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INCOME AND FISCAL INCIDENCE BY AGE AND GENDER: SOME EVIDENCE FROM NEW ZEALAND

by Omar Aziz

New Zealand Treasury and Harvard University

Norman Gemmell* and Athene Laws

Victoria Business School, Victoria University of Wellington, New Zealand

With many fiscal policies likely to have quite different age/gender incidences, this paper examines age and gender dimensions of income distribution and fiscal incidence in New Zealand using Household Economic Survey data for 2010. Applying, and testing, an intra-household income sharing rule, our evidence suggests strong life-cycle and gender aspects to fiscal incidence. Net tax liabilities are found to be low and negative, at younger and older ages but positive during much of the "working age." Notwithstanding considerable within-gender heterogeneity, women are found on average to have systematically and persistently lower net fiscal liabilities than men, especially at older ages.

JEL Codes: H22, H23

Keywords: age, fiscal incidence, gender, income redistribution, New Zealand

Introduction

This paper contributes to the literature on fiscal incidence by examining the age and gender dimension of redistribution through taxation and government spending in New Zealand. Life-cycle events vary for males and females, resulting in different interactions with the labor market, taxation, and welfare system across the age range. The purpose of this paper is to assess the extent to which income profiles, taxation, and transfer incidences vary across genders associated with their respective life trajectories under certain assumptions. The analysis is based on New Zealand Household Economic Survey (HES) data for 2010, which includes information on households' and individuals' incomes, taxes, transfers etc., and personal

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*Correspondence to: Norman Gemmell, Chair in Public Finance, Victoria Business School, Victoria University of Wellington, PO Box 600, Wellington 6140, New Zealand (norman.gemmell@vuw.ac.nz).

characteristics such as age and gender.[1] In addition, administrative data on public health and education expenditure across household types allows the incidence of those social services to be explored.

Most fiscal incidence studies have focused on the size distribution of various income and tax/spending measures across deciles or other decompositions of the income distribution. Alternatively, summary distribution metrics, such as Gini coefficients, Atkinson indices, concentration curves, and welfare dominance measures are reported.[2] However, with many fiscal policies likely to have quite different incidences across age groups and genders, and with population ageing affecting these decompositions, this age/gender dimension of fiscal incidence is increasingly recognized as potentially important for policy.

A number of studies have explored age and/or gender dimensions to redistribution or fiscal incidence. Early work by Deaton and Paxson (1994), for example, established that, as predicted by the permanent income hypothesis, both income and consumption inequality tend to increase systematically with age. Nelissen (1998) and Ter Rele (2007) compare annual versus lifetime inequality effects of Dutch fiscal interventions; Nelissen examines social security in particular, while Ter Rele covers a range of taxes, cash, and non-cash transfer.[3] Both find that lifetime redistributive impacts are smaller than annual equivalents. Creedy and van de Ven (2001) examine how Gini inequality measures of taxes and transfers change over the life-cycle for males and all household members combined in Australia using a micro-simulation model.

In addition, following Auerbach *et al*. (1991, 1992), age and to a lesser extent gender has figured in "generational accounting" evidence, which aims to capture intergenerational fiscal liabilities of taxpayers. While this literature has identified cross-cohort net fiscal liabilities for a number of countries, it has not in general examined the age and gender distribution at a point in time, nor explored how these relate to final inter-generational outcomes.[4]

For New Zealand there is currently little age- or gender-based analysis of the income distribution or fiscal incidence, though Maloney and Pacheco (2012) examined the inequality dimensions of a different form of government intervention; namely minimum wage legislation. They found that "increases in both teenage and adult minimum wages result in a greater concentration of minimum wage workers in the bottom of the income distribution" (p. 673). Aziz *et al*. (2012, 2014)

[1]It should be borne in mind that the 2010 HES followed in the immediate aftermath of the 2008–09 global economic crisis and during the ongoing recession, and so may be atypical. The results for the incidence of income and fiscal variables may therefore partly reflect short-term economic/fiscal conditions rather than more persistent patterns.

[2]See, for example, Jenkins and Lambert (2002) for an application of these and similar approaches to the U.K., and Makdissi and Wodon (2002) on the use of consumption dominance curves applied to indirect tax reform. Gemmell and Morrissey (2005) provide a review of fiscal incidence methods and studies for developing countries.

[3]See also Bridges and Choudhury (2007), who focus on the distribution of social security benefits in the U.S., finding that social security benefit wealth tended to increase for later cohorts, and to be higher for women than for men.

[4]See, for example, Auerbach *et al*. (1992, 1994, 1999), Ablett (1996), and Cardarelli *et al*. (2000) for generational accounts for the U.S., Australia, and the U.K.; Haveman (1994) provides a review. As we show in Aziz *et al*. (2013), the net fiscal incidence profiles across age groups by gender that we produce for New Zealand at a given point in time reveal remarkably similar patterns to the cross-time incidence that Auerbach *et al*. (1992, 1994) produce for the U.S. and Ablett (1996) produces for Australia.

examined fiscal incidence by income decile in New Zealand (1988–2007) but did not explore age/gender dimensions.

The remainder of the paper is organized as follows. Section 1 outlines the framework of analysis. Section 2 provides an overview of the demographic profile of New Zealand in 2010, by age and gender. Incidence results are reported in subsequent sections. Section 3 first discusses the distribution of market income. Section 4 analyzes the conversion of market income to disposable income through the direct tax, transfer, and intra-family sharing mechanisms. Section 5 incorporates indirect taxation and government expenditure on health and education to analyze the impacts on final income. Section 6 discusses net fiscal incidence, while Section 7 draws out some lifetime incidence implications for New Zealand from our results and compares them with other generational accounting evidence. Section 8 concludes.

1. Incidence Methodology

The traditional methodologies for undertaking fiscal incidence analysis are well established.[5] As with most previous studies, this paper does not aim to capture the overall "impact of government" on individuals' incomes or consumption. Governments, including in New Zealand, often intervene in economic activity in ways that are not captured by their taxation and expenditure policies alone. Even within this limited form of fiscal intervention, fiscal incidence analysis generally ignores general equilibrium interactions and responses. In addition, without a "no government" counterfactual, we follow standard practice and treat the pre-tax-and-transfer, or "market" income distribution as the benchmark against which changes due to fiscal interventions are compared.

Interpretation of fiscal incidence results always requires caution. The allocation of both taxes and expenditures to individuals is a difficult task, known in principle to depend on a variety of conditions and response elasticities. For public expenditures especially, such as on health and education, allocating the costs to individuals on a pro-rata basis to the users of the services provided out of that public expenditure can be a crude approximation to presumed incidence, even before allowing for general equilibrium responses. We therefore regard the results reported below as preliminary evidence on the approximate *direct impact* of taxes, transfer payments, and some government expenditures on individuals in New Zealand. More sophisticated analysis would be required before drawing conclusions regarding the distribution of the economic or welfare gains and losses associated with these fiscal variables.

