is fairly straightforward, as these individuals are not subject to any transitional effects of reform. Their welfare changes reflect the fact that the

economy has typically not yet attained the steady state 55 years from the enactment of reform; that is, the macroeconomic variables in the model, especially the capital stock, are still adjusting to the reform. Note, however, that the economy is fairly close to the steady state by this time; that is, the magnitudes of the welfare changes shown are fairly small, so that the figures accentuate the effects of small changes. Thus, the welfare changes increase (or fall) smoothly as age becomes more negative (generations that are born further into the future), approaching the steady state welfare change.

The pattern of the ratios of lifetime utilities after and before reform for generations alive at the time of reform is in all cases much more complicated. In general, all of these generations experience windfall gains and losses related to changes in the values of their asset holdings and changes in the after-tax rates of return on those assets, as well as changes related to all the general equilibrium changes in prices during the transition to a new long-run, steady state equilibrium. For example, for households already retired at the time of enactment of reform (ages 45-54), changes in wages are irrelevant and the most important factor is the immediate changes in asset values and the short-run increase in interest rates that occurs due to adjustment costs, as capital is not fully reallocated immediately in response to the corporate rate cut and some capital earns somewhat above normal returns. This also makes achieving the target bequest, which is fixed in nominal terms, easier, which generates additional welfare gains for the elderly at the time of reform. Younger generations alive at the time of reform, however, benefit less from these windfalls, while bearing the transitional effects of reform—e.g., suffering a reduction in consumption as saving increases and capital accumulates slowly and wages increase slowly as well. The welfare changes of individuals alive at the time of reform approach those of individuals who were unborn as the cohort age approaches zero. There is typically a discontinuity in the welfare pattern beginning with the first generation not alive at the time of reform, as this is the first generation that experiences no transitional effects. In addition, there is often a discontinuity at age 28, which is the age at which a child receives a bequest, as children of this age and younger do not benefit from any windfall gains on the returns to the assets funded with the bequest (these gains go entirely to the donor, who leaves a bequest that is fixed in nominal terms).

Turning to the specific case of the cut in the corporate income tax rate, the long-run effect of this reform is a small welfare reduction, on the order of 0.5 percent of lifetime utility. This welfare loss arise primarily because foreign owners of capital in New Zealand capture some of the gains from reducing the corporate income tax rate, while all of the burden of the reduction in transfers is borne by residents of New Zealand, and because the lower corporate rate reduces the taxation of location-specific rents in the imperfectly competitive corporate sector, implying a larger revenue loss than would otherwise occur. In addition, real wages decline slightly in the long run (although nominal wages increase due to higher capital intensity) primarily due to reform-induced increases in housing prices and, coupled with the outflow of income to foreign owners of capital (as well as the reduction in wages implied by in-migration of labor, relative to what would occur in a closed economy), imply that a long-run welfare gain is never achieved. Note, however, that this result may be too pessimistic for at least two reasons. First, a lower corporate tax rate would increase growth by reducing the distortionary effects of inter-industry distortions with each sector, a result that our model is not sufficiently disaggregated to capture. Second, additional foreign (or domestic) investment may stimulate additional technology adoption or otherwise increase the productivity growth rate—that is, the growth rate may be endogenous rather than exogenously specified as assumed in the model—which would also increase the rate of economic growth.

B. *Personal Income Tax Rate Reduction*

The TWG report stresses the importance of moving away from both corporate and personal income taxation on the grounds that they are the taxes that are the most harmful to saving and investment and thus economic growth, and because further increases in the rates under these taxes may not be sustainable over time in the global economy, given increasing international mobility of both capital and labor.

Accordingly, the second reform analyzed is a reduction in average and marginal tax rates under the personal income tax of 5 percentage points; specifically, the average tax rate on wage income drops from 23.4 percent to 18.4 percent, the average tax rate on interest income drops from 24.9 to 19.9 percent, and the average tax rate on dividends drops from 30.8 percent to 25.8 percent.

Once again, in order to focus on the substitution effects of the rate reduction, the loss in revenues, which in this case initially equals $5.9 billion, is assumed to be offset with a reduction in government transfers.[19]

The results of this simulation are shown in Table B-1. A large personal income tax rate cut with no offsetting increase in other taxes has a significant positive effect on overall output. In particular, GDP increases by 3.4 percent two years after reform, and the increase declines only slightly to 3.2 percent in the long run. This increase is driven by increases in investment of roughly 10.0 percent initially and 6.5 percent in the long run, with the increases in investment concentrated in the noncorporate sector (N) and the rental housing sectors (R), which benefit relatively more from the reduction in personal income tax rates. For example, the increases in investment in the noncorporate sectors range from 12.5 to 17.6 percent initially and 7.6 to 13.8 percent in the long run. By comparison, the increases in investment in the two corporate sectors range from 6.6 to 7.6 percent initially, and 5.3 to 6.0 percent in the long run. The increase in investment in owner-occupied housing, which benefits little from the reduction in personal income tax rates (but still benefits from increased saving and growth, and can expand only with additional investment given its extreme capital intensity) is the smallest, at 4.7 percent in the long run. Similarly, the reduction in personal income tax rates also increases labor supply, which increases by 3.8 percent initially and by 3.5 percent in the long run. The associated increases in output are thus largest in the noncorporate sectors N, R, and H (6.8, 5.2, and 5.2 percent in the long run). The reduction in personal income tax rates has almost no effect on rates of return in the long run, and thus no effect on the foreign-owned capital stock in New Zealand. On the other hand, the long-run increase in real wages of 0.8 percent results in increased immigration that increases the population slightly by 0.3 percent.

The increase in investment is accompanied by an increase in saving, of 8.7 percent two years after reform, 6.6 percent in 10 years, and 5.4 percent in the long run. However, the increase in output is large enough so that consumption also increases, by 2.1 percent initially, by 3.2 percent

[19] Note that since the revenue loss with the cut in personal income rates is nearly three times that with the cut in the corporate income tax rate, the two sets of simulation results are not directly comparable.

after 10 years, and by 4.8 percent in the long run. (Recall that government spending does not increase with GDP, as it increases at the economy-wide growth rate, so that consumption can grow at a faster rate than GDP.) Exports and imports both increase, but the relative increase in imports is larger at roughly 5.1 percent in the long run, while exports increase by roughly 2.5 percent. As a result, net exports decrease (the absolute amounts are shown in the second panel of the table), and capital income flows and capital stocks both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown in the second panel of the table).

The changes in firm values are all positive, but largest in the noncorporate sectors most directly affected by the cut in personal income tax rates. For example, firm values in the rental housing sector increase by 14.4 percent initially, by 12.3 percent after 10 years, and by 8.8 percent in the long run, while firm values in the noncorporate sector increase initially by 8.4 percent band by 12.9 percent in the long run. The values of owner housing increase initially by 6.4 percent and 4.7 percent in the long run and the values of the corporate firms increase more modestly, on the order of 4.1 percent in the long run. Initially, these changes in firm values are due primarily to changes in net cash flows, but in the long run most of the changes are simply attributable to increases in the capital stock as the economy adjusts to the new tax system.

The relative price effects are dominated initially by the relatively high adjustment costs in the housing sector, which drive up prices by 5.8 percent initially, while all other prices are roughly unchanged. However, in the long run most relative prices decline, which helps real wages, which initially fall by 2.0 percent but increase by 0.8 percent in the long run.

The ratios of lifetime utilities after and before reform by age cohort associated with these changes are shown in Figure B-1. The long-run effect of the cut in personal income tax rates is a long-run welfare increase on the order of 1.1 percent of lifetime utility, due to reductions in distortions of both labor supply and saving decisions, including the long-run increase in real wages of 0.8 percent noted above. This welfare increase is limited because lowering personal income tax rates while holding the rate of the corporate tax constant causes some inefficiency in

the allocation of capital. As discussed above, the pattern of the ratios of lifetime utilities after and before reform for generations alive at the time of reform reflects a complex interaction between short-run changes in asset values and in the return to capital due to adjustment costs, short-run general equilibrium price effects, and the lengthy amount of time it takes for reform-induced capital accumulation to occur.

We also simulate an increase in personal income tax rates of five percentage points, with an offsetting increase in transfer payments—in this case of $6.4 billion—is also simulated. These results are shown in Table B-2 and Figure B-2, and are roughly the mirror image of those for the cut in personal income tax rates. The long-run reduction in welfare is 1.3 percent, slightly larger than the 1.1 increase with the rate reduction, reflecting larger marginal efficiency costs as tax rates increase.

C. *Goods and Services Tax Rate Reduction*

For purposes of comparison, this section examines the effects of a reduction in the GST, also accompanied by a reduction in government transfers to focus primarily on the substitution effects of such a tax change. The GST in New Zealand is a relatively efficient tax, as it has a base that is the broadest of any value-added type tax in the world. Moreover, the GST taxes on the basis of consumption rather than income, thus limiting its effects on saving, investment, and growth, and is levied at a flat rate rather than applying a progressive rate structure, which mitigates its distortionary effects on labor supply. The GST also has the advantage of applying in part to purchases by foreign tourists, thus shifting some of the tax savings abroad; TWG (2010, p. 46) estimates that five percent of GST revenues are paid by overseas visitors to New Zealand (although in principle, such payments should be refundable since the tax is assessed on a destination basis). These many advantages have to be weighed against the distributional issues raised by increasing a flat rate tax on consumption; note, however, that such concerns are overstated to the extent that they focus on annual measures of ability to pay tax rather than lifetime income, since consumption tends to be proportional to lifetime income except at the very top of the lifetime income distribution.

The first reform analyzed is a reduction in the GST rate of 6 percentage points that generates a revenue loss of $6.7 billion, roughly equivalent to the $5.9 billion loss under option B-1 (the reduction in personal income tax rates of 5 percentage points), with the loss in revenues again offset with a reduction in government transfers.

The results of this simulation are shown in Table C-1. A GST rate cut with no offsetting increase in other taxes has a significant positive effect on overall output. In particular, GDP increases by 2.6 percent two years after reform, and the increase declines only slightly to 2.4 percent in the long run. This increase is driven primarily by increases in labor supply in response to the reform-induced increase in the real wage attributable to the cut in the GST, as labor supply increases by 1.8-1.9 percent, and real wages increase by 3.8 percent initially, by 4.2 percent after 10 years, and by 4.8 percent in the long run. The increase in labor supply is accompanied by modest increases in investment, of 1.6 percent after two years, 1.1 percent after 10 years, and 0.6 percent in the long run.

Since the two housing sectors are very capital intensive, the increase in labor supply is absorbed almost entirely in the nonhousing sectors; as a result, producer prices in those sectors are little affected. By comparison, since there is little labor in the housing sectors and new investment is limited by relatively high adjustment costs, the reform-induced increase in demand is translated into initial producer price increases of 5.5 percent, with this increase diminishing over time to about 2.0 percent in the long run. High capital intensity in the housing sectors plus the need to cover relatively high adjustment costs imply that investment in those sectors is initially relatively high (5.2 percent), although this difference diminishes over time, and in the long run investment in the housing sectors increases by about 1.7–1.9 percent while investment in the other sectors is little affected. In the short run, output increases in the housing sectors are limited for the same reasons (very low labor intensity and relatively high adjustment costs) but in the long-run output increases roughly 2 percent in each industry, although the increase in the C sector is smaller (1.0 percent) since investment declines by 1 percent in that sector.

Overall, consumption increases by 1.8 percent initially and by 2.5 percent in the long run, and saving increases by 0.2 percent initially and by 1.0 percent in the long run. Exports and imports both increase, as imports increase by roughly 3.5 percent, and exports increase by roughly 4.6 percent, and net exports increase by nearly 6 percent. Foreign capital income flows and the foreign-owned capital stock both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown). The changes in firm values are generally modest, but the values of housing increase by 3.1–3.8 percent initially and by 1.7–1.9 percent in the long run, reflecting the increase in housing prices described above. The consumer price index falls by nearly 5 percent in the long run, reflecting the effects of the cut in the GST.

The ratios of lifetime utilities after and before reform by age cohort associated with these changes are shown in Figure C-1. These effects are basically zero, which reflects the fact that the GST is a relatively efficient tax, despite its distortions of labor supply decisions, so that reductions in the GST rate offset by reduced transfers do not generate much in the way of changes in welfare.

The effects of an increase in the GST of 6 percentage points that raises roughly the same amount of revenue ($6.3 billion) are also simulated. These results are shown in Table C-2 and Figure C-2 and are roughly the mirror image of those for the reduction in the GST rate.

D. *The Introduction of a Capital Gains Tax*

Although tax bases in New Zealand are in general quite broad, a prominent exception, at least relative to the standard Haig-Simons comprehensive income tax base, is the general absence of a capital gains tax under the personal income tax—although certain capital gains are subject to tax (Burman and White 2010; Coleman 2009; New Zealand Inland Revenue Department and New Zealand Treasury 2009d). Although the Haig-Simons criterion requires accrual taxation of capital gains, practical difficulties (e.g., measurement issues in some cases [and the inefficiency associated with differentially taxing only those gains that are easily measurable] and cash flow problems that arise when tax is due even though an asset is not sold) imply that those countries

that tax capital gains do so on a realization basis. The TWG stressed that the arguments favoring a broad-based low-rate income tax support the taxation of capital gains, and that such a tax might bring in significant revenue.[20]

The arguments for taxing capital gains are largely the traditional arguments for a base-broadening, rate-lowering reform. Taxing capital gains on a realization basis reduces (but does not eliminate due to deferral) a distortionary tax preference favoring investments that generate capital gains, reduces the incentive to convert other forms of income to tax exempt capital gains and the complexities associated with limiting such attempts, and is equitable in the sense of taxing all forms of income more equally. In addition, uniform taxation of capital gains in New Zealand would eliminate the current inconsistent, distortionary, and inequitable situation under which only a few types of gains are taxed.

On the other hand, several arguments suggest that exemption or preferential taxation of capital gains may be desirable. Capital gains taxes are difficult to administer, and create disincentives for saving and investment and are thus deleterious to growth. The taxation of purely inflationary gains is undesirable and provides a rationale for a preferential rate in the absence of inflation indexing of capital gains. Taxation on a realization basis creates lock-in problems and provides tax avoidance opportunities. Measures to deal with the latter problem, such as limits on the extent to which realized losses can be used to offset ordinary income, in some cases discourage risk taking by providing asymmetric treatment of gains and losses. Capital gains taxation of corporate shares results in double taxation to the extent that the underlying income is taxed at the corporate level (unless an imputation system is enacted for such gains).

After weighing all of these considerations, the TWG was somewhat ambivalent about the desirability of introducing a capital gains tax. In any case, since such a reform is under active debate, it is included in the potential reforms analyzed in this report. Specifically, we simulate the introduction of a comprehensive realization-based capital gains tax that includes deemed

[20] The TWG (2010, p. 48) report noted that Australia collects 4.9 percent of its total tax revenue from its capital gains tax.

realization of gains at death and taxes gains at ordinary income tax rates, with the revenue increase offset with an equiproportionate reduction in all personal income tax rates and the corporate income tax rate.

We perform two simulations—one in which only business assets are taxed, and one in which both business assets and owner-occupied housing are taxed. Based on data provided by NZT, we set the annual accrual capital gains tax rate in the model equal to 82 percent of the tax rate on interest income to reflect nominal taxation at the same rate as interest income while capturing the benefits of deferral under a realization system.[21] We then reduce all personal and corporate income tax rates, including the capital gains tax rate, to achieve revenue neutrality. Note that our analysis does not capture any reform-induced changes in debt-asset ratios and payout ratios, both of which are fixed in the model.

The results of the simulation for the business capital gains tax are shown in Table D-1. A new capital gains tax has moderately negative effects on investment, even if offset with reduced CIT and PIT rates, although GDP is little affected, falling initially by 0.2 percent and left unchanged in the long run. Investment in the two corporate sectors declines, especially in the imperfectly competitive sector, which generates a disproportionate share of capital gains, where investment declines by 10.8 percent initially, 7.1 percent in 10 years, and 5.5 percent in the long run. By comparison, investment increases slightly in the two noncorporate business sectors (N and R) where capital gains taxes are relatively unimportant as all income is assumed to be passed through to business owners, and in owner-occupied housing, which is not subject to the new tax in this simulation. Labor supply increases by 0.1 percent initially and by 0.3 percent in the long run. The foreign-owned capital stock declines by 0.3 percent, while the population increases slightly by 0.1 percent.

[21] The level of capital gains generated in the initial equilibrium in the model is much smaller than that estimated by NZT, presumably because we do not include inflation and thus inflationary gains in the model, nor any differential growth in residential housing prices in the initial equilibrium, contrary to recent experience in New Zealand.

The reduction in investment is accompanied by a reduction in saving of 1.2 percent two years after reform, and 0.1 percent in the long run. However, consumption increases by 0.3 percent, and by 0.4 percent in the long run. This increase is large enough that welfare increases in the long run as well, by 0.3 percent (Figure D-1). Imports increase by roughly 0.6 percent while exports fall by 0.4 percent. Net exports thus decline (the absolute amounts are shown in the second panel of the table), and capital income flows and stock both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown in the second panel of the table). The changes in firm values are consistent with the changes described above, as the values of the firms in the two corporate sectors, especially the M sector, decline, while the values of firms in all other sectors increase. The changes in relative prices are modest.

The results of the simulation of the comprehensive capital gains tax, which includes owner-occupied housing, are shown in Table D-2. These are broadly similar to the business capital gains tax, except that investment in owner-occupied housing now declines as well, but overall investment increases, by 0.7 percent initially and by 0.8 percent in the long run. The more uniform capital gains tax results in larger long-run increases in GDP (0.5 percent initially and 0.7 percent in the long run) and a slightly larger welfare gain of 0.27 percent in the long run (Figure D-2).

E. *Cumulative Reforms, 2007–2011*

The last of the first set of reforms we analyze examines the cumulative effects of all of the reforms that were enacted in New Zealand over the period 2007–2011, with government transfers adjusted to ensure revenue neutrality of the combined package. Five tax changes are simulated.

The first is a reduction in the company tax rate from 33 to 28 percent. The second is a reduction in personal income tax rates as shown in Table 1.

The third is an increase in the GST rate from 12.5 percent to 15 percent. The fourth is a change in the taxation of retirement savings from a flat rate tax of 33 percent applied to income earned in superannuation schemes and life insurance plans to (a) the introduction of the Portfolio Investment Equity (PIE) regime with current taxation at individual rates up to a maximum of 28 percent, and (b) the introduction of the Kiwisaver plan which is subject to PIE rules but also includes a $1,000 subsidy for joining, an employer subsidy so that up to 1.34 percent of wages can be contributed to the employee's Kiwisaver account, and a tax credit that matches individual contributions at a 50 percent rate up to the maximum individual credit of $520. The net effect of all these provisions is shown in the changes in the average rates applied to interest and dividend income in the second panel of Table 1, which reflects a decline in the tax rate applied to interest income from 24.9 to 19.1 percent, and in the dividend tax rate from 30.8 to 23.7 percent.