Our analysis uses three concepts of income in framing the redistributive effects of government fiscal policy. Figure 1 outlines the process whereby disposable and final incomes are derived from the interaction of market income with direct and indirect taxation and government spending.

Market income refers to income from wages and salaries, investments, self-employment, and from other forms of taxable income earned by private means.

[5]See Cullis and Jones (2009) for a summary treatment, and Martinez-Vazquez (2001) and Harding *et al.* (2007) for more detailed conceptual discussion and an application to the U.K.

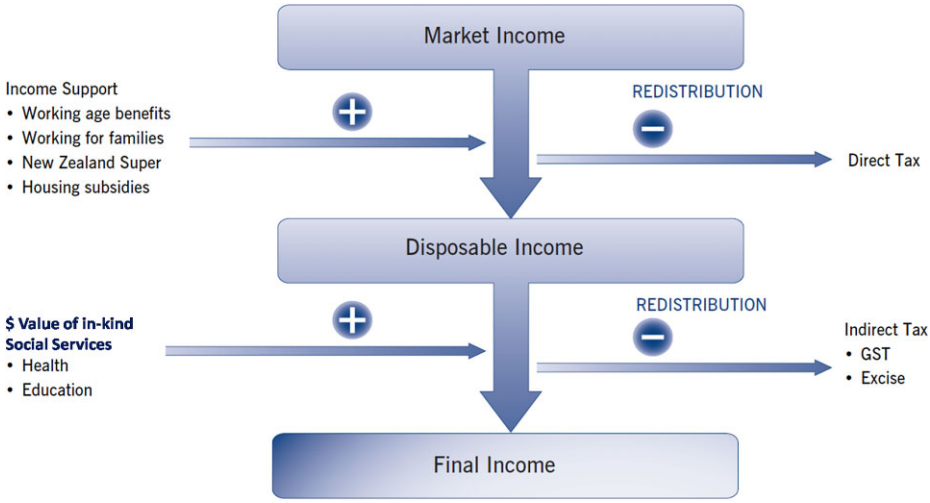

Figure 1. Three Definitions of Household Income

Source: Aziz (2012).

With the addition of income support and the removal of direct taxation, market income is converted into *disposable income*, reflecting the income available for household consumption or savings. *Final income* takes into account the distributive effects of in-kind publicly provided goods, namely education and healthcare, and indirect tax. It reflects a more comprehensive measure of the economic resources available to a household than does market or disposable income.

The methodology this paper follows is that of Aziz *et al*. (2012). The 2009/10 Household Economic Survey (HES) and Treasury's non-behavioral tax and benefit microsimulation model, *Taxwell*, are used to model the distribution of taxes, transfers, and social spending.

1.1. *The Dataset*

The HES survey collects detailed micro-level data from around 5,000 households, weighted to ensure that the sample data accurately match key characteristics of New Zealand's "normally resident population."[6] The weighted HES data (provided by Statistics New Zealand) is then reweighted for use within *Taxwell* to ensure accurate representation of the distribution of taxes and benefits expenditure.

The dataset covers household income, expenditures, and characteristics such as family type, ethnicity, and gender.[7] Rules of the tax and welfare system are

[6]Examples of the characteristics used in the weighting are age, sex, ethnicity, household composition, home ownership, and benefit status. See http://www.stats.govt.nz/survey-participants/a-z-of-our-surveys/household-economic-survey.aspx#1 for more details on survey methods.

[7]HES data on household incomes *and* expenditures are collected every three years, with income-only surveys in the intervening years. Following 2009/10, the next expenditure survey was for 2012/13 (available in December 2013). The years of income-only data collection typically involve larger sample sizes and the resulting sample income distributions can be quite different to those obtained from the three-yearly expenditure surveys. Examining annual or more recent fiscal incidences using HES data would therefore likely add additional error to the comparisons.

applied to the HES to derive individual direct tax liabilities and eligibility for income support. Household expenditure data, including consumption of alcohol, tobacco, and fuel, are used to impute indirect taxes such as "goods and service" tax (GST) and excises. Health and education expenditure are allocated on the basis of average costs for individuals based on their demographic characteristics and indicators of socio-economic deprivation.

Statistics New Zealand claim overall HES sampling errors for expenditure and income data of around plus or minus 3–6 percent (at the 95 percent confidence interval) but acknowledge much higher sampling errors for individual expenditure items and income types.[8] This suggests some caution is required when interpreting average age group and/or gender differences for income or fiscal variables, given that relevant sample cells may contain relatively few observations.

Our analysis attributes total government education and health expenditures to individuals. For education, HES data on use of early childhood and tertiary education services are used to allocate overall education expenditures on those categories.[9] Similarly overall expenditure on primary and secondary education is largely attributed to those age-eligible. Allocations of government health spending to households is based on administrative data from the Ministry of Health which decomposes spending by Health Boards according to age, gender, ethnicity etc. (see Aziz *et al.*, 2012, for details).

1.2. *The Unit of Analysis*

The HES provides household-level data based on income data for each *individual* within the household, but household expenditures are not decomposed by individual household member. To examine fiscal incidence by age and gender, our unit of analysis is necessarily the individual. However, since some "family" transfers and expenditures out of disposable income are made at the household level, a method of allocating intra-household expenditure is also required; that is, a household "sharing rule."[10]

1.3. *Intra-Household Sharing*

We do not pursue "adult-equivalent income" results here; and hence do not require a suitable scale for this purpose. However, we do require an

[8]For example, some specific housing expenditure items in 2009/10 were estimated to have sampling errors up to 50 percent, though these are generally items forming very small shares of total housing expenditures. For aggregated groups of expenditure items (such as "food," "clothing," and "footwear,") sampling errors for average weekly expenditures generally ranged from 2 to 9 percent in 2009/10. See http://www.stats.govt.nz/browse_for_stats/people_and_communities/Households/HouseholdEconomicSurvey_HOTPYeJun13/Data%20Quality.aspx#sampling

[9]Self-reports were used for income from student allowances. Those who reported receiving an allowance were attributed lower student loan write-offs.

[10]Given different household compositions it is common to measure household income or expenditure in "adult-equivalent" terms. Though we make use of adult equivalence scales as a household sharing rule (see below), we do not then convert incomes/expenditures into adult-equivalent terms.

intra-household sharing rule which allows relevant incomes, fiscal variables, and expenditures to be allocated to the individual unit of analysis.

In identifying a suitable household sharing rule, some modeling of income- and consumption-sharing within the household is required in order to attribute tax and public expenditures to individual household members. For example, what fraction of household income does each member consume, and to whom should relevant GST payments be attributed?

Traditionally, this intra-household resource sharing has been treated as something of a "black box," with intra-household income/consumption dynamics regarded as incidental. In effect, each individual within a household or family has been assumed to have the same access to resources and material quality of life. This would suggest using an "equal sharing rule" for consumption and fiscal incidence measurement where, for example, disposable income is assumed to be divided equally among all household members with expenditure and tax incidence allocated similarly.

More recently however, a growing literature has emerged that challenges this "common preference" approach, suggesting that single family utility function models do not accurately represent observed family consumption behavior.[11] This recognizes that households or families are comprised of individuals with different preferences, who each try to exert their particular preferences within the family. As Phipps and Burton (1996, p. 130) note: "ignoring family relations will lead not just to simpler explanations of behaviour but to inaccurate explanations of behaviour."

Empirical evidence appears increasingly to reject the common preference model of family behavior and adopts unequal consumption scales. For example, analysis of Canadian Family Expenditure Survey data by Browning *et al*. (1994) found that allocations of expenditures to each partner depended significantly on their relative incomes. Using similar data, Phipps and Burton (1998) showed that spouse's incomes do not always exert identical effects on families' consumption patterns. Rather, husbands and wives were more likely to allocate their own income toward their own consumption instead of pooling and distributing resources evenly.

We follow Aziz *et al*. (2012) and assume that *disposable income* sharing is the main mechanism for intra-household sharing and use a sharing rule to allocate this income among household members. In our "benchmark" fiscal incidence calculations below we adopt an adult equivalence scale as our intra-household sharing rule. This aims to reflect the more-than-proportionate influence of the primary earner on household consumption choices.

This also reflects the essence of the empirical evidence that intra-household consumption is related to intra-household income-earning. Thus, for example, children and a second adult in a household ("secondary earner" in the HES) consume a smaller fraction of household disposable income than the first adult ("primary earner" in the HES). However, recognizing that the fractions imposed

[11]See, for example, Phipps and Burton (1995, 1996, 1998), Browning *et al*. (1994), Findlay and Wright (1996), Lundberg and Pollak (1996), Cherchye *et al*. (2011), Thomas (1990), and Lee (2007).

by the OECD scale may not accurately capture actual intra-household consumption allocations, we also undertake some sensitivity testing of this scale in Section 7.

Previous researchers have used many alternative methods to "equivalize" incomes within a household, to account for the presumption that each additional adult or child in a household does not require the same additional income as the first adult in the household in order to enjoy the same per capita consumption or "living standard." Creedy and Sleeman (2005, 2006), for example, argue that many of the most commonly used equivalence scales can be closely approximated by the general form:[12]

$$E = (\alpha A + \beta C)^{\gamma}, \tag{1}$$

where E is the adult-equivalent size of the household, A is the number of adults in the household, α the weighting associated with adults, C the number of dependants in the household, β the weight associated with dependants, and γ captures household economies of scale. Hence an adult-equivalent income metric for a household is derived by dividing household income by the equivalization index in (1).

As an alternative, several studies, and Eurostat, have adopted the specific "OECD-modified equivalence scale" index, which takes the simple linear form:[13]

$$E = 1.0 + 0.5(A - 1) + 0.3C. \tag{2}$$

This scale allocates a weighting of 1 to the primary earner in the household, each subsequent adult receives a weighting of 0.5, and dependants a weighting of 0.3. In this case, the economies of scale parameter, γ, in equation (1) implicitly takes a value of 1.0 in equation (2), reflecting no adjustment for scale economies. In effect these are accommodated by the equivalization factor for each additional adult.

In the analysis below, we use the OECD scale in equation (2) as our income sharing rule, in part because it allows easier comparison with other fiscal incidence evidence. A useful property of (2) for our household sharing rule is that the aggregation of individuals' weighted resources is equal to administrative totals for fiscal variables, whereas using (1) results in individuals' effective resources summing to a higher value than obtained by simple aggregation of administrative data. As we argue below, it also provides a useful "benchmark" household sharing rule.

2. Demographic Patterns and the Distribution of Market Income in New Zealand

Before examining the role of age and gender for income distribution and fiscal incidence it is useful to note the age/gender composition of the New Zealand population and the distribution of "original" or "market" income. Figure 2 shows the demographic pyramid in 2010. Of a total population of 4.25 million people, 49

[12]See also Jenkins and Cowell (1994).
[13]This scale is based on the one proposed by Hagenaars *et al*. (1994).

Figure 2. Population Pyramid by Age and Gender, 2010
Source: Aziz (2012), based on Statistics New Zealand estimates of resident population.

percent are male and 51 percent female. However, the ratio of males to females can be seen to decline with age, notably for the over 80 age group, of which only 39 percent are male.

In this, and the next section we examine the transitions from market to final income illustrated in Figure 1, on a *per capita* basis.[14] Figure 3 shows the average (arithmetic mean) annual market income earned across genders and age groups in New Zealand, together with the respective gender medians and 25th/75th percentiles of the male or female market income distributions. These data include all citizens, including those not in the workforce. The values therefore incorporate the impact of labor force participation rates. Since participation rates for women are generally lower than for men, this contributes to their lower average market income than men observed in Figure 3. Some features of the figure immediately stand out.

The mean values in Figure 3 reveal that from the age of around 20 onwards, women earn *on average* less market income than men of the same age. These average differences become quite substantial from around age 25. In addition to greater part-time working among women compared to men, the tendency for more women to be involved in unpaid work, such as child-rearing, may lie behind the largest mean gender discrepancy during the 20–49 age range.

[14]In Aziz *et al.* (2013) we also examine how *aggregate* distributions differ from their per capita equivalents; that is, incorporating the different sizes of each age/gender cohort. These differences are generally small but become more important at older age groups where the ratios of males to females fall.

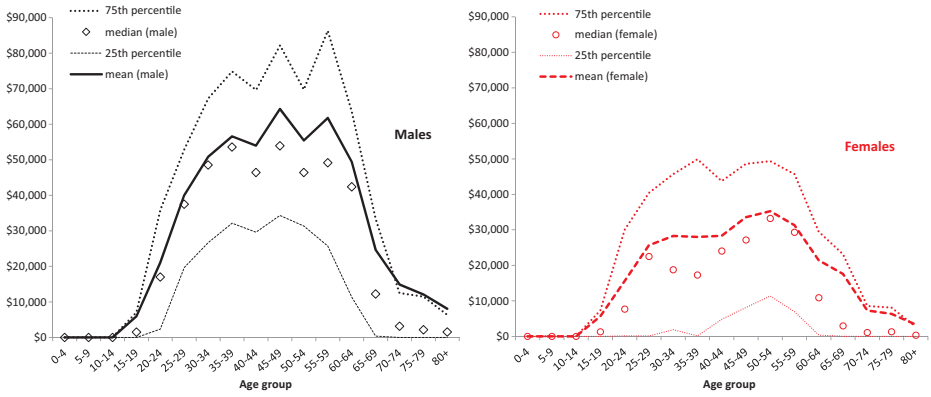

Figure 3. Market Income Per Capita by Gender and Age Group

Source: Based on HES, 2010 reweighted and Taxwell simulations.