The fifth is a reduction in tax depreciation rates, with the depreciation rate under the declining value method of calculating depreciation allowances reduced from 3 percent to zero for buildings with a life longer than 50 years (including existing buildings) and accelerated depreciation of 20 percent eliminated for all other assets. We model these changes by assuming that tax depreciation in the initial equilibrium equals 3 percent for housing capital (where the economic depreciation rate is zero), and tax depreciation for all other (nonresidential) capital assets reflects a weighted average of a 3 percent depreciation rate for nonresidential buildings (37.9 percent of the nonresidential capital stock) and a 7.87 percent depreciation rate for other nonresidential capital (62.1 percent of the nonresidential capital stock), which implies an overall tax depreciation rate for all nonhousing capital of 6.03 percent. Under the reform, the depreciation rate on nonresidential buildings goes to zero, the depreciation rate on other nonresidential capital is reduced by 20 percent to 6.30 percent, and the overall depreciation rate falls to 3.91 percent. Government transfers are then adjusted to achieve revenue neutrality for the entire package, which in the year of enactment requires a reduction in transfers of $7.6 billion.

Table 1. Changes in Personal Tax Rates

Start Point (2007)

Income Range	Tax Rate (%)
$0-$9,500	15
$9,501-$38,000	21
$38,001-$60,000	33
$60,000+	39
Average wage income tax rate	23.37
Average marginal wage income tax rate	29.41
Average interest income tax rate	24.90
Average dividend income tax rate	30.80

End Point (2011)

Income Range	Tax Rate (%)
$0-$14,000	10.5
$14,000-$48,000	17.5
$48,000-$70,000	30
$70,000+	33
Average wage income tax rate	17.37
Average marginal wage income tax rate	22.88
Average interest income tax rate	19.08
Average dividend income tax rate	23.74

The results of all of these changes are shown in Table E, and are generally quite favorable. The results presented thus far suggest that the corporate rate cut, coupled with the reduction in depreciation allowances, is likely to have a minimal or negative effect on growth—but this is more than offset by the benefits of lowering personal income tax rates, especially personal tax rates on interest income and dividends, while offsetting the resulting revenue losses with increases in the GST and reductions in transfers, a tax substitution that increases efficiency and promotes growth. In particular, GDP increases by 4.1 percent two years after reform, 4.4 percent after 10 years, and by 4.6 percent in the long run. This increase is driven by increases in both investment, of 15.3 percent initially and 11.4 percent in the long run, and increases in labor supply, of 4.7 percent initially and 3.8 percent in the long run. The largest increase in investment occurs in the C sector (22.4 percent in the long run), due to the increase in purchases of investment goods and the corporate rate reduction, but investment increases in all of the five production sectors. This increase in investment is financed by an increase in personal saving of 18.9 percent initially and 9.0 percent in the long run (the supply of foreign capital increases

slightly by 0.4 percent, while the size of the population increases by 0.2 percent. The increase in GDP is sufficiently large, however, that consumption increases initially as well, 2.0 percent, and 5.2 percent in the long run.

The associated increases in output are initially smallest in the housing sectors (only 0.5 percent), where adjustment costs are large, but in the long run output in all sectors increases by 4.6–6.3 percent. Exports and imports both increase, but the increase in imports is larger at 3.2 percent initially and 6.4 percent in the long run, while exports increase initially by 2.6 percent and by 4.2 percent in the long run. Net exports increase slightly (the absolute amounts are shown in the second panel of the table), and capital income flows and the foreign-owned capital stock both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown in the second panel of the table).

The changes in firm values are all positive, with the largest effect in the corporate C sector that benefits from both the increase in investment and the corporate rate cut—an increase of 25.2 percent two years after reform and 23.8 percent in the long run. Firm values in the other sectors increase by 5.7–13.5 percent in the long run.

The relative price effects are dominated initially by the relatively high adjustment costs in the housing sectors, which drive up prices by 5.8 percent initially, while all other prices are roughly unchanged. In the long run, prices decline in the housing sectors slightly, by less than 1 percent.

The ratios of lifetime utilities after and before reform by age cohort associated with these changes are shown in Figure E. These effects are modest. The long-run effect of the cut in personal income tax rates is a long-run welfare increase on the order of 1 percent of lifetime resources, which reflects the fact that even though GDP increases significantly, labor supply increases considerably as well.

F. *RFRM Tax on Residential Rental Housing*

Another reform of capital income taxation that has been discussed in New Zealand for more than 10 years is the application of the "risk-free rate-of-return method" (RFRM) to taxing residential rental housing.[22] This approach would estimate the risk-free rate of return to equity investment in residential rental housing and tax the resulting imputed income at the taxpayer's marginal personal income tax rate. This would be the final tax, that is, rents would not be subject to separate taxation under the income tax.

The rationale underlying use of the RFRM is that accelerated depreciation allowances and the tax exemption of capital gains on investment in capital-intensive residential rental housing create a distortionary tax preference for such investment, resulting in over-investment in such assets, driving down before tax rates of return to the point that taxable income in this sector has been negative in recent years. In addition, unlike the alternative of capital gains taxation on a realization basis, the RFRM provides a relatively steady stream of tax revenues and does not create a lock-in problem for investors.

The proposed RFRM reform is, however, difficult to approximate in the TPA model; although the taxation of equity returns is straightforward, these returns cannot be separated into normal returns and risk premiums or economic rents because the residential rental housing sector is competitive and earns only normal returns (as noted above, the model does not account for uncertainty). Accordingly, we simply model the RFRM reform as the taxation of the return to equity invested in the residential rental housing sector at the average tax rate applied to investors in residential rental property of 24.8 percent. The resulting revenue increase of $0.31 billion is offset with an equiproportionate reduction in all personal income tax rates and the corporate income tax rate.

The results of this simulation, which are shown in Table F, reflect the expected reallocation of investment in response to the tax increase on the income earned on investment in the residential

[22] Although other forms of capital income could be subject to the same tax regime, the discussion in New Zealand has focused on applying the RFRM to residential rental housing and we restrict our analysis to that option.

rental housing (R) sector. Investment in the R sector declines by 7.4 percent two years after reform, by 5.3 percent after 10 years, and by 2.9 percent in the long run; the transition to the new equilibrium is lengthy, given the relatively large adjustment costs in the R sector and its extreme capital intensity. The reallocation of capital away from the tax-favored R sector results in a small increase in GDP (0.1 percent in the short run and 0.2 percent in the long run) and in overall investment (0.2 percent initially and 0.3 percent in the long run). Saving increases by 0.8 percent two years after reform and by 0.2 percent in the long run, while consumption is unchanged and labor supply increases slightly (by 0.1 percent). All other variables similarly experience very slight changes, except for the value of rental housing, which declines by 5.1 percent initially and by 2.7 percent in the long run, and is offset by much smaller increases in asset values in all the other sectors. The ratio of lifetime utilities after and before reform increases, reflecting the efficiency gains from the reform, but the increase is very small, 0.0002 percent of lifetime resources in the long run (Figure F).

G. *The Introduction of an Allowance for Corporate Equity (ACE)*

Another option for reforming the taxation of capital income in New Zealand is the approach recommended by the recent Mirrlees Review committee in the United Kingdom—the introduction under the corporate income tax of an allowance for corporate equity or ACE, which would be calculated as the product of the value of a corporation's equity capital and a presumptive rate of return that approximates the risk-free rate of return (Institute for Fiscal Studies 2011).

The primary goal of the ACE is to eliminate the current tax bias favoring debt finance at the corporate level that arises because interest payments to a firm's bondholders are tax deductible but dividend payments to its shareholders are not. In addition, to the extent that the resulting revenue loss is made up with taxes other than those on capital income, an ACE reduces tax disincentives to saving, investment including that by foreign multinationals, and economic growth, while holding constant incentives for income shifting and the level of taxation of economic rents. Indeed, the marginal effective tax rates at the firm level on both debt and equity financed investments are zero. An additional advantage of the ACE is that it automatically

results in relatively accurate income measurement under the corporate income tax, as any error in depreciation accounting or in any implicit inflation adjustment for a capital asset is offset by an equal and opposite error in the calculation of the allowance for corporate equity.

The primary disadvantage of the ACE is that it loses revenue, including revenue that is lost because the ACE applies to existing capital, including that owned by foreigners, which must be offset with either higher taxes on labor income, which distort labor supply decisions and encourage emigration, or a higher corporate tax rate, which has the many incentive problems noted previously, including offsetting the investment incentive effects of the ACE deduction and encouraging income shifting to lower tax jurisdictions.[23]

The ACE proposed in the report of the Mirrlees Review also includes a rate-of-return allowance (RRA) at the individual level, designed to eliminate the taxation of normal returns from both corporate and noncorporate investment on equity-financed, and on debt-financed, investment at the individual level.

We model the introduction of an ACE by allowing an additional deduction equal to the product of the value of a corporation's equity capital and the risk-free rate of return which, given the absence of uncertainty in the model, implies exemption of the return to equity in the competitive corporate sector, and exemption of the normal return to equity (exclusive of the return attributable to markup pricing) in the imperfectly competitive corporate sector. In addition, we couple the ACE with a rate-of-return allowance (RRA) at the individual level, which exempts normal returns on debt-financed and equity-financed corporate and noncorporate investment. The net result of the combination of the ACE and the RRA is that all returns to investment except those generated in the imperfectly competitive sector (M) are exempt from tax. (We model this as exemption of capital income at the individual level, coupled with a business-level

[23] In addition, because interest is still deductible while dividends are not (the ACE is an implicit deduction for dividends), the incentive to recharacterize non-deductible dividends as deductible interest still exists and attempts to limit such recharacterization will give rise to complexity.

tax for noncorporate companies.) The loss in revenues is offset with an equiproportionate increase in all personal income tax rates and the corporate income tax rate.

The simulation results for the introduction of the ACE/RRA combination are shown in Table G. As expected, the generous treatment of capital income under the ACE/RRA stimulates investment in all sectors except owner-occupied housing, which does not benefit from the reform (and declines by 14.8 percent initially and by 5.8 percent in the long run). Overall investment increases by roughly 2 percent, and is concentrated primarily in the imperfectly competitive (M) sector and the noncorporate (N) sector, where investment increases initially by roughly 16-19.5 percent and in the long run by roughly 11 percent. However, the increase in PIT rates (the average tax on wages increases by nearly 23 percent, from 23.4 percent to 28.7 percent) is sufficiently great that labor supply declines by 2.1 percent initially and 3.3 percent in the long run, and emigration reduces the population by 0.6 percent. These changes are large enough that GDP declines in spite of the increases in investment, by roughly 1.3 percent. Although saving increases slightly in the long run (by 0.4 percent), consumption declines by 2.2 percent initially and by 3.4 percent in the long run. The changes in exports and imports are modest, but exports increase (by 5-6 percent) and imports decrease (by 4.4-6.6 percent), so that net exports increase by roughly 20 percent. Capital income flows and the stock of foreign capital both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown in the second panel of the table).

The changes in firm values are roughly zero or positive in all sectors except owner-occupied housing, which declines by 8.3 percent initially and 5.8 percent in the long run. The largest increases are in the two noncorporate sectors, 13-19.5 percent initially and 12-17 percent in the long run. Relative producer prices change relatively little.

As suggested by the short- and long-run declines in consumption, long-run welfare declines with implementation of the ACE, with a reduction equal to 2.2 percent of lifetime resources (Figure G). This partly reflects the fact that some of the gains from the ACE accrue to foreigners, and the ACE applies to existing equity capital (including that owned by foreigners), generating

windfall gains that lose revenues but do not improve marginal incentives to invest. In addition, because the debt-equity ratio is fixed in the model and the costs of excessive debt finance are not considered, the model does not account for the ACE-induced efficiency gains that would be obtained, as the current tax bias favoring debt finance was eliminated. It thus understates the gains that would be obtained from implementing an ACE.

H. *The Introduction of a Dual Income Tax*

As noted previously, much attention in New Zealand has focused on the concern that its relatively high corporate tax rates and capital income tax rates discourage saving, investment (including investment by foreign multinationals), and economic growth, especially in a global economy characterized by increasing tax competition, while magnifying existing tax distortions of the allocation of capital and encouraging income shifting to lower tax jurisdictions. One potential solution to this problem is to move away from the traditional Haig-Simons comprehensive income tax approach, which taxes a broad measure of income at uniform rates, toward a "dual income tax" (DIT) that applies a relatively low flat tax rate to all capital income (regardless of the organizational form of the company earning the income) while maintaining (and perhaps increasing) the progressive taxation of labor income to achieve distributional goals and maintain revenues. Of course, as discussed above, such an approach has disadvantages: It reduces the taxation of immobile location-specific rents, reduces the taxation of existing capital, including that earned by foreigners, and increases the tax rates applied to labor income, which encourages emigration and reduces labor supply. Beyond those issues, the main problem associated with the DIT (discussed further below) is that it creates an incentive to convert labor income into relatively lightly taxed capital income.

The dual income tax approach was pioneered in the late 1980s and early 1990s by the Nordic countries (Cnossen 2000), and such regimes have been adopted more recently by several other nations (Genser and Reutter 2007). Although the details of the various DITs vary considerably across countries, a generic approach can be described as follows. All equity capital income is taxed at a single, relatively low proportional rate at the corporate level (typically equal to the minimum non-zero tax rate applied to labor income), while labor income is taxed at progressive

rates under the individual income tax. Dividends are not deductible at the corporate level but are excluded from the individual capital income tax base. Most capital gains are also untaxed at the individual level, as capital gains are nominally taxed at the individual level on a realization basis, but shareholders are allowed to write up their basis by net retained earnings, which will eliminate most gains. Interest is deductible at the corporate level and taxable at the individual level at the flat rate tax on capital income. The tax on interest income may be collected via withholding at the corporate level, which may be the final tax. To limit tax avoidance in the form of converting labor to capital income, the income of proprietorships and closely-held companies is split into a capital income component, typically calculated by applying a presumptive rate of return to the firm's capital, which is taxed at the fixed low rate on capital income, and a residual labor income component (which equals all remaining business income) that is taxed at progressive rates under the personal income tax.[24]

We model the replacement of the existing system of capital income taxation in New Zealand with a dual income tax as a tax imposed on capital income earned in both the corporate and noncorporate sectors at a relatively low flat rate, with labor income taxed at proportionately higher progressive rates to achieve revenue neutrality. The flat rate on capital income is initially set at the current second bracket income tax rate of 17.5 percent, and then adjusted upward to 19.6 percent to reflect the increases in the tax rates on labor income that are required to maintain revenue neutrality. Income in the noncorporate sector is divided into capital and labor income components as described above. Dividends and capital gains are not subject to tax at the individual level, while interest is deductible to the firm but taxed at the individual level at the flat 17.5 percent rate. (We do not model capital gains taxation at the individual level because, apart from transitional effects, all capital gains in our model are generated by retained earnings, and would thus be eliminated from the tax base with the retained earnings adjustment noted above.)

[24] The Norwegian DIT also includes personal taxes on dividends and capital gains that are designed to tax only above-normal returns to capital at the individual level, thus in principle eliminating the gains from converting labor income to capital income while subjecting above-normal returns to corporate capital to a neutral form of double taxation (Sorensen 2005); however, since the noncorporate sector earns only normal returns in our model and we assume that labor and capital income are identified accurately, we do not include these provisions in our analysis.

The simulation results for implementation of the DIT are shown in Table H. The effects of the DIT are by far the most pronounced in the competitive corporate sector (C) where the large reduction in the corporate tax rate results in a surge in investment of 47.6 percent two years after reform, 39.3 percent 10 years after reform, and 33.0 percent in the long run. Note that these results are inflated by two of the assumptions made in constructing the model, as all of the increase in investment and all of the increase in exports (noted below) must come from the competitive corporate (C) sector, which stimulates investment in that sector.

By comparison, the rate reduction under the DIT has smaller effects on investment in the imperfectly competitive sector (M) (8.3 percent initially and 6.7 percent in the long run), as all of the increase in investment comes from the C sector and lower taxation of location-specific rents in the M sector does not stimulate much additional investment. Because so much investment is diverted to the C sector, investment in the noncorporate sectors declines, especially in the rental housing sector (by 16.1 percent initially [which includes investment expenses to cover relatively high adjustment costs] and by 2.2 percent in the long run), and in the owner-occupied housing sector (by 21.9 percent initially and 5.8 percent in the long run). The increase in investment in the corporate sectors is sufficiently large that overall investment increases, by 3.3 percent two years after reform, 5.4 percent 10 years after reform, and 6.9 percent in the long run. This increase in investment is in addition to a significant one-time increase in the foreign capital stock, split equally between the two corporate sectors, of 3.1 percent, which is accompanied by significant increases in net exports of roughly 20 percent. These increases in investment, however, are offset by reductions in labor supply in response to the increase in PIT rates on labor of 3.0 percent two years after reform and 3.9 percent in the long run. The population also decreases slightly (by 0.7 percent), as after-tax real wages decline with the increase in PIT rates on labor income of roughly 26 percent. The net result is a reduction in GDP of 2.5 percent initially, 1.2 percent after 10 years, and 0.2 percent in the long run, with only output in the C sector increasing in the long run (by 0.7 percent) and output in all the other sectors declining in the long run by 3.4-5.6 percent. Similarly, consumption declines by 3.5 percent initially and by 4.3 percent in the long run. These negative effects reflect the fact that some of the gains of the cuts in capital income taxation accrue to foreign owners of capital; that cutting taxes on capital

income reduces the taxation of existing capital, including capital earning location-specific economic rents in the M sector, which reduces revenue while not stimulating marginal investment; and that raising PIT tax rates on labor income reduces labor supply. As a result, long-run welfare declines with implementation of the DIT by 2.9 percent of lifetime resources in the long run (Figure H) .

Finally, consistent with the above changes, firm values increase significantly in the C sector (by 40.8 percent initially and 33 percent in the long run), increase in the M sector (by 8.7 percent initially and 7.6 percent in the long run), and decline, at least initially, in all the other sectors, with the largest fall in the value of owner-occupied housing (12.5 percent initially and 5.8 percent in the long run), which benefits the least from the capital income rate cut.

V. The Introduction of a Low Tax Rate for Interest Income

The final reform considered is one suggested by the Henry Review of the tax system in Australia—the introduction of a relatively low flat rate for interest income.[25] The rationale for such a provision is that reductions in capital income taxation are in general desirable for the reasons detailed above, and such a reduction is particularly appropriate for interest income because it receives the least favorable tax treatment (at least under the personal income tax) of the various forms of capital income, since interest income—including its purely inflationary component—is fully taxed on an accrual basis at the personal level. By comparison, equity investments benefit from the exemption of capital gains (and from deferral, even in the presence of a realizations-based capital gains tax), and certain forms of investments, such as investments in owner-occupied housing, benefit from various tax preferences.

The specific provision modeled is the introduction of a relatively low flat rate for interest income only, set equal to 60 percent of the current rate of 25 percent, or 15 percent. The resulting revenue loss of $2.8 billion is offset by a reduction in transfers.

---

[25] See Henry et al. (2010).