For those in the paid workforce, differences in average pay and higher rates of part-time employment may contribute to lower market income for women. The average hourly pay rate for those in the workforce aged 15–64, in 2010, was $23.69 for women and $28.21 for men. Furthermore, male workforce participants work on average 37.2 hours per week compared with 28.9 hours per week for females.

The large drop in market income for men at the age of 65 is at least partly attributable to the large work disincentive provided by New Zealand's universal pension ("NZ Superannuation," NZS). As Gorman *et al.* (2012, p. 34) found, for those reaching the entitlement age of 65, NZS "substantially reduces the likelihood of remaining in the labour force."

There is quite substantial variation around the gender averages in Figure 3. In particular, both male and female income distributions are noticeably skewed (as might be expected), such than mean incomes for all age groups exceed medians. There is also considerable overlap between the two gender distributions, but with the *75th percentile* for women generally close to male *median* income during the main working age years (25–60). The male 25th percentile is also typically close to female mean or median values. However, among older age groups (age 65+), both genders display both greater concentration of market incomes and a large fraction of earners with zero market income. This latter feature reflects the fact than many pensioners have no income except their NZS pension.

3. From Market to Disposable Income

As in most mixed market economies, disposable income in New Zealand differs from market income due to the government's redistributive policies in the form of income support targeted predominantly at low-income households, families with children, and pensioners, and direct (mainly personal income) taxes deducted from market incomes. Transfer payments included in this analysis are working age benefits (such as for the unemployed and disabled), family tax credits, New Zealand Superannuation, and housing subsidies such as the Accommodation Supplement and Income-related Rents.

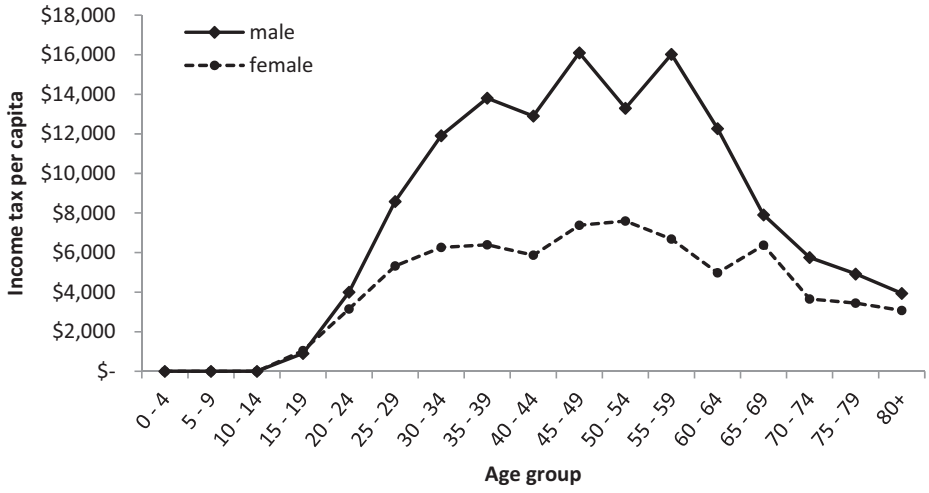

Figure 4. Direct Tax Per Capita by Age Group and Gender
Source: Based on HES, 2010 reweighted and Taxwell simulations.

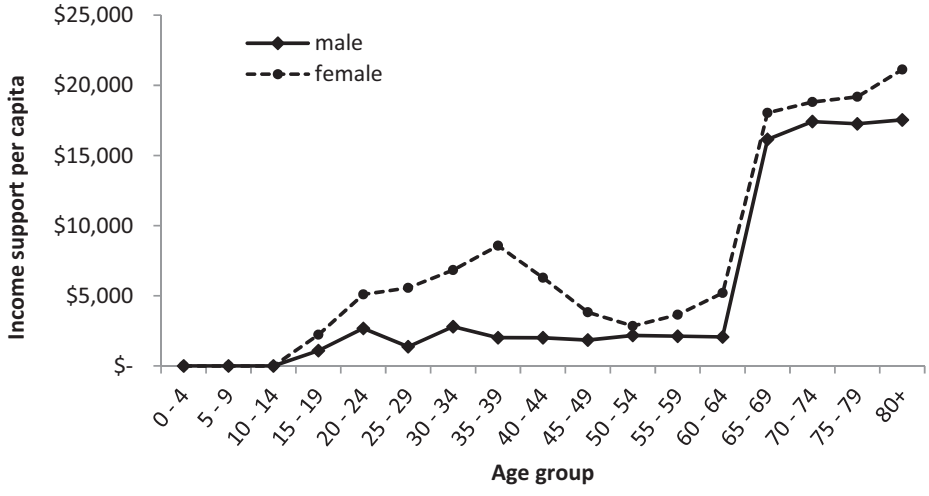

Figure 5. Income Support Per Capita by Gender and Age Group
Source: Based on HES, 2010 reweighted and Taxwell simulations.

In this section we report arithmetic mean values, by age and gender, of direct taxation and the income support system; see Figures 4 and 5, respectively.[15] Figure 4 reveals that the distribution of direct taxation per capita (including non-participants with zero income) closely resembles the profile of individuals' market

[15]Distributional information comparable to that shown in Figure 4 for market income is available in Aziz *et al.* (2013).

incomes in Figure 3. Direct tax payments per capita, by both genders, rise sharply on average during ages 20–40, become relatively flat until around ages 50–60, then decline.

The increase in direct taxation *paid by women* in the 65–69 year old age group may in part reflect the impact of their entitlement to the taxable Superannuation (NZS) at 65, receipt of which for many involves an *increase* in their income. This would be consistent with the absence of a similar increase for 65–69 year old men who tend to have higher participation in the labor market at age 60–65 and to maintain higher labor market activity after NZS eligibility is reached.[16]

Figure 5 shows average government income support by age group/gender. This includes working-age and retirement benefits, family tax credits, and housing assistance (accommodation supplement and Income Related Rents). This indicates that more income support on average is granted to women than men between the ages of 15 to 64 (though statistically, from around age 45 years at least, these values may be indistinguishable).[17]

The higher average income support for women during ages 25–44 partly reflects their lower workforce participation rate, higher rate of providing for dependants, and increased likelihood of being a sole parent. The male–female difference peaks during the child-rearing ages of 35–39 when women receive income support that is, on average, 4.8 times that of the income support payments to men of the same age.[18]

After the NZS entitlement age of 65, women on average still appear to receive more income support than men: the discrepancy reaches 20 percent in the over-80 demographic group. Gender differences in life expectancy affect these trends. In particular, life expectancy at birth averaged over 2008–10 was 78.8 years for men and 82.7 years for women.[19] This results in women, on average, outliving their partners, such that a higher proportion of retirement age men live in couples and receive the lower NZS allowance.[20] Similarly, singles (more commonly women), may be entitled to other forms of income support, such as Accommodation Supplement, which further contributes to differences in the average amount of income support received by males and females in this age group.

The interaction of market income, direct taxation, and income support, combined with the impact of the equivalization scale on the intra-household allocation

[16]Nevertheless, some caution is warranted when comparing changes in these mean values across age groups and also for differences from male averages. Given the dispersion of direct tax payments within each gender distribution, and the overlap across gender distributions, plus possible sampling errors referred to earlier, small changes or differences may simply reflect statistical noise.

[17]Formal testing for statistical significance of differences between mean values is problematic with these data for a number of reasons. First, dispersion *within* age groups is clearly not independent of *between* age group differences. Second, the data used here are based on HES sample data that have been pre-weighted to scale up to population values such that statistical significance tests essentially hinge on sampling errors. These are known to vary across the various income and expenditure categories, but are not reported by Statistics New Zealand at a sufficient level of detail to enable specific "difference in means" tests here.

[18]Family tax credits are assumed to be received by the person designated the "carer" of dependants in a family. For couples with children, the carer is assumed to be the person who has reported being the spouse of the principal earner in the HES. In sole-parent families, the carer is the principal earner.

[19]See Statistics New Zealand (2012).

[20]The NZS rate for couples is less than twice the rate for singles, designed to reflect real sharing economies within retired families.

of those incomes and fiscal interventions, determines the distribution of disposable incomes. We report age and gender differences in those disposable incomes in Section 4 after first considering the impact of fiscal variables on the transition to final incomes.

4. From Disposable Income to Final Income

As Figure 1 highlights, our measure of final income deviates from disposable income due to payments of GST and excises on individuals' private expenditures, and in-kind publicly provided goods and services. In the case of in-kind provisions, we focus on the two largest, and easiest to allocate, spending categories: publicly-provided healthcare and education. This section examines the incidence of both these fiscal variables.

Focusing first on indirect taxes, the New Zealand system involves a VAT-type GST, at a uniform 15 percent in 2010, on almost all goods and services (except financial services). There are also various excises dominated in revenue terms by those on fuel, alcohol, and tobacco. The HES data on household expenditure by age and gender, together with the intra-household sharing rule discussed earlier, allows those expenditures and associated indirect taxes to be allocated to individuals using *Taxwell*.

For all indirect taxes combined (GST and excises), Figure 6 shows the average liability by gender and age. This indicates a generally rising profile of indirect tax payments by both genders from early adulthood to the late-50s age group, with declines from around age 60 or 65. This largely reflects the tendency for disposable incomes to rise over the working life and decline in retirement.

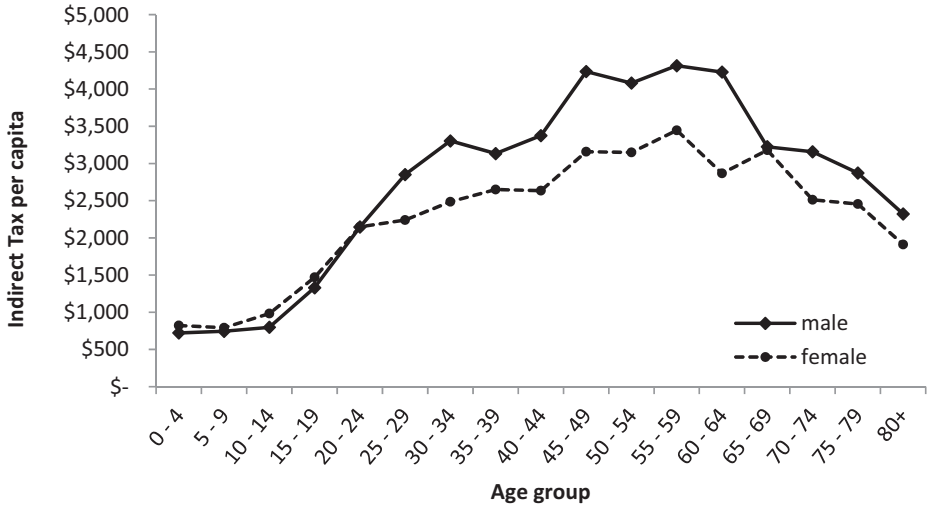

Figure 6. Indirect Tax Per Capita by Gender and Age Group

Source: Based on HES, 2010 reweighted and Taxwell simulations.

As expected, given the roughly proportional system of indirect taxation and limited effects of age-related savings rate differences, the age distribution of indirect tax payments looks quite similar to that of disposable income shown in Figure 8.[21]

On gender differences, similar amounts of indirect tax are attributed to women and men in the under 25 age range. However, from ages 25–64 men on average pay around 25 percent more indirect tax per capita than women. This difference is, however, sensitive to the method of intra-family allocation of disposable income and indirect taxes included in the analysis as discussed in Section 6.

As men are more often declared as principal earners, the benchmark methodology grants them greater control over resources and therefore spending, explaining the higher values of indirect tax attributed to them. The greater relative number of women in the 80+ age group also results in a greater incidence of indirect tax attributed to them. Despite this, in this benchmark case men pay on average, over all ages, around 20 percent more per capita in indirect tax than women.

Since consumption of education and healthcare are important components of many households' overall consumption bundles, and much of this occurs via government provision free at the point of consumption in New Zealand, allocating this consumption across individuals is potentially important to gain a more accurate picture of overall fiscal incidence.[22]

Figure 7 shows education and health expenditure per capita by age and gender. Not surprisingly, this demonstrates the bulk of education spending on younger age groups and is allocated roughly equally for both males and females younger than 15 years of age. Interestingly, there is noticeably higher spending on women in the 20–24 year old age group: women, on average, receive around 60 percent more funding than men. This may stem from more women attending tertiary education or from women proportionately attending more expensive forms of tertiary education, such as university.[23]

For post-tertiary education ages, per capita spending is both lower absolutely and similar across the genders. Nevertheless, for women around 35–44, per capita education expenditure appears higher on average than for men, perhaps attributable to part-time education and retraining during child-rearing years.

Average per capita health expenditure in Figure 7 suggests that the incidence of health spending rises smoothly with ageing (after higher initial spending on the

[21]See Gibson and Scobie (2001) for discussion of the age-relatedness of savings in the HES. They find that savings rates are mildly hump-shaped with age in New Zealand, over 1983–98.