The results of this simulation are shown in Table I-1. A cut in the tax rate on interest income that is offset by a reduction in transfers has a positive effect on overall output. Moreover, because the model is characterized by a fixed debt-asset ratio, these results are understated to the extent the debt-asset ratio would be expected to increase in response to the more favorable treatment of debt finance (unless these effects were offset by increased costs associated with higher leverage). In particular, GDP increases by 0.6 percent two years after reform, by 0.7 percent in 10 years, and by 0.7 percent in the long run. This increase is driven by increases in investment, of 4.2 percent initially and 3.3 percent in the long run, which are spread out over investment in all the sectors, although untaxed owner-occupied housing is relatively little affected. In addition, the capital stock owned by foreigners experiences a one-time increase of 1.1 percent in response to an increase in the interest rate. The patterns of the increases in output in the five sectors are similar to those for investment. Labor supply increases by 0.5 percent two years after reform, by 0.4 percent in 10 years, and by 0.2 percent in the long run, as real wages increase, by 0.2 percent initially and 0.9 percent in the long run, in response to reform-induced greater capital intensity.

The increase in investment is accompanied by an increase in saving, of 4.9 percent two years after reform, 3.3 percent in 10 years, and 2.1 percent in the long run. This forces down consumption slightly, by only 0.1 percent after two years, with increases of 0.2 percent after 10 years, and 0.8 percent in the long run. Imports decline slightly initially while exports increase moderately, by roughly 2.7 percent. Net exports increase by roughly 6 percent (the absolute amounts are shown in the second panel of the table), and capital income flows and the stock of foreign-owned capital both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown).

The reduction in the taxation of interest income results in increases in the values of the firms in all five sectors, which range from 0.4 percent to 4.0 percent initially, and 0.7 percent to 5.3 percent in the long run. The relative price effects are relatively modest, with the largest effects being long-run declines of 1.8 percent in the heavily capital intensive housing sectors. The overall price index decreases by 0.7 percent in the long run.

Although consumption increases in the long run, Figure I-1 shows that the associated increase in labor supply is sufficiently large that the net effect is a long-run welfare loss of 0.2 percent of lifetime resources.

Our final simulation again considers a lower tax rate on interest income, in this case coupled with the introduction of a tax on capital gains on business assets, with revenue neutrality achieved by lowering the flat rate tax on interest income, holding the level of government transfers roughly equal to the level achieved under the previous simulation. In this case, the tax rate on interest income drops further to 13.7 percent (rather than 15.0 percent as in the previous simulation), which equals the capital gains tax rate.

The results of this simulation are shown in Table I-2. Since the reduction in transfers is approximately equal to that in the previous simulation and all of these revenues are used to reduce the taxation of capital income (with a larger reduction in the taxation of debt-financed investment coupled with greater taxation of equity-financed investment), the effects of this reform are broadly similar to those of the previous reform. This is especially true because the model is characterized by a fixed debt-asset ratio, so that the debt-asset ratio cannot increase in response to the more favorable treatment of debt finance.

The combination of an interest rate cut with the introduction of a capital gains tax and a reduction in government transfers has a positive effect on overall output. In particular, GDP increases by 0.5 percent. This increase is driven by increases in investment, of 2.8 percent initially and 2.2 percent in the long run, which are spread out over investment in all the sectors except the imperfectly competitive sector (M), where the introduction of the capital gains tax is especially harmful; the untaxed owner-occupied housing is again relatively little affected. In addition, the capital stock owned by foreigners experiences a one-time increase of 0.9 percent in response to an increase in the interest rate. The patterns of the increases in output in the five sectors are similar to those for investment. Labor supply increases by 0.4 percent two years after reform, by 0.3 percent in 10 years, and by 0.2 percent in the long run, as real wages increase, by

0.1 percent initially and 0.9 percent in the long run, in response to reform-induced greater capital intensity.

The increase in investment is accompanied by an increase in saving, of 2.9 percent two years after reform, 2.3 percent in 10 years, and 1.6 percent in the long run. This has a negligible effect on consumption initially, with increases of 0.3 percent after 10 years, and 0.8 percent in the long run. Imports decline slightly initially, while exports increase by roughly 2.2 percent. Net exports increase by 4.8 percent (the absolute amounts are shown in the second panel of the table), and capital income flows and the stock of foreign-owned capital both increase in such a way as to satisfy the balance of payments equation (each of the elements of the balance of payments equation is shown).

The reduction in the taxation of interest income coupled with the introduction of the business capital gains tax results in increases in the values of the firms in all of the production sectors except M; these changes range from -0.9 percent to 4.7 percent initially, and -0.1 percent to 6.0 percent in the long run. The relative price effects are modest, with the largest effects being long-run declines of 2.2 percent in the heavily capital intensive housing sectors. The overall price index decreases by 0.8 percent in the long run.

Although consumption increases in the long run, Figure I-2 shows that the associated increase in labor supply is sufficiently large that the net effect is a long-run welfare loss of 0.1 percent of lifetime resources.

VI. Conclusion

This report has simulated the effects of a wide variety of reforms of the tax system in New Zealand; these reforms are listed in Table J. We conclude this report by summarizing the extent to which each reform in principle satisfies the main criteria discussed above, and then summarize the main simulated macroeconomic effects of each proposal.

The corporate rate reduction and the DIT both reduce the taxation of mobile capital and thus should be beneficial in terms of attracting foreign direct investment, including investment that generates firm specific rents, reducing incentives for income shifting (to the extent that the statutory CIT rate is reduced), and creating marginal incentives for new investments that promote saving, investment, and economic growth. The CIT rate reduction has modest effects on labor supply, in constrast to the DIT, which reduces labor supply since PIT rates on wage income are increased. Both of these taxes, however, reduce the taxation of location-specific rents, reduce the taxation of income earned by foreigners, and reduce the taxation of income earned by old capital, which makes them less attractive reform options for New Zealand. In addition, they move the CIT and PIT rates further from alignment, and thus encourage labor income shifting. The ACE/RRA has similar properties, although its negative effects are primarily due to the fact that the ACE applies to existing capital, including that owned by foreigners. However, the ACE/RRA does not discourage income shifting since the corporate rate increases under the version of the ACE analyzed.

The main advantages of a reduction in PIT rates and a reduction in the GST rate are that they encourage labor supply and stimulate domestic saving; both are thus relatively favorable to economic growth. Although a capital gains tax would imply a movement toward taxing all forms of capital income more uniformly, tax some location-specific rents, and encourage labor supply since PIT rates on labor income could be lowered, it would also increase the cost of capital and thus discourage FDI and domestic saving and investment and thus would not be especially favorable to economic growth.

The cumulative reforms enacted over 2007–2011 lowered corporate tax rates (while simultaneously reducing depreciation deductions) and personal income tax rates while increasing the GST rate (the remaining revenue losses were offset in the model with reduced government transfers). These reforms thus were beneficial in terms of attracting foreign direct investment, including investment that generates firm specific rents, reducing incentives for income shifting, encouraging labor supply and saving, and promoting economic growth. They did not, however,

align PIT and CIT rates, and lowered the taxation of firm specific rents (and the capital income of foreigners and returns to old capital), thus limiting their positive effects.

The other two reform proposals analyzed are more limited in scope. A new RFRM tax on residential rental housing would make the taxation of investment more uniform and thus improve the allocation of capital, at the cost of reducing investment and output in the residential rental housing sector. To the relatively minor extent the resulting revenues were used to lower PIT and CIT rates, all of the effects described in the previous reforms would occur in this case as well. Finally, the introduction of a low tax rate on interest income would encourage investment, saving, and labor supply, but would have fairly minimal effects in terms of the other tax reform criteria.

The macroeconomic effects of the various reforms are also summarized in Table K. The most striking feature is the long-run welfare declines associated with the CIT reduction, the ACE, and the DIT. These are associated with small increases or reductions in GDP, no effect or declines in consumption, and slight increases or declines in labor supply. As discussed above, these results reflect reduced taxation of location-specific rents, reduced taxation of income earned by foreigners, reduced taxation of income earned by old capital, and increased taxation of labor; these effects are large enough to offset the positive effects of the reforms on saving and investment. By comparison, the reduction in PIT rates results in a long-run increase of welfare of 1.1 percent, accompanied by a 3.2 percent increase in GDP, a 6.5 percent increase in investment, a 4.8 increase in consumption, and a 3.5 increase in labor supply. The cumulative reforms that combine a CIT rate cut with a reduction in depreciation allowances, a PIT rate cut, and a GST rate increase have effects that are similar to, but larger than, the PIT reduction accompanied with a reduction in transfers; the GST rate reduction has similar but smaller effects. The introduction of the capital gains tax has small but positive effects, largely due to the taxation of location-specific rents earned by foreigners, the RFRM tax on residential rental housing increases investment slightly but is too small to have much of an impact, and the low rate tax on interest income results in a small welfare loss

REFERENCES

Benge, Matt, and David Holland, 2010. "Company Taxation in New Zealand." In *Tax Reform in Open Economies: International and Country Perspectives,* edited by Iris Claus, Norman Gemmell, Michelle Harding and David White, 289-312. Edward Elgar Publishing, Northampton, MA.

Burman, Leonard E., and David White, 2010. "Taxing Capital Gains in New Zealand: Assessment and Recommendations." Tax Working Group Background Paper. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/3-taxing-capital-gains-burman_white.pdf.

Cline, Robert J., Robert J. Carroll, John W. Diamond, Thomas S. Neubig, and George R. Zodrow, 2010. *The Macroeconomic Effects of an Add-On Value-Added Tax.* Ernst and Young LLP, Washington, DC.

Coleman, Andrew, 2009. "The Long Term Effects of Capital Gains Taxes in New Zealand." Tax Working Group Background Paper. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/3-long-term-effects-of-cgt-coleman.pdf.

Coleman, Andrew, and Andrew Grimes, 2010. "Fiscal, Distributional and Efficiency Impacts of Land and Property Taxes. Tax Policy Working Group Background Paper. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/3-impacts-land-property-taxes-coleman_grimes.pdf

Cnossen, Sijbren, 2000. "Taxing Capital Income in the Nordic Countries: A Model for the European Union?" In Cnossen, Sijbren (ed.), *Taxing Capital Income in the European Union: Issues and Options for Reform*, 46-77. Oxford University Press, Oxford, UK.

Creedy, John, 2010. "The Distortionary Costs of Taxation." Tax Working Group Background Paper. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/5-the-distortionary-costs-of-taxation-johncreedy.pdf

Diamond, John W., 2005. "Dynamic Effects of Extending the 2001 and 2003 Income Tax Cuts." *International Tax and Public Finance* 12 (2), 165-192.

Diamond, John W., and Alan D. Viard, 2008. "Welfare and Macroeconomic Effects of Deficit – Financed Tax Cuts: Lessons from CGE Models." In Viard, Alan D. (ed.), *Tax Policy Lessons from the 2000s*, 145–193. The AEI Press, Washington, DC.

Diamond, John W., and George R. Zodrow, 2006. "Reflections on the Use of Life-Cycle Computable General Equilibrium Models in Analyzing the Effects of Tax Reform." NTA Network (April), National Tax Association, 3–4.

Diamond, John W., and George R. Zodrow, 2007a. "Economic Effects of a Personal Capital Income Tax Add-on to a Consumption Tax." *Finanzarchiv* 63 (3), 374–395.

Diamond, John W., and George R. Zodrow, 2007b. *Effects of the FairTax on Housing*. National Association of Home Builders, Washington DC, 2007.

Diamond, John W., and George R. Zodrow, 2008. "Consumption Tax Reform: Changes in Business Equity and Housing Prices." In *Fundamental Tax Reform: Issues, Choices and Implications*, edited by John W. Diamond and George R. Zodrow, 227-280. MIT Press, Cambridge, MA.

Genser, Bernd, and Andreas Reutter, 2007. "Moving Towards Dual Income Taxation in Europe." *FinanzArchiv* 63 (3), 436–456.

Gunning, Timothy, John W. Diamond, and George R. Zodrow, 2008. "Selecting Parameter Values for General Equilibrium Model Simulations." *Proceedings of the One Hundredth Annual Conference on Taxation*, National Tax Association, Washington, DC.

Henry, Ken, et al., 2010. *Australia's Future Tax System: Report to the Treasurer*. Commonwealth of Australia, Canberra, Australia.

Institute for Fiscal Studies, 2011. *Tax by Design*. The Mirrlees Review, Institute for Fiscal Studies. Oxford University Press, Oxford, UK.

Joint Committee on Taxation, 2006. *Macroeconomic Analysis of a Proposal to Broaden the Individual Income Tax Base and Lower Individual Income Tax Rates*. JCX-53-06. Joint Committee on Taxation, Washington, DC.

Kalb, Guyonne, 2010. "Modelling Labor Supply Responses in Australia and New Zealand. In *Tax Reform in Open Economies: International and Country Perspectives,* edited by Iris Claus, Norman Gemmell, Michelle Harding and David White, 166–193. Edward Elgar Publishing, Northampton, MA.

Netzer, Dick, 1999. *Land Value Taxation: Could It Work Today?* Lincoln Institute for Land Policy, Cambridge, MA.

New Zealand Inland Revenue Department, 2008. *Briefing for the Incoming Minister of Revenue, 2008*. New Zealand Inland Revenue Department, Wellington, New Zealand.

New Zealand Inland Revenue Department and New Zealand Treasury, 2009a. *Company Tax Issues Facing New Zealand*. Tax Working Group Background Paper. New Zealand Treasury, Wellington, New Zealand. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/4-company-tax-_issues-facing-nz.pdf

New Zealand Inland Revenue Department and New Zealand Treasury, 2009b. *Estimating the Distortionary Costs of Income Taxation in New Zealand*. Tax Working Group Background Paper. New Zealand Treasury, Wellington, New Zealand. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/5-estimating-the-distortionary-costs-of-income-taxation-in-newzealand-treasury.pdf.

New Zealand Inland Revenue Department and New Zealand Treasury, 2009c. *Land Tax*. Tax Working Group Background Paper. New Zealand Treasury, Wellington, New Zealand. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/3-land-tax-ird_treasury.pdf.

New Zealand Inland Revenue Department and New Zealand Treasury, 2009d. *The Taxation of Capital Gains*. Tax Working Group Background Paper. New Zealand Treasury, Wellington, New Zealand. http://www.victoria.ac.nz/sacl/cagtr/twg/Publications/3-taxation-of-capital-gains-ird_treasury.pdf

New Zealand Treasury, 2008. *Medium Term Tax Policy Challenges and Opportunities*. New Zealand Treasury, Wellington, New Zealand.

Shoven, John B, and John Whalley, 1992. *Applying General Equilibrium*. Cambridge University Press.

Sorensen, Peter Birch, 2005. "Neutral Taxation of Shareholder Income." *International Tax and Public Finance* 12 (6), 777-801.

President's Advisory Panel on Federal Tax Reform. 2005. *Simple, Fair, and Pro-Growth: Proposals to Fix America's Tax System*. US Government Printing Office: Washington, DC.

Victoria University of Wellington Tax Working Group, 2010. *A Tax System for New Zealand's Future*. Victoria University of Wellington, Wellington, New Zealand. http://www.victoria.ac.nz/sacl/cagtr/pdf/tax-report-website.pdf.

Zodrow, George R, 2007. "Should Capital Income be Subject to Consumption-Based Taxation?" In *Taxing Capital Income*, edited by Henry J. Aaron, Len Burman, and Eugene C. Steuerle, 49-81. Urban Institute Press, Washington, DC.

Zodrow, George R, 2010a. "Capital Mobility and Capital Tax Competition." *National Tax Journal* 63 (4, Part 2), 865-902.

Zodrow, George R., 2010b. "International Taxation and Company Tax Policy in Small Open Economies." In *Tax Reform in Open Economies: International and Country Perspectives,* edited by Iris Claus, Norman Gemmell, Michelle Harding and David White, 109-134. Edward Elgar Publishing, Northampton, MA.

Table A. Simulation Results:

Reduction in CIT Rate from 33% to 25%, Offset with Reduced Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	0.6	0.8	1.1	1.3	1.4
Output of sector C	1.3	1.3	1.4	1.5	1.6
Output of sector M	-0.1	0.0	0.2	0.4	0.6
Output of sector N	-0.5	-0.8	-1.1	-1.3	-1.1
Output of sector R	-0.2	-0.4	-0.6	-0.7	-0.4
Output of sector H	-0.2	-0.4	-0.6	-0.7	-0.4
Investment	5.7	5.7	5.7	5.5	5.2
Investment in sector C	25.5	23.4	21.0	18.8	17.5
Investment in sector M	10.5	9.6	8.7	7.8	7.3
Investment in sector N	-6.0	-5.1	-4.1	-3.0	-2.5
Investment in sector R	-5.0	-3.4	-1.8	-0.6	-0.6
Investment in sector H	-4.2	-2.9	-1.5	-0.5	-0.5
Consumption	-0.3	-0.3	-0.3	-0.2	0.0
Personal saving	9.4	7.4	5.6	3.8	2.8
Government transfers	-12.2	-11.4	-10.5	-9.7	-9.3
NZ exports	2.4	2.6	2.8	3.1	3.2
NZ imports	-0.7	-0.3	0.1	0.6	0.9
Net NZ exports	6.3	6.2	6.2	6.1	6.1
Current account	1.4	1.5	1.6	1.8	1.8
Capital account	1.6	1.6	1.6	1.6	1.6
Labor Supply	0.6	0.4	0.2	0.0	-0.1
Firm value in C	20.2	19.5	18.6	17.8	17.4
Capital stock in C	1.3	2.9	4.7	6.4	7.4
Firm value in M	8.3	8.2	8.1	8.0	8.0
Capital stock in M	0.2	0.8	1.5	2.2	2.6
Firm value in N	-3.4	-3.2	-2.8	-2.4	-2.0
Capital stock in N	-0.4	-1.4	-2.3	-2.9	-2.5

Firm value in R	-3.6	-2.5	-1.4	-0.5	-0.4
Capital stock in R	-0.2	-0.5	-0.8	-0.8	-0.6
Firm value in H	-2.7	-2.0	-1.2	-0.6	-0.5
Capital stock in H	-0.1	-0.4	-0.6	-0.7	-0.5
Price index	-0.3	0.1	0.5	0.8	0.8
Price of C-imports	0.1	0.0	0.0	-0.1	-0.1
Price of M	-0.2	-0.1	0.0	0.0	0.1
Price of N	0.0	0.3	0.6	0.9	0.9
Price of R	-0.6	0.4	1.4	2.1	1.9
Price of H	-0.6	0.4	1.4	2.1	1.9
Real wages	0.3	0.1	-0.1	-0.2	-0.1
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.28	0.28
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.09	0.09	0.09
Capital share, sector H (%)	0.35	0.35	0.34	0.34	0.34
Value of net exports ($b)	0.00	9.10	9.91	11.38	128.18
Cap inc to foreigners ($b)	17.19	18.74	20.31	23.22	259.50
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	7.84	5.87	6.36	7.28	81.29
Government transfers ($b)	14.93	13.83	15.13	17.47	197.85