[22]In New Zealand, state-provided tertiary education often involves the payment of some fees per course, but students are generally eligible for government allowances and loans that cover most or all of those fees. We allocate these education expenditures to children even though it may be argued that, were they marketed, the parents would pay the costs. We do so because we regard the "benefit" from in-kind education expenditures received by children as incident on them, and to be consistent with the allocation of GST payments to children associated with their consumption.

[23]Earlier evidence from Craig (2002), for example, shows that in New Zealand "significantly more females than males qualified for university entrance at bursary level from 1997 to 2000, and that for the year 2000 more females (6932) than males (5225) enrolled in bachelor degrees." Evidence for medicine (a relatively expensive university subject) in New Zealand in 2009 also suggests higher female participation; see Poole *et al.* (2009).

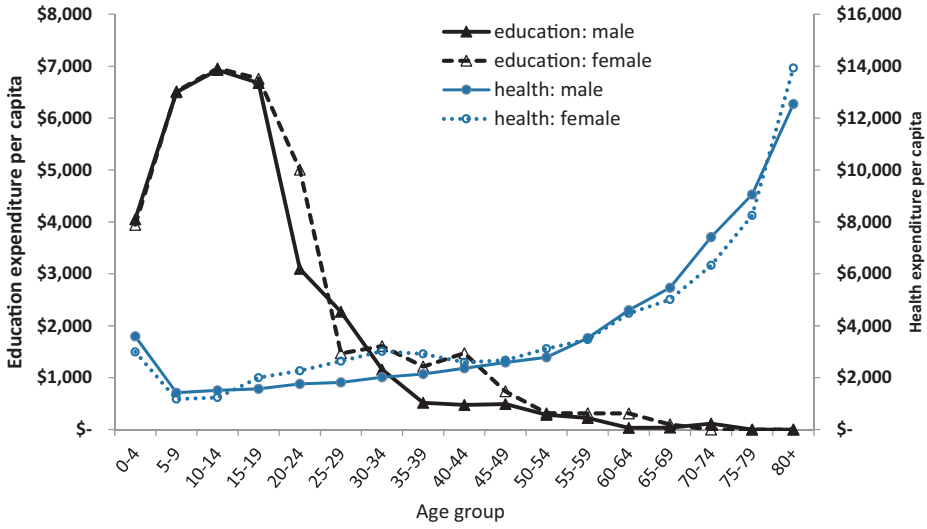

Figure 7. Education and Health Expenditure Per Capita by Gender and Age Group
Source: Based on HES, 2010 reweighted and Taxwell simulations.

0–4 age group). The *rate* of increase rises noticeably from around age 55, with very similar patterns for both males and females.

Some literature suggests that proximity to death is an important determinant of lifetime health costs. For example, Mays (2012) reports that typically half of an individual's lifetime health costs are generated in the last 12 months of their lives. Given that the average life expectancy of males falls in the 70–79 year old age bracket, this may lie behind the slightly higher male per capita spend in this age group, which is reversed for the 80+ group.

It is interesting to consider the combined impact of these government interventions (direct and indirect taxes, education, health, and transfers spending) on differences between average market, disposable, and final incomes across age groups. The three income measures are shown in Figure 8A (males) and 8B (females).

The life-cycle smoothing effect of government taxing and spending interventions can be seen clearly in Figure 8 for both genders. Government actions redistribute income, on average, away from those aged approximately 25–64 toward either end of the age spectrum. It is interesting to note that, for women, far less redistribution from middle age occurs compared to that for men. This largely stems from their lower mean market income.

In addition, indirect taxation and government in-kind provision has very little effect on the transition from mean disposable income to final income for middle aged individuals (males and females), but it substantially raises the consumption of children and the elderly. For adult females in particular, the age distribution of mean final income becomes relatively "flat," especially when compared with female market incomes.

The impact of the fiscal system on differences between males and females can be seen in Figure 9. This confirms the substantial differences between males and

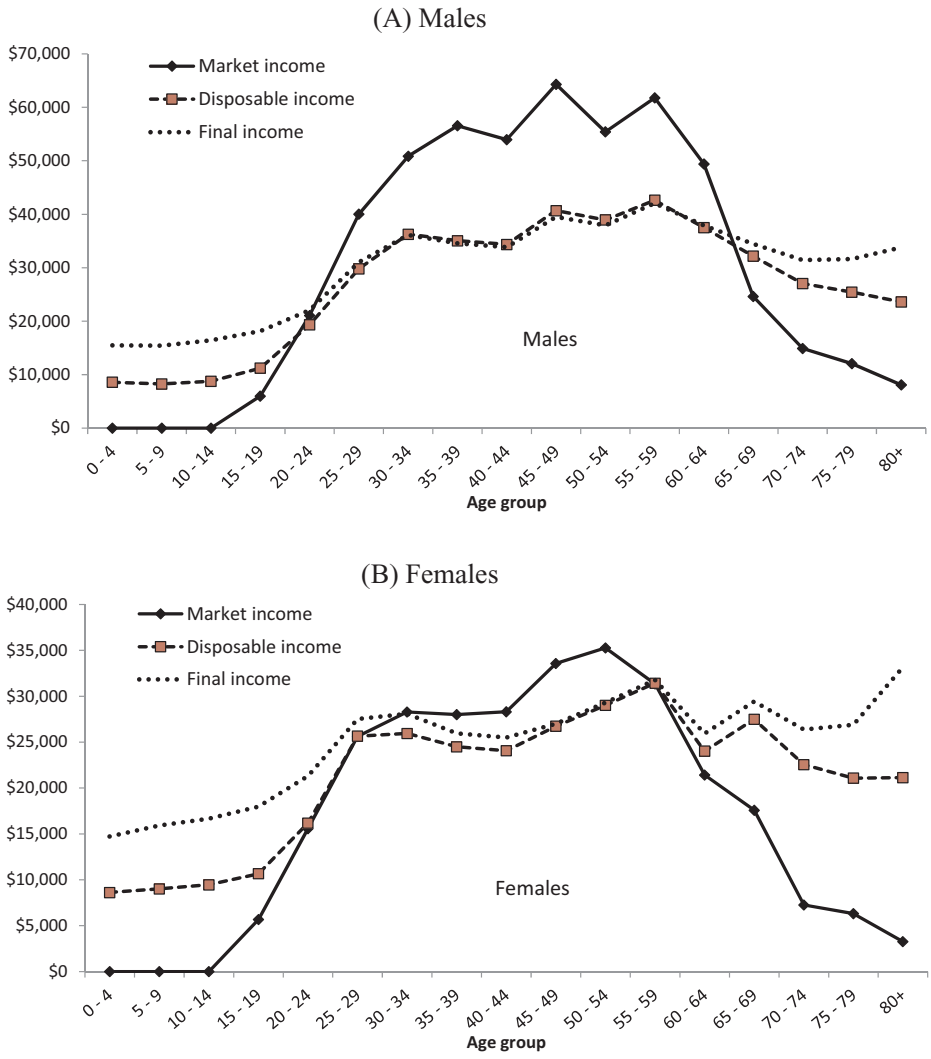

Figure 8. Three Income Measures

Source: Based on HES, 2010 reweighted and Taxwell simulations.

females in average disposable incomes at all adult ages. Market incomes are typically 80–120 percent higher for men. The "first stage" of income redistribution, via direct taxes and transfers, narrows the male–female income gap substantially. For example, the per capita percentage difference between incomes of 30–64 year old men and women decreases from 89 percent for market income to 43 percent for disposable income.

Through intra-household sharing the pattern of disposable income is related not only to an individual's own market income but also to the market incomes earned by other household members. For example, where a woman in a two-earner

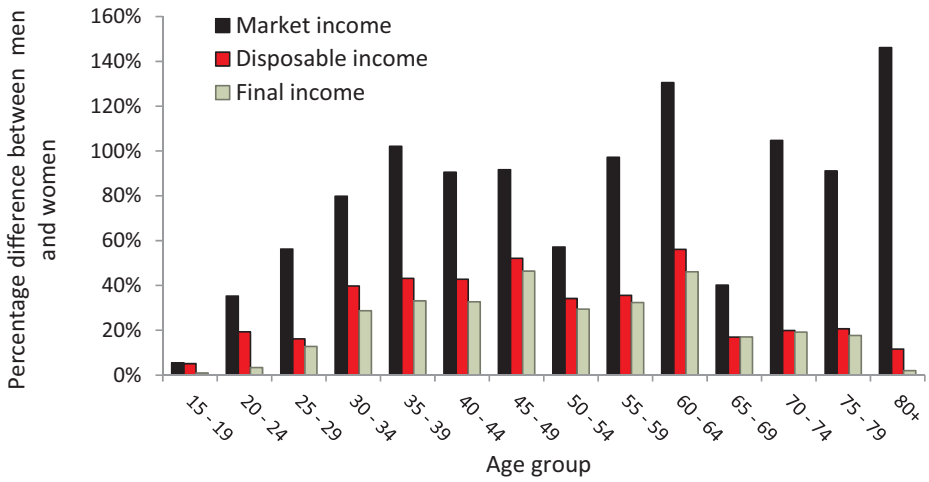

Figure 9. Percentage Differences between Mean Incomes of Males and Females
Source: Based on HES, 2010 reweighted and Taxwell simulations.

household is a secondary earner with a low market income, her disposable income can increase relative to her market income, both due to fiscal impacts directly on that income, and from disposable income gains via the effect of the sharing rule which allocates the household's pooled disposable income between the two adults based on a 1:0.5 ratio.

Figure 9 suggests that the "second stage" of the fiscal system has a more modest impact on gender differences in mean final income (compared to mean disposable income) than the "first stage" impacts on disposable income from market income. This smaller difference is partly a consequence of the more gender-neutral pattern of state assistance shown in Figure 7 and the assumption that intra-family sharing occurs at the disposable income/consumption level. Between the ages of 30 and 64, the per capita difference between men and women falls from 43 percent for disposable income to 35 percent for final income (having been 89 percent for market income). Gender differences in final income are especially small for retirees, largely due to the uniform rate of NZS for men and women.

5. Net Fiscal Impacts

As mentioned in the Introduction, one of the interesting questions that generational accounting attempts to answer is the net lifetime liability of government taxing and spending across different age cohorts. We cannot answer that question directly here, where effectively we only have information from a single snapshot (in 2010) for each of a set of different birth cohorts (aggregated into five-year age bands). Nevertheless the age, and gender, distribution of net fiscal incidence provides useful information on the patterns of change associated with the ageing process.

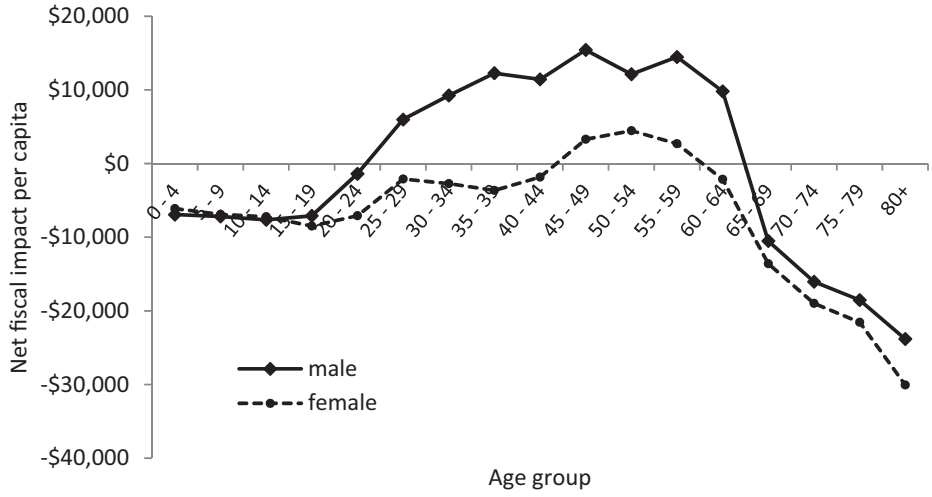

Figure 10. Net Fiscal Impact Per Capita by *Gender* and *Age* Group
Source: Based on HES, 2010 reweighted and Taxwell simulations.

Figure 10 shows this gender-specific age distribution of net fiscal incidence; that is, the incidence of tax revenue minus expenditure. Direct and indirect taxation contribute positively to net fiscal impacts offset by the effects of government spending in the form of income support, education, and health expenditures.

Of course, since not all government expenditure is included in the analysis, a positive net fiscal value here is *not* equivalent to the individual being a net contributor to the government budget overall. Nevertheless, for those expenditures that are more readily attributable to individuals (and distinguishable by age and gender), the data reveal the net positive/negative contributions.

The data illustrated in the figure suggest that, on average, males start having a positive net fiscal impact—per capita tax revenue exceeds the (allocated) expenditure they receive—in their early 20s. Women, on average, do not pass this "break even" point until their mid-40s. This is due to a combination of lower workforce participation, higher health and education spending, higher income support, and lower direct and indirect taxation.