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0	0.234	0.234	0.234	0.234
Avg tax rate on interest	0.249	0.249	0.249	0.249	0.249
Avg tax rate on dividends	0.308	0.308	0.308	0.308	0.308
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.25	0.25	0.25	0.25
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.088	0.088	0.087	0.087	0.087
One-time chg in foreign K stock	1.1				
One-time chg in population	-0.1				

Table B-1. Simulation Results:

Reduction in PIT Rates by 5 Percentage Pts., Offset w/ Reduced Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	3.4	3.4	3.3	3.3	3.2
Output of sector C	3.2	3.1	3.1	3.0	3.0
Output of sector M	2.5	2.7	3.0	3.3	3.6
Output of sector N	2.8	3.4	4.3	5.6	6.8
Output of sector R	0.6	1.4	2.5	3.8	5.2
Output of sector H	0.6	1.4	2.5	3.8	5.2
Investment	10.0	9.5	8.6	7.5	6.5
Investment in sector C	7.6	7.3	6.7	6.2	6.0
Investment in sector M	6.6	6.3	5.8	5.3	5.3
Investment in sector N	12.5	13.0	13.4	13.7	13.8
Investment in sector R	17.6	15.9	13.7	10.7	7.6
Investment in sector H	10.9	9.9	8.4	6.5	4.7
Consumption	2.1	2.6	3.2	4.0	4.8
Personal saving	8.7	7.6	6.6	6.0	5.4
Government transfers	-38.2	-38.0	-37.7	-37.2	-37.0
NZ exports	1.7	1.8	2.0	2.3	2.5
NZ imports	3.4	3.7	4.1	4.6	5.1
Net NZ exports	-0.4	-0.4	-0.5	-0.6	-0.6
Current account	0.9	1.0	1.1	1.2	1.4
Capital account	0.0	0.0	0.0	0.0	0.0
Labor Supply	3.8	3.7	3.6	3.6	3.5
Firm value in C	4.0	4.1	4.0	3.9	4.1
Capital stock in C	0.2	0.7	1.2	1.8	2.3
Firm value in M	3.6	3.8	4.0	4.2	4.5
Capital stock in M	0.1	0.5	1.0	1.5	1.9
Firm value in N	8.4	9.4	10.5	11.7	12.9

Capital stock in N	0.8	2.9	5.9	9.6	13.8
Firm value in R	14.4	13.5	12.3	10.5	8.8
Capital stock in R	0.5	1.8	3.4	5.5	7.6
Firm value in H	6.4	6.2	5.8	5.2	4.7
Capital stock in H	0.3	1.1	2.1	3.4	4.6
Price index	1.7	1.2	0.6	-0.1	-0.8
Price of C-imports	-0.3	-0.4	-0.4	-0.5	-0.5
Price of M	0.1	0.1	0.2	0.2	0.3
Price of N	0.0	-0.2	-0.5	-0.9	-1.3
Price of R	5.8	4.1	2.2	0.1	-2.3
Price of H	5.8	4.1	2.2	0.1	-2.3
Real wages	-2.0	-1.5	-0.8	-0.1	0.8
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.05	0.05	0.05	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.26
Capital share, sector M (%)	0.24	0.24	0.24	0.23	0.23
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.06
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.35
Value of net exports ($b)	8.41	8.96	9.74	11.19	126.27
Cap inc to foreigners ($b)	17.66	18.14	19.66	22.48	251.23
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	5.51	5.81	6.29	7.20	80.39
Government transfers ($b)	15.33	9.74	10.58	12.17	137.46

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.184	0.184	0.184	0.184
Avg tax rate on interest	0.249	0.199	0.199	0.199	0.199
Avg tax rate on dividends	0.308	0.258	0.258	0.258	0.258
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.330	0.330	0.330	0.330
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.087	0.086	0.086	0.085	0.085
One-time chg in foreign K stock	0.0				
One-time chg in population	0.3				

Table B-2. Simulation Results:

Increase in PIT Rates by 5 Percentage Points, Offset with Increased Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	-3.7	-3.6	-3.5	-3.5	-3.4
Output of sector C	-3.3	-3.3	-3.2	-3.1	-3.1
Output of sector M	-2.8	-2.9	-3.2	-3.5	-3.8
Output of sector N	-3.0	-3.7	-4.6	-5.9	-7.2
Output of sector R	-0.6	-1.5	-2.7	-4.1	-5.5
Output of sector H	-0.6	-1.5	-2.7	-4.1	-5.5
Investment	-10.7	-10.0	-9.0	-7.7	-6.7
Investment in sector C	-7.6	-7.3	-6.8	-6.2	-6.1
Investment in sector M	-6.9	-6.5	-6.0	-5.6	-5.5
Investment in sector N	-13.1	-13.6	-13.9	-14.0	-14.0
Investment in sector R	-18.8	-16.8	-14.1	-10.8	-7.7
Investment in sector H	-12.0	-10.8	-9.1	-7.0	-5.0
Consumption	-2.3	-2.8	-3.5	-4.3	-5.1
Personal saving	-8.7	-7.7	-6.7	-6.1	-5.6
Government transfers	34.2	34.1	33.8	33.4	33.1
NZ exports	-1.9	-2.0	-2.2	-2.5	-2.7
NZ imports	-3.8	-4.0	-4.4	-4.9	-5.3
Net NZ exports	0.5	0.5	0.5	0.6	0.7
Current account	-1.0	-1.0	-1.1	-1.3	-1.4
Capital account	0.0	0.0	0.0	0.0	0.0
Labor Supply	-4.0	-3.9	-3.9	-3.8	-3.7
Firm value in C	-4.1	-4.2	-4.2	-4.1	-4.2
Capital stock in C	-0.2	-0.7	-1.2	-1.8	-2.3
Firm value in M	-3.8	-4.0	-4.2	-4.4	-4.7
Capital stock in M	-0.1	-0.6	-1.0	-1.5	-1.9
Firm value in N	-7.7	-8.6	-9.6	-10.7	-11.8

Capital stock in N	-0.8	-3.1	-6.1	-9.9	-13.9
Firm value in R	-13.5	-12.7	-11.4	-9.9	-8.4
Capital stock in R	-0.5	-1.9	-3.6	-5.7	-7.7
Firm value in H	-7.1	-6.7	-6.3	-5.6	-5.0
Capital stock in H	-0.3	-1.2	-2.3	-3.6	-5.0
Price index	-1.9	-1.3	-0.7	0.1	0.9
Price of C-imports	0.4	0.4	0.5	0.5	0.6
Price of M	-0.2	-0.2	-0.2	-0.3	-0.3
Price of N	0.0	0.2	0.5	1.0	1.5
Price of R	-6.2	-4.5	-2.5	-0.1	2.6
Price of H	-6.2	-4.5	-2.5	-0.1	2.6
Real wages	2.3	1.7	1.0	0.1	-0.8
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.11
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.09	0.09
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.34
Value of net exports ($b)	8.41	8.27	8.94	10.18	112.48
Cap inc to foreigners ($b)	17.66	18.14	19.66	22.48	251.22
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	5.51	5.81	6.29	7.19	80.39
Government transfers ($b)	15.33	21.13	22.89	26.12	290.33

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.284	0.284	0.284	0.284
Avg tax rate on interest	0.249	0.299	0.299	0.299	0.299
Avg tax rate on dividends	0.308	0.358	0.358	0.358	0.358
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.330	0.330	0.330	0.330
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.083	0.083	0.084	0.084	0.085
One-time chg in foreign K stock	0.0				
One-time chg in population	-0.3				

Table C-1. Simulation Results:

Reduction in GST Rate of 6 Percentage Points, Offset with Reduced Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	2.6	2.6	2.5	2.4	2.4
Output of sector C	1.1	1.1	1.0	1.0	1.0
Output of sector M	2.2	2.3	2.4	2.5	2.6
Output of sector N	2.0	2.0	2.1	2.2	2.3
Output of sector R	0.3	0.7	1.1	1.5	1.9
Output of sector H	0.3	0.7	1.1	1.5	1.9
Investment	1.6	1.4	1.1	0.8	0.6
Investment in sector C	-2.1	-1.8	-1.6	-1.2	-1.0
Investment in sector M	0.0	0.1	0.2	0.3	0.4
Investment in sector N	-1.1	-0.9	-0.7	-0.4	-0.1
Investment in sector R	5.2	4.3	3.3	2.3	1.7
Investment in sector H	5.2	4.4	3.5	2.6	1.9
Consumption	1.8	1.9	2.1	2.3	2.5
Personal saving	0.2	0.2	0.5	1.0	1.0
Government transfers	-40.5	-40.5	-40.5	-40.5	-40.4
NZ exports	4.5	4.5	4.6	4.7	4.7
NZ imports	3.3	3.4	3.5	3.7	3.8
Net NZ exports	5.9	5.9	5.9	5.9	5.9
Current account	2.5	2.5	2.6	2.6	2.7
Capital account	1.6	1.6	1.6	1.6	1.6
Labor Supply	1.8	1.8	1.9	1.9	1.9
Firm value in C	-1.1	-1.0	-0.9	-0.8	-0.6
Capital stock in C	0.7	0.5	0.4	0.3	0.3
Firm value in M	0.0	0.1	0.2	0.3	0.4
Capital stock in M	0.0	0.0	0.0	0.0	0.1
Firm value in N	-0.6	-0.5	-0.4	-0.3	0.0

Capital stock in N	-0.1	-0.2	-0.4	-0.5	-0.1
Firm value in R	3.8	3.3	2.7	2.1	1.7
Capital stock in R	0.1	0.5	0.9	1.4	1.7
Firm value in H	3.1	2.8	2.5	2.1	1.9
Capital stock in H	0.1	0.5	1.0	1.4	1.9
Price index	-3.7	-3.9	-4.2	-4.4	-4.6
Price of C-imports	-0.3	-0.3	-0.3	-0.4	-0.4
Price of M	0.2	0.2	0.3	0.3	0.3
Price of N	0.3	0.4	0.4	0.4	0.4
Price of R	5.5	4.7	3.8	2.8	2.0
Price of H	5.5	4.7	3.8	2.8	2.0
Real wages	3.8	4.0	4.2	4.5	4.8
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.45	0.45	0.45	0.45	0.45
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.05	0.05	0.05	0.05	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.35
Value of net exports ($b)	8.41	9.50	10.30	11.80	132.17
Cap inc to foreigners ($b)	17.66	18.76	20.33	23.24	259.71
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	7.90	5.87	6.36	7.28	81.32
Government transfers ($b)	15.33	9.37	10.15	11.61	129.90

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.235	0.235	0.235	0.235
Avg tax rate on interest	0.249	0.249	0.249	0.249	0.249
Avg tax rate on dividends	0.308	0.308	0.308	0.308	0.308
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.330	0.330	0.330	0.330
GST rate	0.125	0.065	0.065	0.065	0.065
Interest rate	0.087	0.087	0.087	0.087	0.087
One-time chg in foreign K stock	1.2				
One-time chg in population	0.0				

Table C-2. Simulation Results:

Increase in GST Rate of 6 Percentage Points, Offset with Increased Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	-2.5	-2.4	-2.3	-2.3	-2.2
Output of sector C	-1.1	-1.0	-1.0	-1.0	-1.0
Output of sector M	-2.1	-2.1	-2.2	-2.3	-2.4
Output of sector N	-1.9	-1.9	-2.0	-2.1	-2.3
Output of sector R	-0.3	-0.7	-1.0	-1.5	-1.9
Output of sector H	-0.3	-0.7	-1.0	-1.5	-1.9
Investment	-1.7	-1.4	-1.1	-0.9	-0.7
Investment in sector C	1.8	1.6	1.3	1.0	0.8
Investment in sector M	-0.2	-0.2	-0.3	-0.4	-0.5
Investment in sector N	0.8	0.6	0.5	0.2	-0.1
Investment in sector R	-5.0	-4.2	-3.2	-2.3	-1.7
Investment in sector H	-5.0	-4.3	-3.4	-2.5	-1.8
Consumption	-1.7	-1.8	-2.0	-2.2	-2.4
Personal saving	-0.3	-0.3	-0.6	-1.0	-1.1
Government transfers	37.8	37.9	37.9	37.9	38.0
NZ exports	-4.1	-4.2	-4.2	-4.3	-4.3
NZ imports	-3.1	-3.2	-3.3	-3.5	-3.6
Net NZ exports	-5.3	-5.3	-5.3	-5.3	-5.3
Current account	-2.5	-2.5	-2.5	-2.5	-2.6
Capital account	-1.7	-1.7	-1.7	-1.7	-1.7
Labor Supply	-1.7	-1.7	-1.8	-1.8	-1.8
Firm value in C	1.0	0.8	0.7	0.6	0.5
Capital stock in C	-0.7	-0.6	-0.4	-0.4	-0.4
Firm value in M	-0.1	-0.2	-0.3	-0.4	-0.5
Capital stock in M	0.0	0.0	0.0	-0.1	-0.2
Firm value in N	0.4	0.3	0.3	0.1	-0.2

Capital stock in N	0.1	0.2	0.3	0.3	-0.1
Firm value in R	-3.6	-3.2	-2.6	-2.0	-1.7
Capital stock in R	-0.1	-0.5	-0.9	-1.3	-1.7
Firm value in H	-3.0	-2.7	-2.4	-2.1	-1.8
Capital stock in H	-0.1	-0.5	-0.9	-1.4	-1.8
Price index	3.6	3.9	4.1	4.4	4.6
Price of C-imports	0.3	0.3	0.3	0.4	0.4
Price of M	-0.2	-0.2	-0.2	-0.2	-0.2
Price of N	-0.3	-0.3	-0.4	-0.4	-0.3
Price of R	-5.0	-4.3	-3.5	-2.6	-1.8
Price of H	-5.0	-4.3	-3.5	-2.6	-1.8
Real wages	-3.5	-3.7	-3.9	-4.1	-4.4
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.34
Value of net exports ($b)	8.41	7.84	8.49	9.69	108.00
Cap inc to foreigners ($b)	17.66	17.58	19.05	21.79	243.42
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	3.10	5.74	6.22	7.11	79.46
Government transfers ($b)	15.33	21.71	23.54	26.92	300.93

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.233	0.233	0.233	0.233
Avg tax rate on interest	0.249	0.249	0.249	0.249	0.249
Avg tax rate on dividends	0.308	0.308	0.308	0.308	0.308
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.330	0.330	0.330	0.330
GST rate	0.125	0.185	0.185	0.185	0.185
Interest rate	0.083	0.083	0.083	0.083	0.083
One-time chg in foreign K stock	-1.2				
One-time chg in population	0.0				

Table D-1. Simulation Results:

New Business Capital Gains Tax, Offset with Reduced PIT/CIT Rates

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	0.2	0.1	0.1	0.0	0.0
Output of sector C	-0.1	-0.1	-0.1	0.0	0.0
Output of sector M	0.2	0.1	-0.1	-0.2	-0.2
Output of sector N	0.4	0.6	0.8	1.0	1.1
Output of sector R	0.1	0.2	0.4	0.5	0.6
Output of sector H	0.1	0.2	0.4	0.5	0.6
Investment	-1.0	-0.9	-0.8	-0.7	-0.7
Investment in sector C	-1.3	-1.2	-1.2	-1.1	-0.9
Investment in sector M	-10.8	-8.8	-7.1	-5.8	-5.5
Investment in sector N	3.1	2.9	2.7	2.4	2.3
Investment in sector R	3.1	2.4	1.8	1.2	0.9
Investment in sector H	2.2	1.7	1.2	0.8	0.6
Consumption	0.3	0.3	0.4	0.4	0.4
Personal saving	-1.2	-1.4	-0.8	-0.3	-0.1
Government transfers	0.0	0.0	0.0	0.0	0.0
NZ exports	-0.4	-0.4	-0.4	-0.4	-0.4
NZ imports	0.6	0.6	0.6	0.7	0.6
Net NZ exports	-1.7	-1.7	-1.7	-1.7	-1.7
Current account	-0.3	-0.3	-0.3	-0.3	-0.3
Capital account	-0.3	-0.3	-0.3	-0.3	-0.3
Labor Supply	0.1	0.2	0.2	0.3	0.3
Firm value in C	-0.7	-0.7	-0.7	-0.7	-0.7
Capital stock in C	-0.2	-0.3	-0.4	-0.5	-0.6
Firm value in M	-5.6	-5.1	-4.7	-4.5	-4.4
Capital stock in M	-0.3	-0.9	-1.4	-1.8	-1.9
Firm value in N	1.8	1.9	1.9	1.9	2.0

Capital stock in N	0.2	0.7	1.3	1.9	2.3
Firm value in R	2.3	1.9	1.5	1.1	0.9
Capital stock in R	0.1	0.3	0.5	0.7	0.9
Firm value in H	1.3	1.1	0.9	0.7	0.6
Capital stock in H	0.1	0.2	0.4	0.5	0.6
Price index	0.3	0.2	0.0	-0.1	-0.2
Price of C-imports	-0.1	-0.1	-0.1	-0.1	-0.1
Price of M	0.1	0.2	0.3	0.3	0.4
Price of N	0.0	0.0	-0.1	-0.2	-0.3
Price of R	0.8	0.3	-0.1	-0.5	-0.7
Price of H	0.8	0.3	-0.1	-0.5	-0.7
Real wages	-0.3	-0.2	-0.1	0.0	0.1
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.23	0.23	0.23
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.35
Value of net exports ($b)	8.41	8.56	9.27	10.61	118.52
Cap inc to foreigners ($b)	17.66	17.99	19.49	22.29	249.05
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	4.86	5.79	6.27	7.17	80.14
Government transfers ($b)	15.33	15.75	17.07	19.52	218.09

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.229	0.229	0.230	0.230
Avg tax rate on interest	0.249	0.244	0.244	0.244	0.244
Avg tax rate on dividends	0.308	0.302	0.302	0.302	0.302
Avg tax rate on cap gains	0.204	0.200	0.200	0.200	0.200
Corporate income tax rate	0.33	0.324	0.324	0.324	0.324
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.085	0.084	0.084	0.084	0.084
One-time chg in foreign K stock	-0.3				
One-time chg in population	0.1				

Table D-2. Simulation Results:

New Comprehensive Capital Gains Tax, Offset with Reduced PIT/CIT Rates

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	0.5	0.5	0.6	0.6	0.7
Output of sector C	0.4	0.4	0.5	0.5	0.5
Output of sector M	0.4	0.3	0.2	0.2	0.1
Output of sector N	0.7	1.0	1.3	1.7	1.9
Output of sector R	0.1	0.1	0.1	0.2	0.3
Output of sector H	0.1	0.1	0.1	0.2	0.3
Investment	0.7	0.9	0.9	0.9	0.8
Investment in sector C	5.0	4.4	3.8	3.1	2.9
Investment in sector M	-6.8	-5.4	-4.2	-3.5	-3.3
Investment in sector N	5.8	5.7	5.5	5.2	4.9
Investment in sector R	8.0	7.4	6.6	5.4	3.9
Investment in sector H	-1.8	-1.6	-1.3	-1.0	-0.8
Consumption	0.4	0.5	0.5	0.6	0.7
Personal saving	0.2	1.2	0.9	0.6	0.5
Government transfers	0.0	0.0	0.0	0.0	0.0
NZ exports	-0.8	-0.8	-0.8	-0.7	-0.7
NZ imports	0.8	0.9	1.0	1.1	1.1
Net NZ exports	-2.9	-2.9	-2.9	-2.9	-2.9
Current account	-0.6	-0.5	-0.5	-0.5	-0.5
Capital account	-0.8	-0.8	-0.8	-0.8	-0.8
Labor Supply	0.6	0.6	0.6	0.6	0.6
Firm value in C	3.0	2.8	2.6	2.4	2.3
Capital stock in C	-0.2	0.1	0.4	0.7	0.8
Firm value in M	-3.3	-3.0	-2.7	-2.5	-2.4
Capital stock in M	-0.2	-0.5	-0.9	-1.1	-1.2
Firm value in N	3.6	3.8	4.0	4.2	4.3

Capital stock in N	0.4	1.4	2.6	3.9	4.9
Firm value in R	5.9	5.7	5.3	4.7	4.0
Capital stock in R	0.2	0.8	1.6	2.6	3.9
Firm value in H	-1.1	-1.0	-0.9	-0.8	-0.8
Capital stock in H	0.0	-0.2	-0.3	-0.5	-0.8
Price index	0.5	0.5	0.5	0.5	0.5
Price of C-imports	-0.1	-0.1	-0.1	-0.1	-0.1
Price of M	0.1	0.2	0.3	0.4	0.4
Price of N	0.0	-0.1	-0.2	-0.4	-0.5
Price of R	1.4	1.5	1.5	1.6	1.5
Price of H	1.4	1.5	1.5	1.6	1.5
Real wages	-0.5	-0.5	-0.5	-0.5	-0.4
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.23	0.23	0.23
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.34
Value of net exports ($b)	8.41	8.47	9.19	10.52	117.73
Cap inc to foreigners ($b)	17.66	17.87	19.36	22.14	247.41
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	4.36	5.77	6.26	7.16	79.95
Government transfers ($b)	15.33	15.75	17.07	19.52	218.09

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.223	0.223	0.223	0.223
Avg tax rate on interest	0.249	0.237	0.237	0.237	0.237
Avg tax rate on dividends	0.308	0.293	0.293	0.293	0.293
Avg tax rate on cap gains	0.204	0.195	0.194	0.194	0.194
Corporate income tax rate	0.33	0.314	0.314	0.314	0.314
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.084	0.084	0.084	0.084	0.084
One-time chg in foreign K stock	-0.5				
One-time chg in population	0.1				

Table E. Simulation Results:

Cumulative Reforms 2007-2011, Offset with Reduced Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	4.1	4.2	4.4	4.6	4.6
Output of sector C	4.4	4.5	4.6	4.6	4.6
Output of sector M	2.6	2.9	3.3	3.8	4.2
Output of sector N	2.6	2.9	3.6	4.7	6.3
Output of sector R	0.5	1.2	2.2	3.6	5.2
Output of sector H	0.5	1.2	2.2	3.6	5.2
Investment	15.3	14.8	14.0	12.7	11.4
Investment in sector C	31.5	29.3	26.5	23.7	22.4
Investment in sector M	13.8	13.2	12.4	11.4	10.9
Investment in sector N	5.5	7.4	9.2	11.0	12.0
Investment in sector R	7.2	7.3	6.9	5.7	3.9
Investment in sector H	10.2	10.1	9.5	8.1	5.7
Consumption	2.0	2.5	3.2	4.1	5.2
Personal saving	18.9	15.5	12.8	10.5	9.0
Government transfers	-35.1	-34.2	-33.1	-32.0	-31.4
NZ exports	2.6	2.9	3.4	3.9	4.2
NZ imports	3.2	3.8	4.7	5.7	6.4
Net NZ exports	1.9	1.8	1.7	1.6	1.5
Current account	1.5	1.6	1.9	2.2	2.4
Capital account	0.6	0.6	0.6	0.6	0.6
Labor Supply	4.7	4.4	4.2	3.9	3.8
Firm value in C	25.2	25.0	24.5	23.9	23.8
Capital stock in C	1.1	3.0	5.3	7.5	8.8
Firm value in M	11.2	11.6	12.0	12.3	12.7
Capital stock in M	0.3	1.1	2.1	3.1	3.8
Firm value in N	5.4	7.0	8.8	11.1	13.5

Capital stock in N	0.3	1.4	3.3	6.7	12.0
Firm value in R	13.3	13.8	13.9	13.4	12.4
Capital stock in R	0.2	0.7	1.5	2.7	3.9
Firm value in H	5.8	6.2	6.4	6.2	5.7
Capital stock in H	0.3	1.0	2.2	3.7	5.7
Price index	3.9	3.7	3.4	2.9	2.0
Price of C-imports	-0.3	-0.4	-0.5	-0.6	-0.6
Price of M	0.0	0.1	0.3	0.4	0.5
Price of N	0.0	0.1	0.1	0.0	-0.5
Price of R	5.8	4.9	3.6	1.8	-0.9
Price of H	5.8	4.9	3.6	1.8	-0.9
Real wages	-4.2	-3.8	-3.2	-2.5	-1.5
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.05	0.05	0.05	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.23	0.23
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.09	0.09
Capital share, sector H (%)	0.35	0.35	0.35	0.34	0.35
Value of net exports ($b)	8.41	9.14	9.97	11.51	130.84
Cap inc to foreigners ($b)	17.66	18.37	19.91	22.76	254.33
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	6.41	5.83	6.32	7.23	80.74
Government transfers ($b)	15.33	10.22	11.23	13.06	149.67

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.174	0.174	0.174	0.174
Avg tax rate on interest	0.249	0.191	0.191	0.191	0.191
Avg tax rate on dividends	0.308	0.237	0.237	0.237	0.237
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.250	0.250	0.250	0.250
GST rate	0.125	0.15	0.15	0.15	0.15
Interest rate	0.089	0.088	0.087	0.086	0.086
One-time chg in foreign K stock	0.4				
One-time chg in population	0.2				

Table F. Simulation Results:

RFRM Tax on Residential Rental Housing, Offset with Reduced PIT/CIT Rates

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	0.1	0.1	0.1	0.1	0.2
Output of sector C	0.1	0.1	0.1	0.1	0.1
Output of sector M	0.1	0.1	0.1	0.1	0.1
Output of sector N	0.1	0.1	0.1	0.2	0.2
Output of sector R	0.0	-0.1	-0.1	-0.1	-0.1
Output of sector H	0.0	-0.1	-0.1	0.1	-0.1
Investment	0.2	0.2	0.2	0.3	0.3
Investment in sector C	1.2	1.0	0.9	0.8	0.7
Investment in sector M	0.7	0.6	0.5	0.4	0.4
Investment in sector N	0.7	0.7	0.7	0.6	0.6
Investment in sector R	-7.4	-6.5	-5.3	-4.1	-2.9
Investment in sector H	1.1	1.1	1.0	0.9	0.6
Consumption	0.1	0.0	0.0	0.0	0.0
Personal saving	0.8	0.5	0.3	0.2	0.2
Government transfers	0.0	0.0	0.0	0.0	0.0
NZ exports	0.0	0.0	0.0	0.0	0.0
NZ imports	0.1	0.1	0.1	0.1	0.1
Net NZ exports	-0.2	-0.2	-0.2	-0.2	-0.2
Current account	0.0	0.0	0.0	0.0	0.0
Capital account	-0.1	-0.1	-0.1	-0.1	-0.1
Labor Supply	0.1	0.1	0.1	0.1	0.1
Firm value in C	1.5	1.5	1.4	1.4	1.3
Capital stock in C	0.0	0.1	0.2	0.2	0.2
Firm value in M	0.9	0.8	0.8	0.8	0.8
Capital stock in M	0.0	0.1	0.1	0.1	0.1
Firm value in N	0.4	0.5	0.5	0.5	0.5

Capital stock in N	0.0	0.2	0.3	0.5	0.6
Firm value in R	-5.1	-4.6	-3.9	-3.3	-2.7
Capital stock in R	-0.2	-0.7	-1.4	-2.2	-2.9
Firm value in H	0.6	0.6	0.7	0.7	0.6
Capital stock in H	0.0	0.1	0.2	0.4	0.6
Price index	0.1	0.1	0.1	0.2	0.2
Price of C-imports	0.0	0.0	0.0	0.0	0.0
Price of M	0.0	0.0	0.0	0.0	0.0
Price of N	0.0	0.0	0.0	0.0	-0.1
Price of R	0.3	0.4	0.5	0.6	0.6
Price of H	0.3	0.4	0.5	0.6	0.6
Real wages	-0.1	-0.1	-0.1	-0.2	-0.2
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.09	0.09
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.35
Value of net exports ($b)	8.41	8.63	9.35	10.69	119.46
Cap inc to foreigners ($b)	17.66	18.12	19.64	22.46	250.93
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	5.42	5.80	6.29	7.19	80.36
Government transfers ($b)	15.33	15.75	17.07	19.52	218.09

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.232	0.232	0.232	0.232
Avg tax rate on interest	0.249	0.247	0.247	0.247	0.247
Avg tax rate on dividends	0.308	0.306	0.306	0.306	0.306
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.327	0.327	0.327	0.327
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.085	0.085	0.085	0.085	0.085
One-time chg in foreign K stock	0.0				
One-time chg in population	0.0				

Table G. Simulation Results:

Introduction of ACE Tax, Offset with Increased PIT/CIT Rates

	Years After Reform				
Variable (Changes in %)	0	2	5	10	100
GDP	-1.4	-1.4	-1.4	-1.3	-1.3
Output of sector C	-0.3	-0.7	-0.8	-0.9	-0.9
Output of sector M	-2.2	-2.3	-2.4	-2.6	-2.7
Output of sector N	-2.7	-2.5	-2.2	-1.9	-1.8
Output of sector R	-0.5	-1.2	-2.1	-3.0	-3.6
Output of sector H	-0.5	-1.2	-2.1	-3.0	-3.6
Investment	2.3	1.6	1.7	2.1	2.3
Investment in sector C	4.3	2.8	2.2	1.9	1.6
Investment in sector M	19.5	16.5	14.0	12.0	11.0
Investment in sector N	15.8	13.9	12.7	11.7	10.6
Investment in sector R	4.5	4.6	5.2	5.5	4.1
Investment in sector H	-14.8	-13.2	-10.7	-7.9	-5.8
Consumption	-2.2	-2.5	-2.8	-3.1	-3.4
Personal saving	-7.7	3.3	2.7	1.4	0.4
Government transfers	0.0	0.0	0.0	0.0	0.0
NZ exports	6.5	6.2	5.9	5.6	5.4
NZ imports	-4.4	-5.0	-5.6	-6.3	-6.6
Net NZ exports	19.9	20.0	20.0	20.1	20.2
Current account	3.4	3.2	3.1	2.9	2.8
Capital account	4.5	4.5	4.5	4.5	4.5
Labor Supply	-2.1	-2.6	-2.9	-3.2	-3.3
Firm value in C	2.1	0.6	0.2	0.0	-0.2
Capital stock in C	2.1	2.3	2.5	2.6	2.5
Firm value in M	10.2	8.7	8.1	7.8	7.5
Capital stock in M	0.5	1.5	2.6	3.5	3.8
Firm value in N	19.5	17.8	17.5	17.5	17.1

Capital stock in N	1.1	3.6	6.4	9.2	10.6
Firm value in R	13.1	12.3	13.0	13.6	12.6
Capital stock in R	0.1	0.5	1.0	2.1	4.0
Firm value in H	-8.3	-8.3	-7.5	-6.4	-5.8
Capital stock in H	-0.4	-1.5	-2.8	-4.3	-5.8
Price index	-2.2	-1.9	-1.4	-1.0	-0.7
Price of C-imports	0.4	0.5	0.6	0.6	0.7
Price of M	-0.7	-0.9	-1.1	-1.3	-1.4
Price of N	-0.4	-0.8	-1.2	-1.6	-1.9
Price of R	-6.3	-4.9	-2.9	-1.0	0.5
Price of H	-6.3	-4.9	-2.9	-1.0	0.5
Real wages	2.5	2.3	1.9	1.5	1.1
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.11	0.12	0.11	0.11	0.11
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.13	0.13	0.13	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.25
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.06
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.34	0.34	0.33	0.32
Value of net exports ($b)	8.40	9.88	10.65	12.10	133.82
Cap inc to foreigners ($b)	17.65	19.98	21.66	24.77	276.71
Cap inc earned abroad ($b)	5.15	5.44	5.89	6.74	75.31
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.10
Chg: NZ K owned by foreign ($b)	12.03	5.98	6.48	7.42	82.86
Government transfers ($b)	15.33	15.75	17.07	19.52	218.09

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.280	0.284	0.286	0.287
Avg tax rate on interest	0.249	0.149	0.149	0.149	0.149
Avg tax rate on dividends	0.308	0.000	0.000	0.000	0.000
Avg tax rate on cap gains	0.000	0.000	0.000	0.000	0.000
Corporate income tax rate	0.330	0.396	0.402	0.404	0.406
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.086	0.091	0.091	0.091	0.091
One-time chg in foreign K stock	3.1				
One-time chg in population	-0.6				

Table H. Simulation Results:

Dual Income Tax, Offset with Increased Labor Income Tax Rates

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	-2.5	-2.0	-1.2	-0.6	-0.2
Output of sector C	-0.3	-0.2	0.2	0.6	0.7
Output of sector M	-3.6	-3.6	-3.6	-3.6	-3.4
Output of sector N	-4.5	-5.0	-5.5	-5.8	-5.6
Output of sector R	-0.9	-2.2	-3.6	-4.7	-5.0
Output of sector H	-0.9	-2.2	-3.6	-4.7	-5.0
Investment	3.3	3.9	5.4	6.7	6.9
Investment in sector C	47.6	43.1	39.3	35.5	33.0
Investment in sector M	8.3	7.2	7.2	7.1	6.7
Investment in sector N	-7.6	-7.1	-5.3	-3.4	-2.7
Investment in sector R	-16.1	-12.1	-7.1	-2.8	-2.2
Investment in sector H	-21.9	-17.8	-12.6	-7.8	-5.8
Consumption	-3.5	-3.8	-4.2	-4.4	-4.3
Personal saving	-10.6	11.6	8.4	4.9	2.3
Government transfers	0.0	0.0	0.0	0.0	0.0
NZ exports	5.5	5.8	6.1	6.3	6.5
NZ imports	-6.4	-5.9	-5.3	-4.8	-4.4
Net NZ exports	20.1	20.1	20.0	20.0	19.9
Current account	2.9	3.0	3.1	3.3	3.4
Capital account	4.5	4.5	4.5	4.5	4.5
Labor Supply	-3.0	-3.4	-3.5	-3.7	-3.9
Firm value in C	40.8	36.6	35.1	33.9	33.0
Capital stock in C	3.2	6.1	9.4	12.7	14.5
Firm value in M	8.7	6.6	7.0	7.5	7.6
Capital stock in M	0.3	0.7	1.2	1.8	2.3
Firm value in N	-1.6	-3.1	-2.3	-1.3	-0.5

Capital stock in N	-0.4	-1.7	-3.0	-3.6	-2.7
Firm value in R	-8.8	-7.4	-3.6	-0.3	0.6
Capital stock in R	-0.4	-1.5	-2.6	-3.1	-2.2
Firm value in H	-12.5	-11.6	-9.2	-6.8	-5.8
Capital stock in H	-0.6	-2.1	-3.8	-5.2	-5.8
Price index	-3.1	-1.9	-0.4	0.7	1.2
Price of C-imports	0.7	0.6	0.5	0.5	0.4
Price of M	-0.8	-0.6	-0.4	-0.2	-0.1
Price of N	-0.4	0.1	0.6	1.0	1.1
Price of R	-9.3	-5.7	-1.5	2.0	3.4
Price of H	-9.3	-5.7	-1.5	2.0	3.4
Real wages	3.6	2.7	1.6	0.7	0.5
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.47	0.47	0.47	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.18
Output share, sector N (%)	0.11	0.11	0.11	0.11	0.11
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.13	0.13	0.13	0.13	0.14
Capital share, sector C (%)	0.27	0.27	0.28	0.29	0.30
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.09	0.09	0.09	0.09
Capital share, sector H (%)	0.35	0.34	0.34	0.33	0.32
Value of net exports ($b)	8.40	9.69	10.55	12.14	136.83
Cap inc to foreigners ($b)	17.65	19.98	21.66	24.76	276.71
Cap inc earned abroad ($b)	5.15	5.44	5.89	6.74	75.31
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.10
Chg: NZ K owned by foreign ($b)	12.02	5.98	6.48	7.42	82.86
Government transfers ($b)	15.33	15.75	17.07	19.52	218.09

Avg tax rate on wages	0.234	0.301	0.302	0.299	0.295
Avg tax rate on interest	0.249	0.196	0.196	0.196	0.196
Avg tax rate on dividends	0.308	0.000	0.000	0.000	0.000
Avg tax rate on cap gains	0.000	0.000	0.000	0.000	0.000
Corporate income tax rate	0.33	0.196	0.196	0.196	0.196
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.085	0.093	0.092	0.091	0.091
One-time chg in foreign K stock	3.1				
One-time chg in population	-0.7				

Table I-1. Simulation Results:

Lower Tax Rate on Interest Income, Offset with Reduced Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	0.6	0.7	0.7	0.7	0.7
Output of sector C	0.9	0.9	0.9	0.9	0.9
Output of sector M	0.1	0.1	0.2	0.3	0.4
Output of sector N	-0.1	0.1	0.5	0.9	1.5
Output of sector R	0.0	0.2	0.4	0.7	1.2
Output of sector H	0.0	0.2	0.4	0.7	1.2
Investment	4.2	4.1	3.9	3.7	3.3
Investment in sector C	6.8	6.3	5.8	5.3	5.1
Investment in sector M	5.5	4.9	4.4	4.0	3.8
Investment in sector N	5.6	5.8	6.1	6.4	6.4
Investment in sector R	5.6	5.4	5.0	4.3	3.1
Investment in sector H	0.8	1.0	1.1	1.1	0.7
Consumption	-0.1	0.1	0.2	0.5	0.8
Personal saving	4.9	4.0	3.3	2.7	2.1
Government transfers	-14.0	-13.8	-13.7	-13.6	-13.5
NZ exports	2.6	2.6	2.7	2.7	2.8
NZ imports	-0.4	-0.3	-0.2	0.0	0.1
Net NZ exports	6.2	6.2	6.2	6.1	6.1
Current account	1.5	1.5	1.6	1.6	1.6
Capital account	1.6	1.6	1.6	1.6	1.6
Labor Supply	0.5	0.4	0.4	0.3	0.2
Firm value in C	4.0	3.9	3.8	3.8	3.8
Capital stock in C	0.9	1.3	1.8	2.3	2.6
Firm value in M	3.1	3.1	3.0	3.1	3.2
Capital stock in M	0.1	0.4	0.8	1.1	1.3
Firm value in N	3.2	3.6	4.1	4.7	5.3

Capital stock in N	0.3	1.3	2.6	4.4	6.4
Firm value in R	3.9	3.9	3.8	3.6	3.0
Capital stock in R	0.1	0.6	1.2	2.0	3.1
Firm value in H	0.4	0.6	0.7	0.8	0.7
Capital stock in H	0.0	0.1	0.2	0.4	0.7
Price index	-0.2	-0.2	-0.3	-0.5	-0.7
Price of C-imports	0.0	0.0	0.0	0.0	0.0
Price of M	-0.2	-0.2	-0.2	-0.2	-0.2
Price of N	-0.1	-0.2	-0.3	-0.5	-0.7
Price of R	-0.4	-0.5	-0.7	-1.1	-1.8
Price of H	-0.4	-0.5	-0.7	-1.1	-1.8
Real wages	0.2	0.3	0.4	0.6	0.9
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.24
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.34	0.34
Value of net exports ($b)	8.41	9.13	9.90	11.34	127.05
Cap inc to foreigners ($b)	17.66	18.74	20.31	23.22	259.44
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.36
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.12
Chg: NZ K owned by foreign ($b)	7.82	5.87	6.36	7.28	81.29
Government transfers ($b)	15.33	13.54	14.71	16.85	188.71

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.234	0.234	0.234	0.234
Avg tax rate on interest	0.249	0.149	0.149	0.149	0.149
Avg tax rate on dividends	0.308	0.308	0.308	0.308	0.308
Avg tax rate on cap gains	0	0	0	0	0
Corporate income tax rate	0.33	0.330	0.330	0.330	0.330
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.088	0.088	0.087	0.087	0.087
One-time chg in foreign K stock	1.1				
One-time chg in population	-0.1				

Table I-2. Simulation Results:

Lower Tax Rate on Interest Income, Offset with Capital Gains Tax, Transfers

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	0.5	0.5	0.5	0.5	0.5
Output of sector C	0.6	0.6	0.7	0.7	0.7
Output of sector M	0.1	0.1	0.0	0.0	0.1
Output of sector N	0.0	0.4	0.8	1.3	1.9
Output of sector R	0.1	0.3	0.5	0.9	1.3
Output of sector H	0.1	0.3	0.5	0.9	1.3
Investment	2.8	2.7	2.6	2.5	2.2
Investment in sector C	4.2	3.8	3.5	3.3	3.2
Investment in sector M	-1.6	-1.2	-0.7	-0.3	-0.2
Investment in sector N	7.0	7.1	7.2	7.3	7.2
Investment in sector R	6.7	6.2	5.5	4.6	3.3
Investment in sector H	1.8	1.6	1.5	1.3	0.9
Consumption	0.0	0.1	0.3	0.5	0.8
Personal saving	2.9	2.5	2.3	2.1	1.6
Government transfers	-11.2	-11.1	-11.1	-11.0	-11.0
NZ exports	2.1	2.1	2.2	2.2	2.3
NZ imports	-0.1	-0.1	0.0	0.1	0.2
Net NZ exports	4.8	4.8	4.8	4.8	4.8
Current account	1.2	1.3	1.3	1.3	1.3
Capital account	1.3	1.3	1.3	1.3	1.3
Labor Supply	0.4	0.3	0.3	0.3	0.2
Firm value in C	2.3	2.3	2.2	2.3	2.3
Capital stock in C	0.7	0.9	1.2	1.5	1.8
Firm value in M	-0.9	-0.7	-0.5	-0.2	-0.1
Capital stock in M	0.0	-0.1	-0.2	-0.2	-0.1
Firm value in N	3.9	4.3	4.8	5.4	6.0

Capital stock in N	0.4	1.6	3.2	5.2	7.2
Firm value in R	4.7	4.5	4.1	3.7	3.1
Capital stock in R	0.2	0.7	1.3	2.2	3.3
Firm value in H	1.0	1.0	1.0	1.0	0.9
Capital stock in H	0.0	0.2	0.4	0.6	0.9
Price index	-0.1	-0.2	-0.3	-0.5	-0.8
Price of C-imports	0.0	0.0	0.0	0.0	0.0
Price of M	-0.1	0.0	0.0	0.0	0.0
Price of N	-0.1	-0.2	-0.4	-0.6	-0.8
Price of R	-0.2	-0.5	-0.9	-1.5	-2.2
Price of H	-0.2	-0.5	-0.9	-1.5	-2.2
Real wages	0.1	0.2	0.4	0.6	0.9
	Years After Reform				
Variable (Levels)	0	2	5	10	100
Output share, sector C (%)	0.46	0.46	0.46	0.46	0.46
Output share, sector M (%)	0.19	0.19	0.19	0.19	0.19
Output share, sector N (%)	0.12	0.12	0.12	0.12	0.12
Output share, sector R (%)	0.04	0.04	0.04	0.04	0.04
Output share, sector H (%)	0.14	0.14	0.14	0.14	0.14
Capital share, sector C (%)	0.27	0.27	0.27	0.27	0.27
Capital share, sector M (%)	0.24	0.24	0.24	0.24	0.23
Capital share, sector N (%)	0.05	0.05	0.05	0.05	0.05
Capital share, sector R (%)	0.10	0.10	0.10	0.10	0.10
Capital share, sector H (%)	0.35	0.35	0.35	0.35	0.35
Value of net exports ($b)	8.40	9.04	9.80	11.22	125.55
Cap inc to foreigners ($b)	17.65	18.60	20.16	23.05	257.59
Cap inc earned abroad ($b)	5.16	5.44	5.90	6.74	75.33
Chg: foreign K owned by NZ ($b)	1.65	1.74	1.89	2.16	24.11
Chg: NZ K owned by foreign ($b)	7.34	5.86	6.35	7.26	81.08
Government transfers ($b)	15.33	13.99	15.17	17.36	194.16

		Modeling of Tax Reform in New Zealand			
Avg tax rate on wages	0.234	0.234	0.234	0.234	0.234
Avg tax rate on interest	0.249	0.149	0.149	0.149	0.149
Avg tax rate on dividends	0.308	0.308	0.308	0.308	0.308
Avg tax rate on cap gains	0.123	0.123	0.123	0.123	0.123
Corporate income tax rate	0.33	0.330	0.330	0.330	0.330
GST rate	0.125	0.125	0.125	0.125	0.125
Interest rate	0.087	0.087	0.087	0.087	0.086
One-time chg in foreign K stock	0.9				
One-time chg in population	0.0				

Table J. Summary of Evaluation of Tax Reforms in New Zealand

	Advantages:					
Tax Reform	Attract FDI F-S Rents	Restrain I-Shifting	Favorable to Growth	Tax L-S Rents	Align PIT-CIT Rates	Encourage LS/Imm
A. CIT rate reduction; reduction in transfers	X	X	X			X
B-1. PIT rate reduction; reduction in transfers			X		X	X
C-1. GST rate reduction; reduction in transfers			X			X
D-1. Introduction of business CGT; reduction in IT rates				X		X
E. Cumulative reforms 2007-11; change in transfers	X	X	X			X
F. RFRM tax on rental housing; reduction in IT rates	X	X	X			X
G. Introduction of ACE/CGT; increase in IT rates	X		X			
H. Introduction of DIT; increase in IT rates on wages	X	X	X			
I-1. Introduction of low interest tax/reduction in transfers			X			X

	Long run changes (%) in:					
Tax Reform	GDP	Inv	Consn	Saving	LS	Welfare
A. CIT rate reduction; reduction in transfers	1.4	5.2	0.0	2.8	-0.1	-0.5
B-1. PIT rate reduction; reduction in transfers	3.2	6.5	4.8	5.4	3.5	1.1
C-1. GST rate reduction; reduction in transfers	2.4	0.6	2.5	1.0	1.9	0.0

D-1. Introduction of business CGT; reduction in IT rates	0.0	-0.7	0.4	-0.1	0.3	0.3
E. Cumulative reforms 2007-11; change in transfers	4.6	11.4	5.2	9.0	3.8	1.0
F. RFRM tax on rental housing; reduction in IT rates	0.2	0.3	0.0	0.2	0.1	0.0
G. Introduction of ACE/CGT; increase in IT rates	0.5	2.6	-0.5	0.8	-0.3	-0.4
H. Introduction of DIT; increase in IT rates on wages	-0.2	6.9	-4.3	2.3	-3.9	-2.9
I-1. Introduction of low interest tax/reduction in transfers	0.7	3.3	0.8	2.1	0.2	-0.1

Notation: F-S=firm-specific; L-S=location-specific; LS=labor supply; Imm=immigration

TABLE P-1. PARAMETER VALUES SPECIFIED EXOGENOUSLY

Parameter	Description	Value	Sources/Comments
Growth Parameters			
n	population growth rate	0.012	mean growth rate 1990-2006 http://www.stats.govt.nz/browse_for_stats/population/ estimates_and_projections/historical-population-tables.aspx
g	labor productivity growth rate	0.015	mean growth rate labor productivity per hour worked 1990-2006 http://www.stats.govt.nz/browse_for_stats/economic_indicators/

			productivity/ProductivityStatistics_MR1978-2006.aspx

Factor Migration Parameters (Assume the "Rest of World" is Australia)

ε_P	immigration parameter	0.25	Implies 0.25 percent increase in NZ population in response to an increase in LI_{NZ}/LI_{ROW} of 1 percent (LI = lifetime income of representative agent in the long run
ε_K	capital supply elasticity	5.0	use relatively large elasticity to approximate a highly elastic supply of capital

Modeling of Tax Reform in New Zealand

Consumer Utility Function Parameters

σ_U	intertemporal EOS	0.35	0.25 (AAKSW, FJDKK) < 0.35 < 0.50 (FR)
ρ	rate of time preference	0.01	FJDKK
σ_C	intratemporal EOS (LE and CH)	0.80	0.80 (AAKSW) roughly consistent w/ an hours worked elasticity of 0.44, following http://www.treasury.Govt.nz/budget/forecasts/befu2010/assumptions-taxpackage-may10.pdf, which is based on Table 8.4, Kalb (2010))
σ_H	EOS between CN and HR	0.33	Li, Liu, and Yao (2009)
σ_N	EOS between CM and N	5.0	FR
σ_R	EOS between H and R	0.5, 1.0, 1.5	test all three values; benchmark is 1.5
σ_M	EOS between M and C	2.0	roughly consistent with FJDKK
σ_F	EOS between C^D, C^F	5.0	between values of Adams and Parmenter (2011) and those suggested by Hillberry-Hummels (2011)

Production Function Parameters (All CES)

m_M	price markup in sector M	0.25	Bayoumi, Laxton and Pesenti (2004)
β	adjustment cost factor, nonhousing	0.05	0.01 (Hall, 2004) < 0.05 < 0.10 (AAKSW)
β_H	adjustment cost factor, housing	0.15	roughly consistent with Li, Liu, and Yao (2009)
$\sigma_M^*, \sigma_C^*, \sigma_N^*$	EOS for K, L, nonhousing	0.50	Adams and Parmenter (2011); Chirinko, Fazzari and Meyer (2004)
σ_H^*, σ_R^*	EOS between K, L housing	0.25	assumes few substitution possibilities between labor and the

housing capital-land structure

Debt-Asset Ratios

b_M, b_C	debt-asset ratios in M, C	0.55	NZT, based on data on 200 largest NZ companies at http://www.management.co.nz/top200/pdf/T20008.pdf
b_N, b_R	debt-asset ratios in N, R	0.50	NZT, assuming similar to corporate figure
b_H	debt-asset ratios in H	0.25	NZ household assets and liabilities balance sheet

---

Notes: AAKSW = Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001)

FR = Fullerton and Rogers (1993)

FJKKK = Fehr, Jokisch, Dallweit, Kindermann, and Kotloikoff (2011)

LE = leisure

CH = composite consumption-housing good

CN = composite corporate-noncorporate consumption good

HR = composite owner-housing and rental housing services

CM = composite imperfectly-perfectly competitive corporate good

H = owner housing

R = rental housing

M = imperfectly competitive corporate good

C = perfectly competitive corporate good (domestic C^D and foreign imports C^F)

N = noncorporate business sector

Modeling of Tax Reform in New Zealand

Figure A. Distributional Effects of Corporate Rate Reduction with Offsetting Transfers

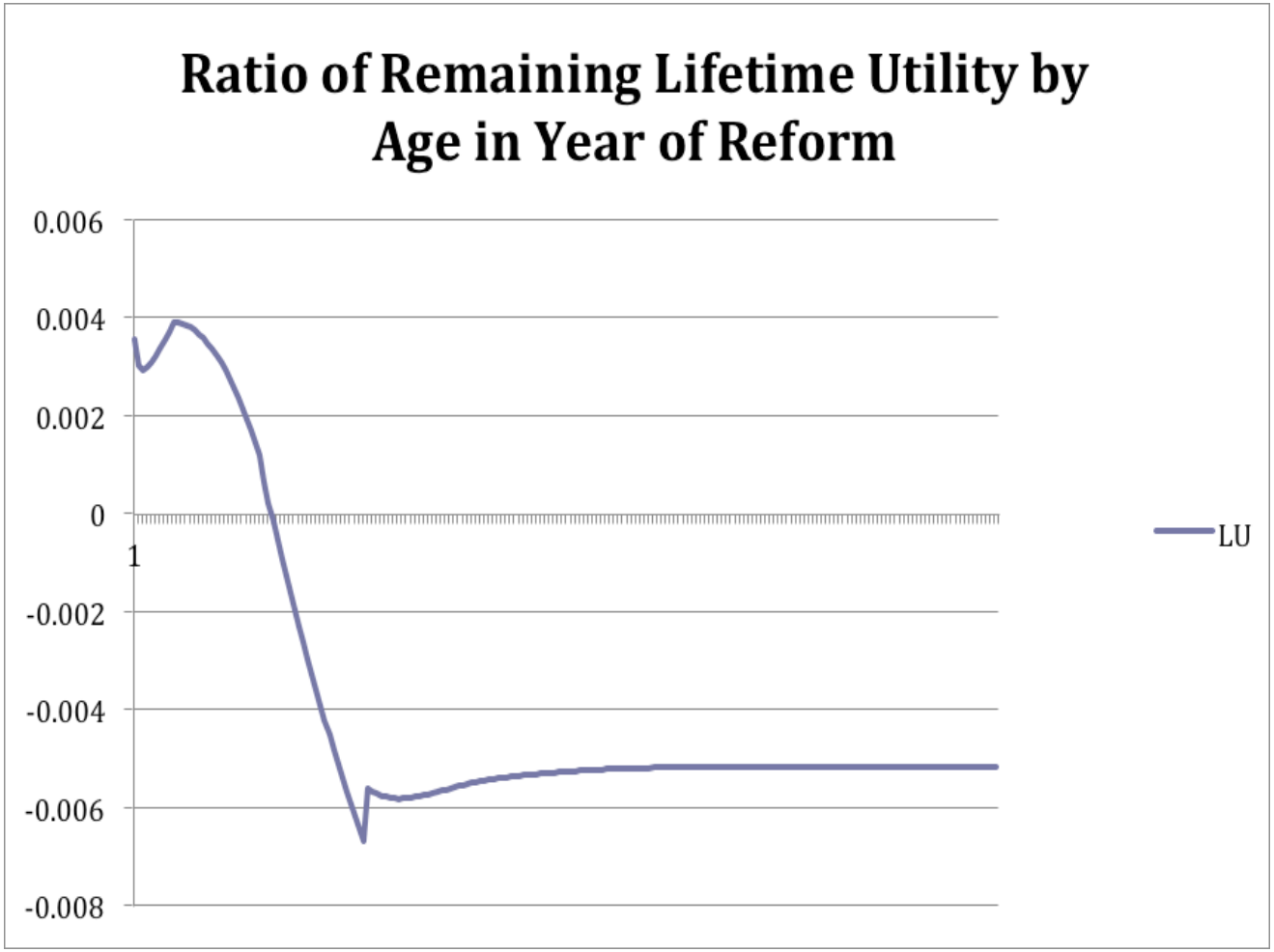


Figure B-1. Distributional Effects of PIT Rate Reduction with Offsetting Transfers

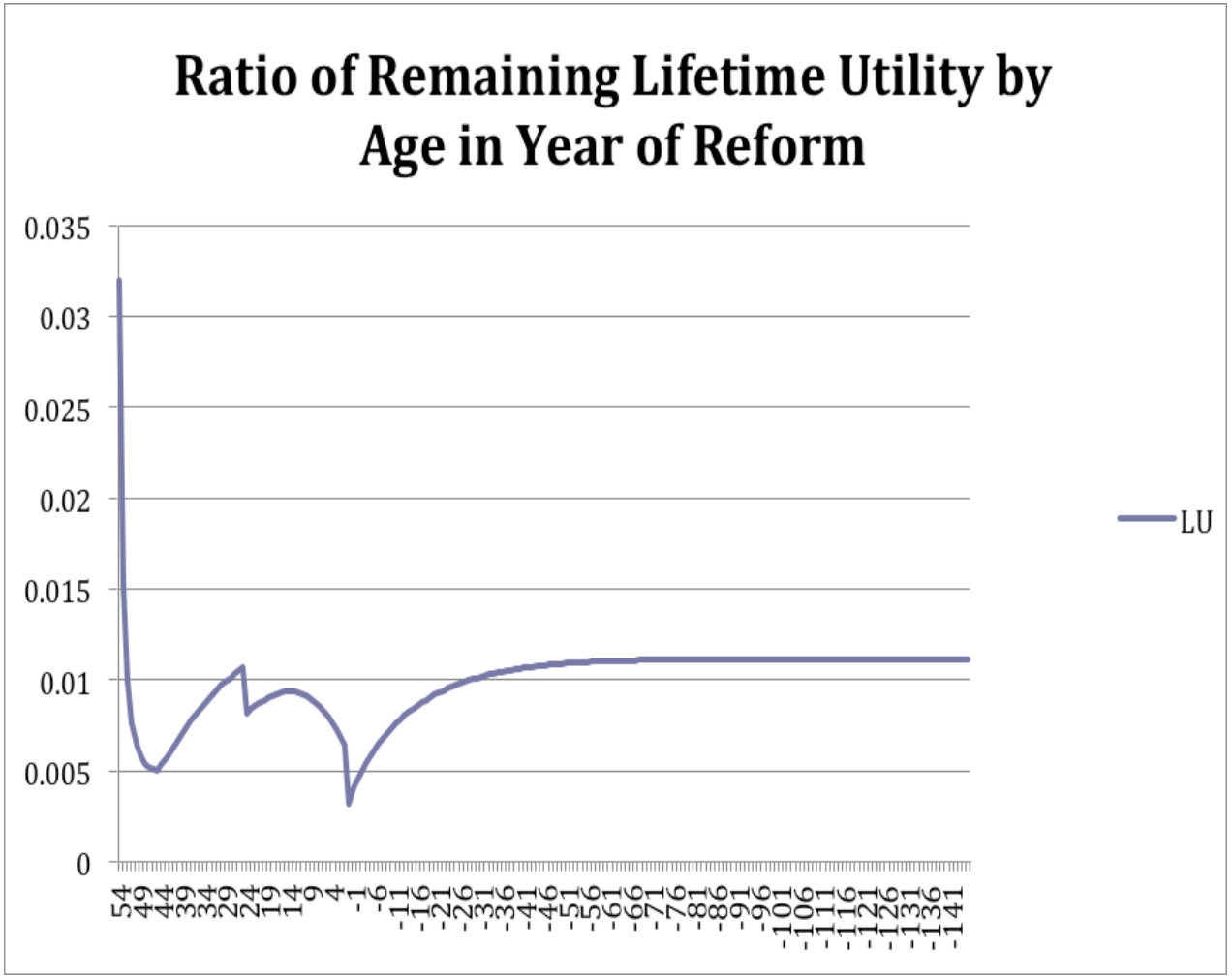


Figure B-2. Distributional Effects of PIT Rate Increase with Offsetting Transfers

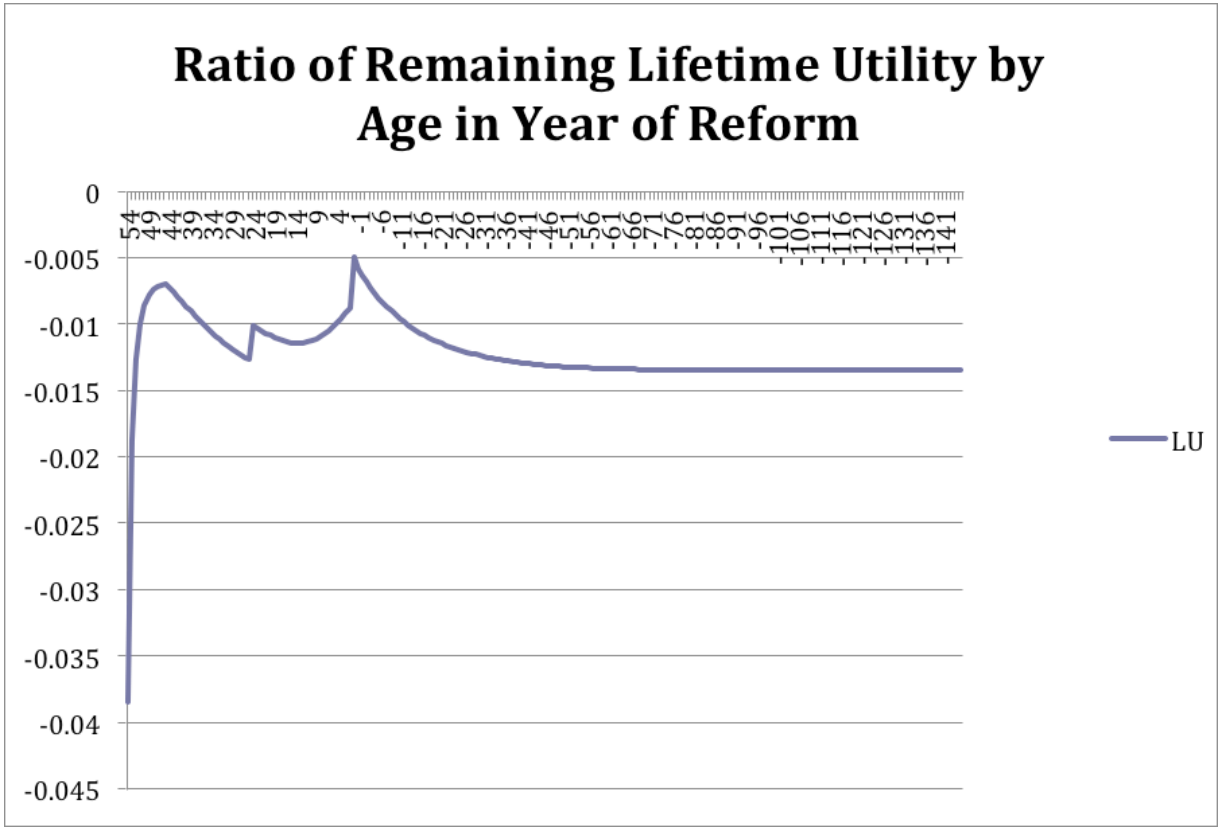


Figure C-1. Distributional Effects of GST Rate Reduction with Offsetting Transfers

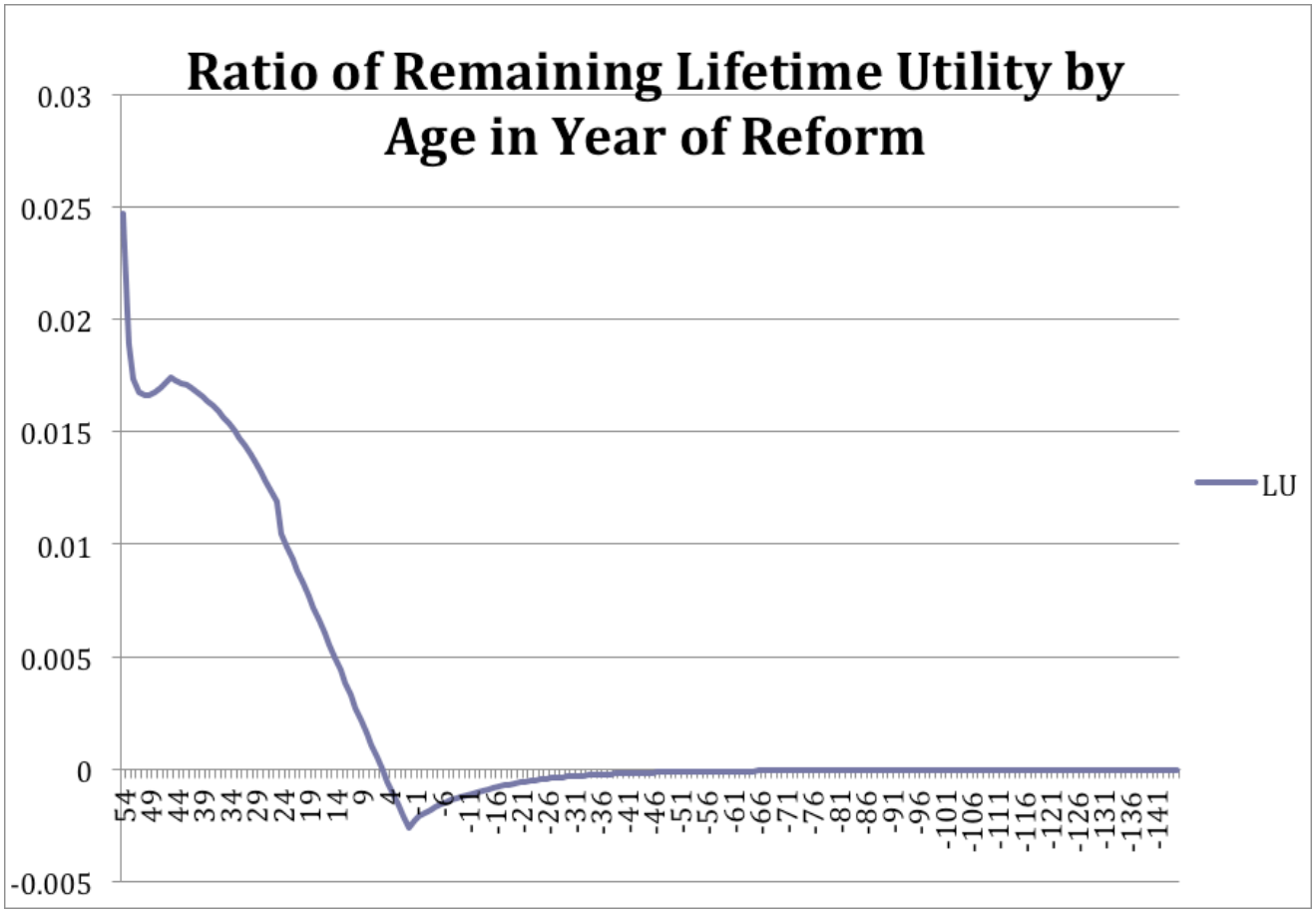


Figure C-2. Distributional Effects of GST Rate Increase with Offsetting Transfers

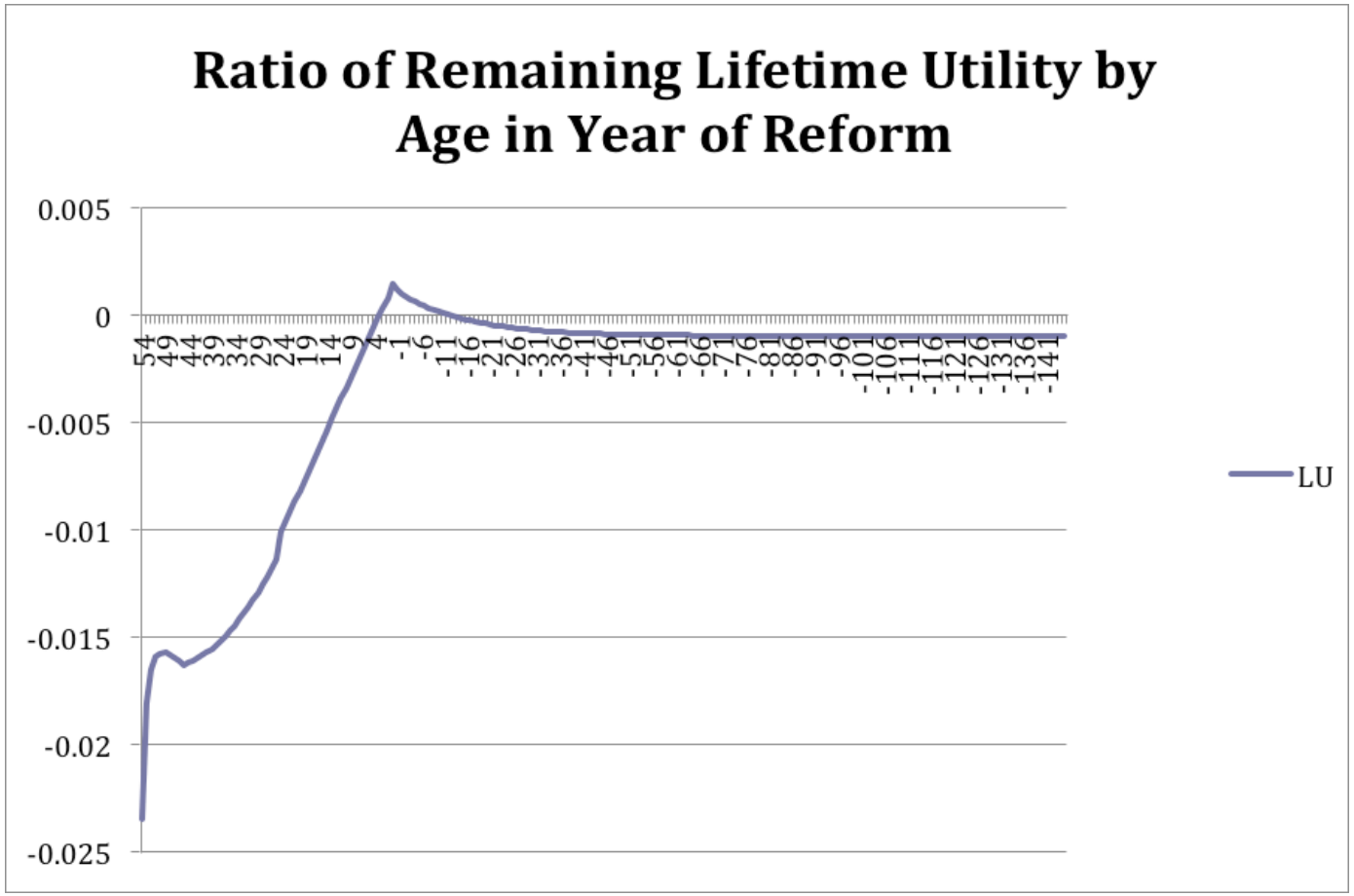


Figure D-1. Distributional Effects of Business Capital Gains Tax with Offsetting Reduction in PIT/CIT Rates

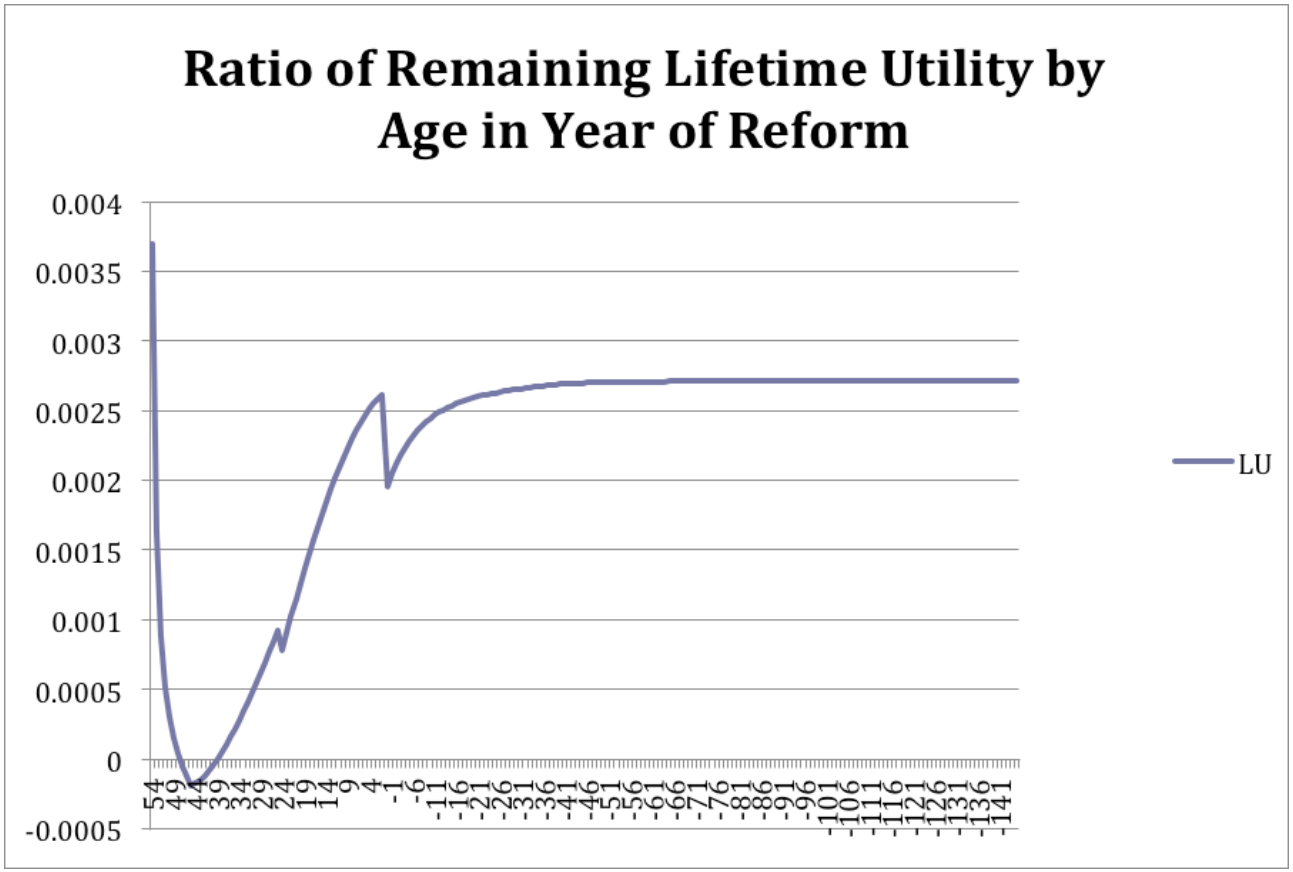


Figure D-2. Distributional Effects of Comprehensive Capital Gains Tax with Offsetting Reduction in PIT/CIT Rates

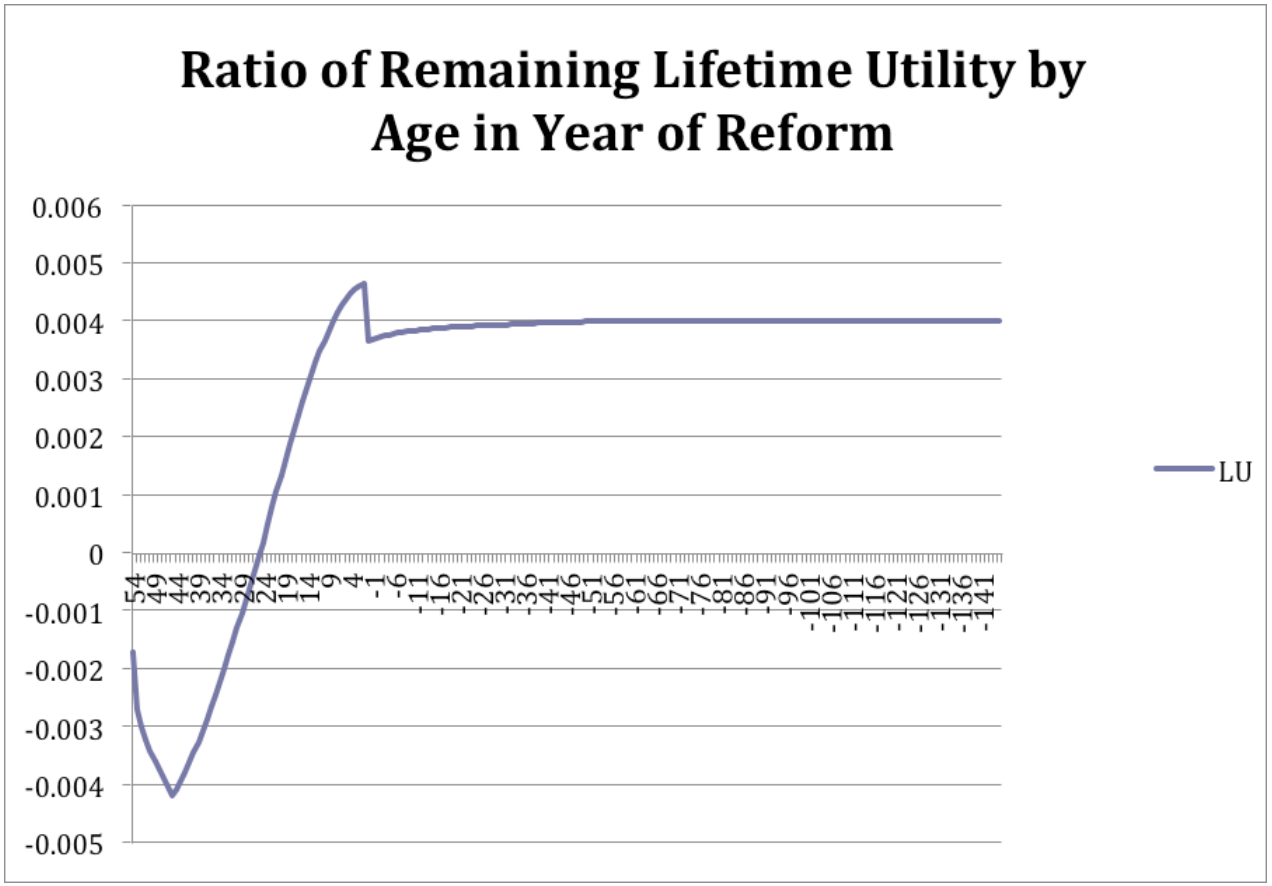


Figure E. Distributional Effects of Cumulative Tax Changes, 2007-2011, with Offsetting Reduction in Transfer Payments

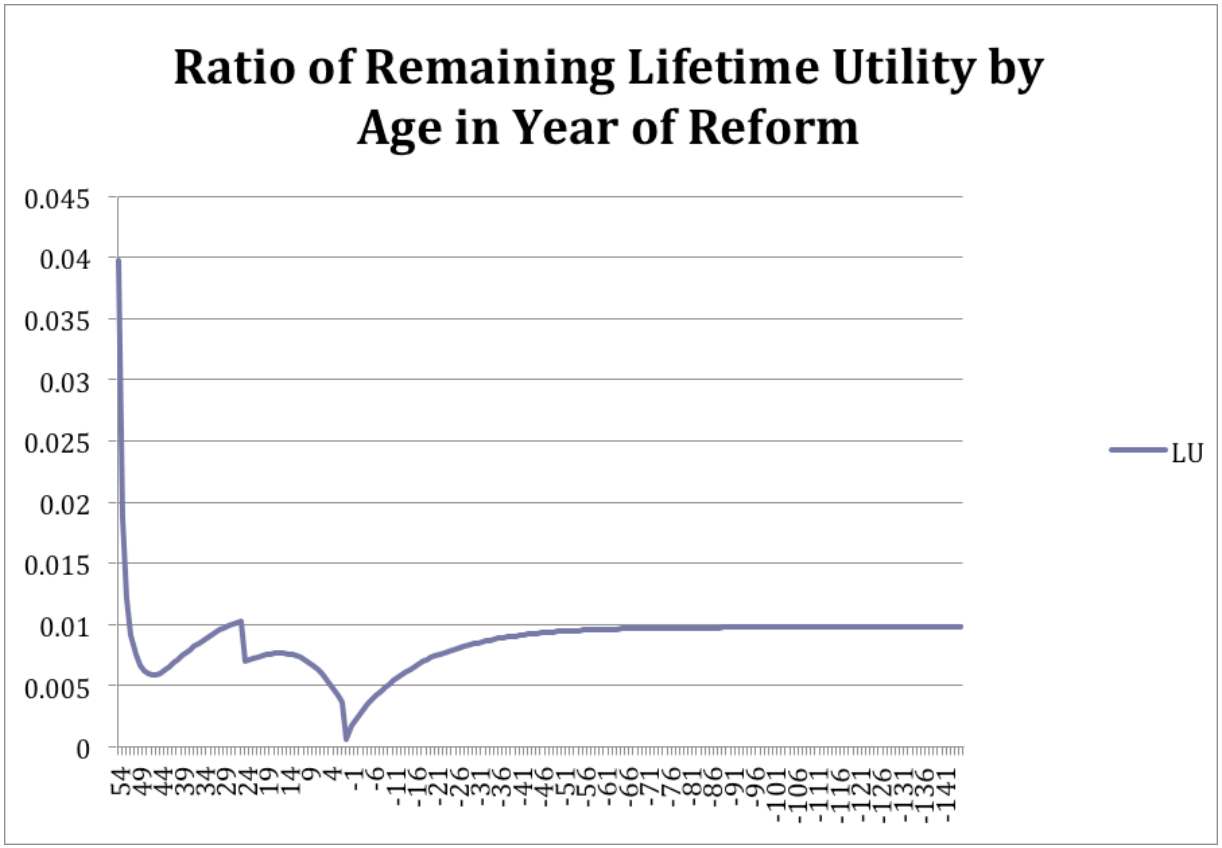
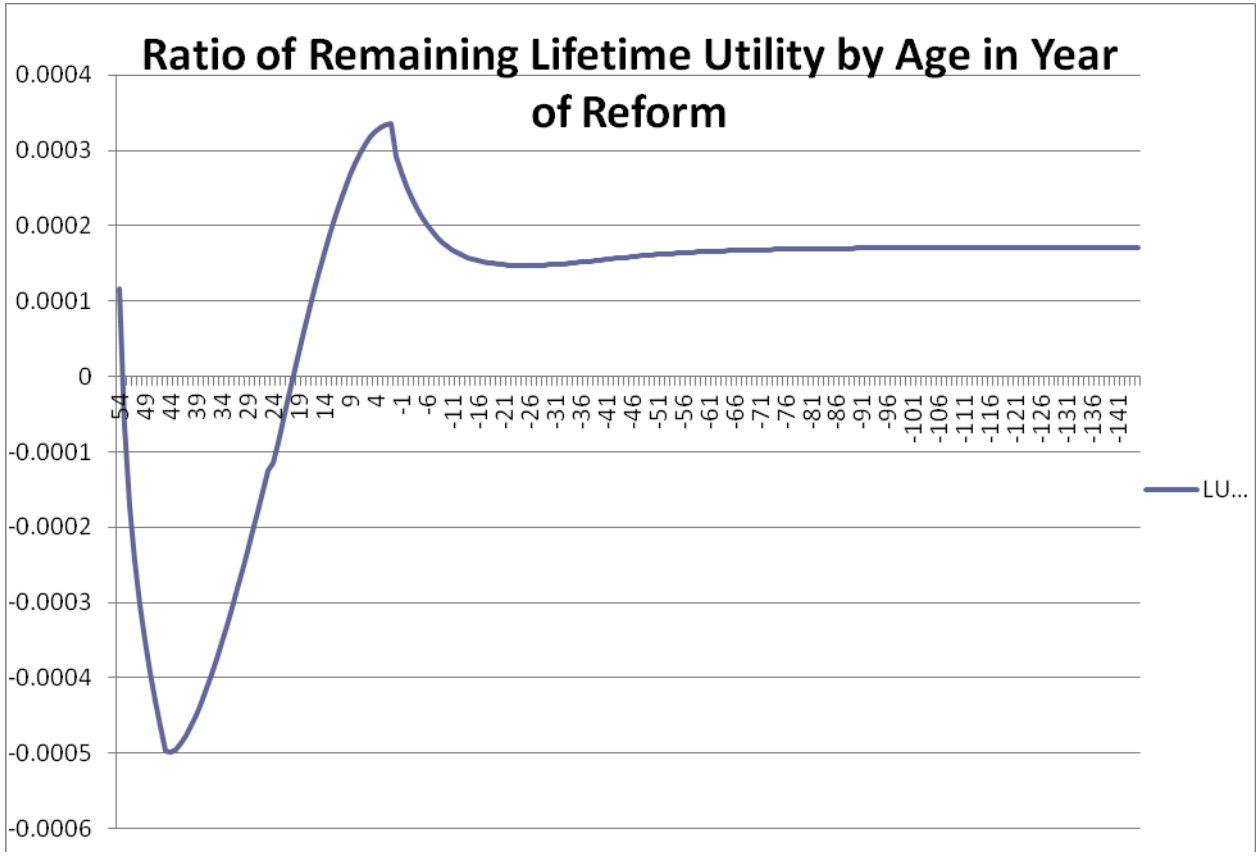
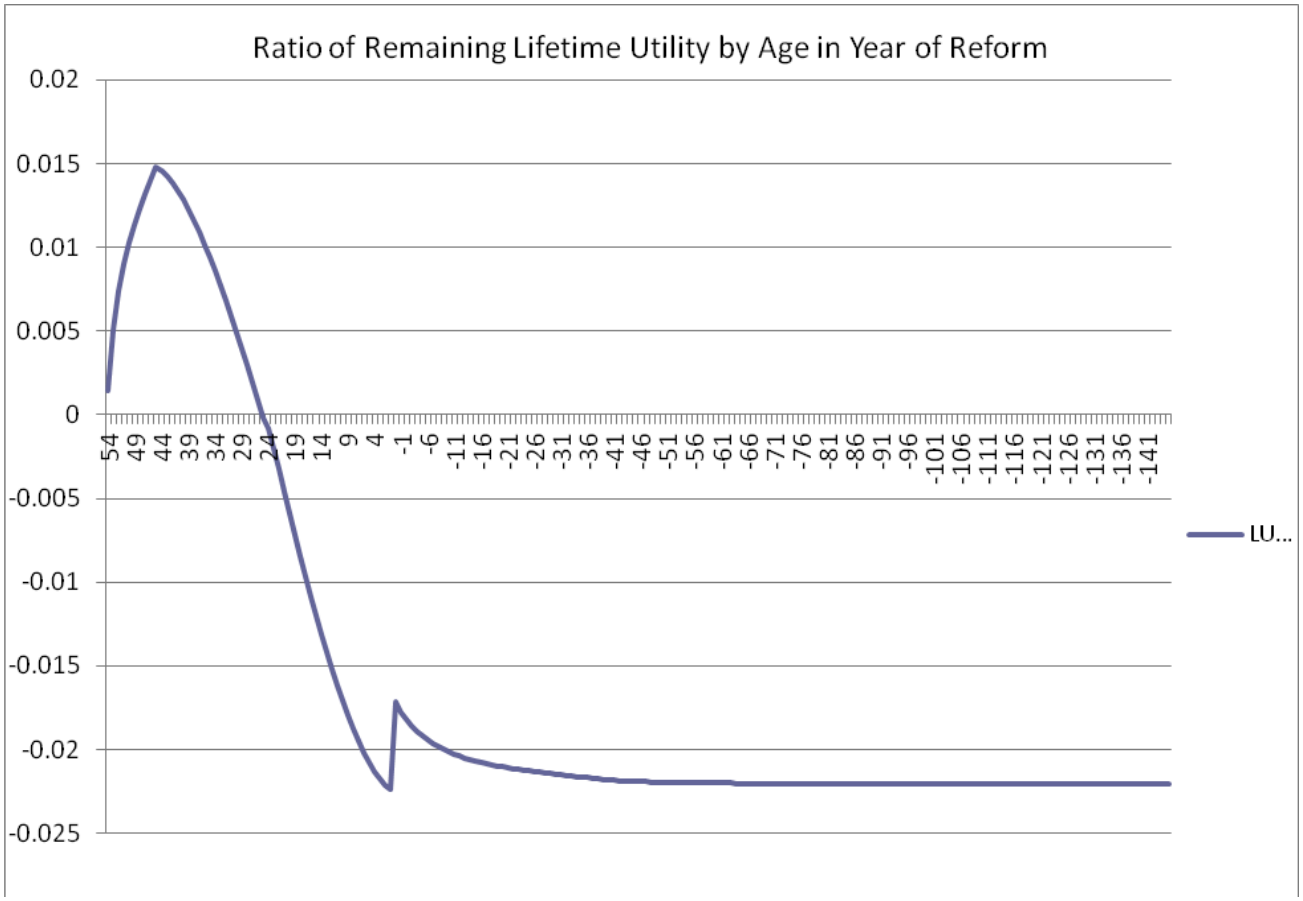


Figure F. Distributional Effects of RFRM Tax on Residential Rental Housing, with Offsetting Reduction in PIT/CIT Rates



Modeling of Tax Reform in New Zealand

Figure G. Distributional Effects of an ACE Tax, with Offsetting Increases in PIT/CIT Rates



Modeling of Tax Reform in New Zealand

Figure H. Distributional Effects of DIT, Offset with Increases in Labor Income Tax Rates

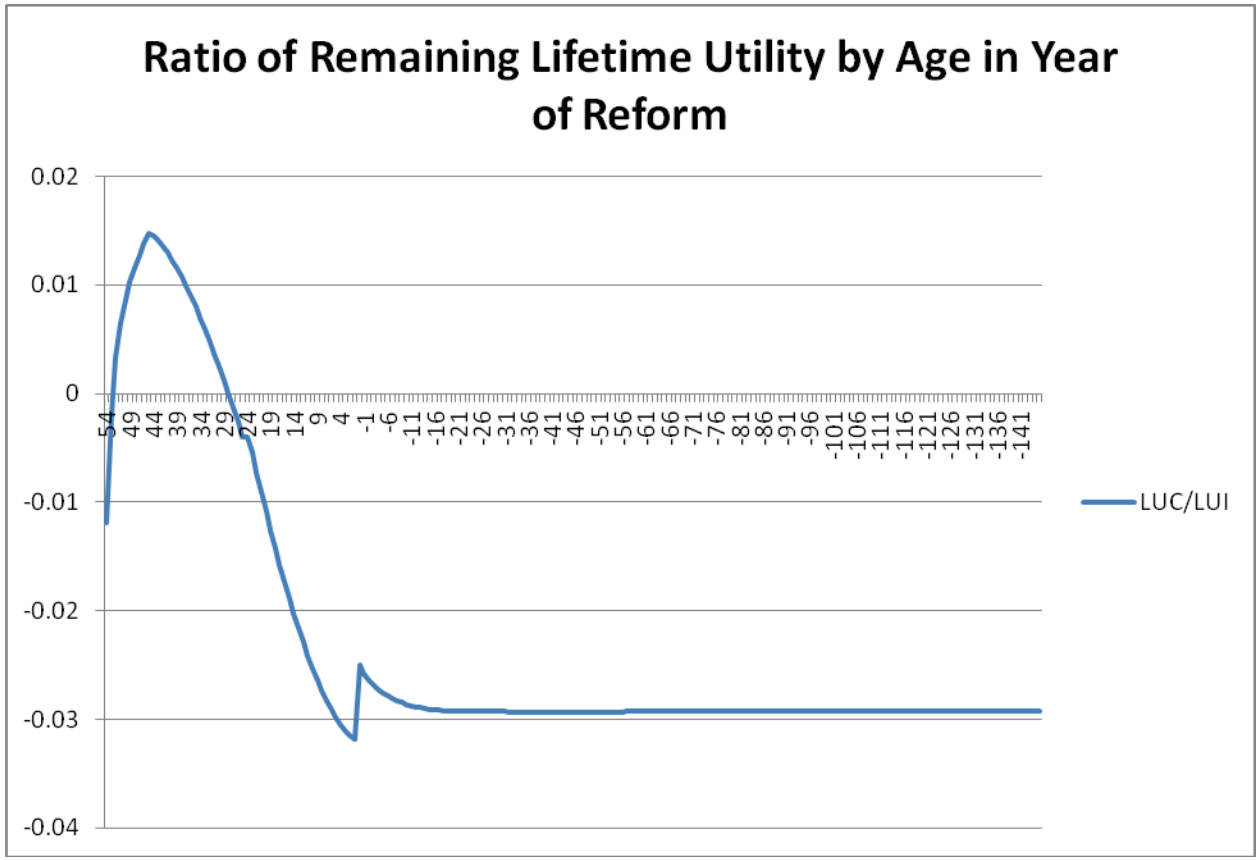


Figure I-1. Distributional Effects of Lower Tax on Interest Income, with Offsetting Reduction in Transfers

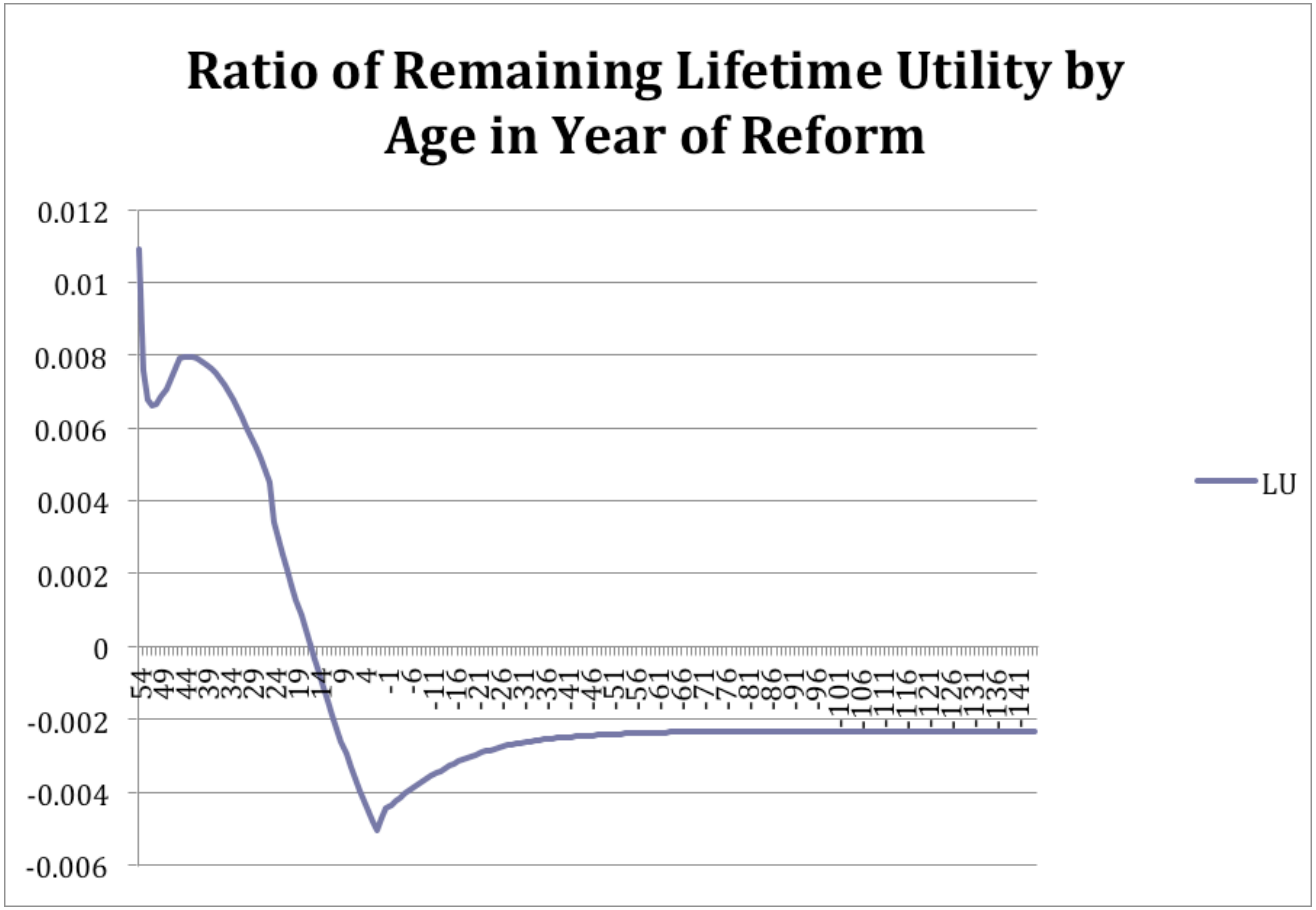


Figure I-2. Distributional Effects of Lower Tax on Interest Income, with Offsetting CGT, Transfers