A possible causal link may lie behind the high value of per capita education expenditure observed for women aged 30–44 and the lagged increase in per capita market income and direct tax for females in the 45–49 year age group. One possible hypothesis is that retraining during child-rearing years that precedes re-entry to the labor market results in an increase in market income and consequently higher direct taxation. The net effect of decreased education expenditure and increased direct taxation increases the net fiscal contribution of women in the 45–49 year old age group.

Beyond the age of eligibility for superannuation both genders are again, on average, net recipients of government tax and spending, but with the onset of this net negative balance slightly later for men. Cumulating the data in Figure 10, it can

be shown that over all age groups, women never achieve a net positive fiscal contribution, while men make a positive net contribution only during the age range 40–79.

6. Testing Sensitivities to Intra-Household Sharing

This section considers how far the results in the previous sections are sensitive to the assumed intra-family income sharing rule.

As noted earlier, the results above adopted the OECD scale weights of 1.0, 0.5, and 0.3 to the primary earner, spouse, and any dependants, respectively. To test sensitivity to this assumption we examined an alternative, extreme assumption of equal sharing within the family (all weights equal to 1). Since primary earners within families of two or more members are more often male, this has the effect of raising the relative weight of females in the incidence analysis. That is, on average they are attributed a greater share of disposable income, indirect tax payments, and net fiscal impacts. We continue to allocate direct tax payments, income support transfers, and government spending to the individuals directly earning or receiving them.

Figures 11A and 11B show the effects on disposable income and indirect taxation of imposing the equal sharing assumption. As anticipated, in both cases equal sharing leads to greater redistribution away from working age males and toward dependants. Women especially benefit from equal sharing after their early 40s, presumably when children leave home, and the equal distribution of resources within the family tends to be between adults only. The remaining differences between genders in Figure 11 can be attributed largely to the fact that, for single person families, male/female income and fiscal incidences remain unaffected by sharing assumptions.

Despite the influence of the sharing assumption on indirect taxation in Figure 11B, there is only a negligible change in net fiscal incidence (not shown). This continues to look similar to that shown in Figure 10. It is essentially due to the other fiscal components—direct taxation, income support, health, and education expenditures—being allocated independently of the sharing rule. Since indirect taxation is a relatively small factor in net fiscal impacts, altering sharing assumptions has a negligible overall effect.

Figure 11C highlights another aspect of the how the intra-family sharing assumption affects the distribution of disposable income. The figure compares the distribution of disposable income by gender and age-group under the assumptions of sharing using the OECD scale (as applied in earlier sections) and no-sharing, that is, individuals keep what they earn after taxes and transfers.

If no sharing of disposable income is assumed among family members, then working individuals keep what they earn and non-earners are allocated no fraction of the household's disposable income. Contrasting this with the results using the sharing assumption helps to highlight two aspects of intra-family income dynamics. First, that sharing disposable income involves transfers between the primary and secondary earners.

Second, intra-family sharing involves income transfers from working adults to dependants in the family. This largely explains why males in Figure 11C have

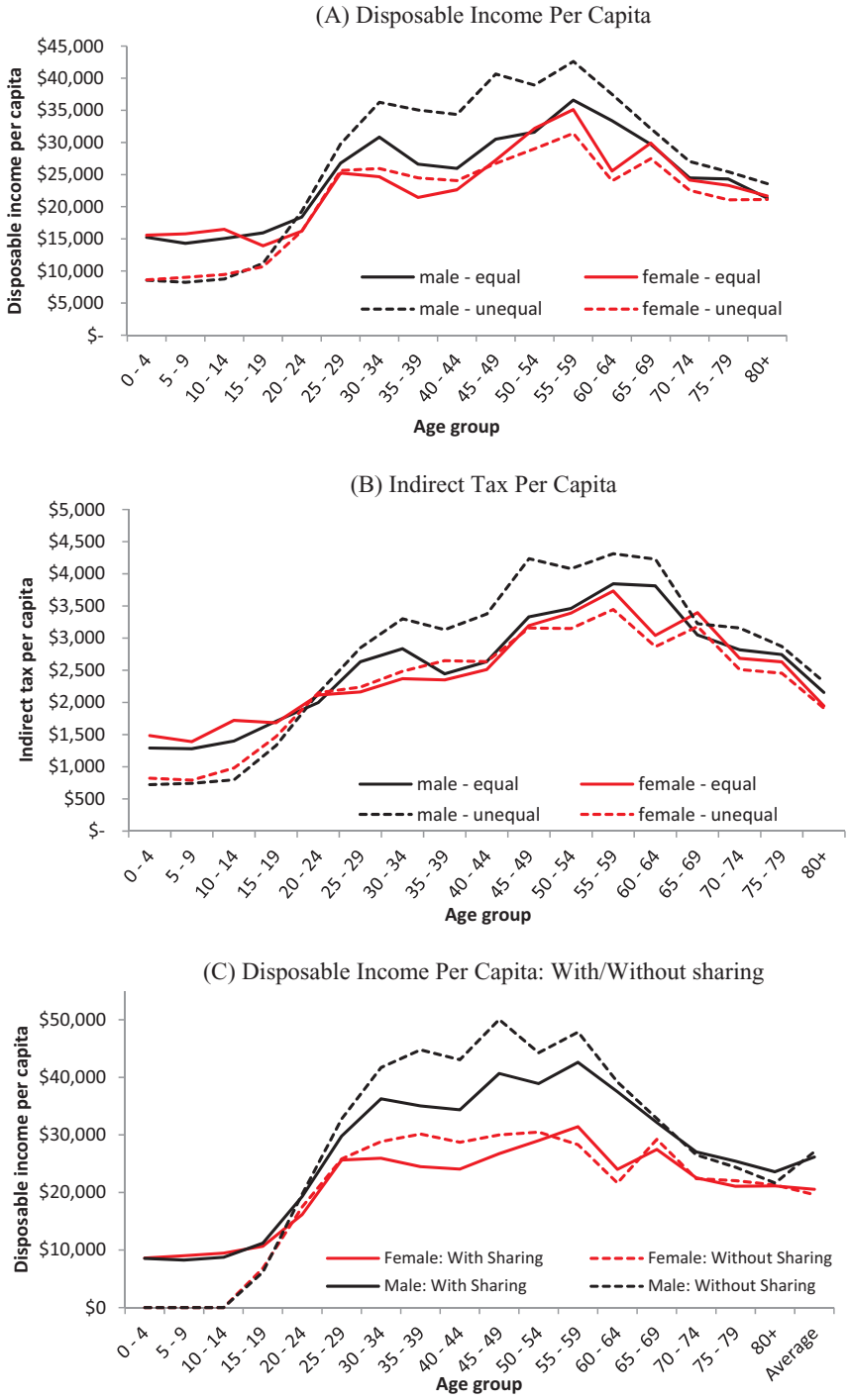

Figure 11. Testing Alternative Intra-Family Sharing Assumptions

Source: Based on HES, 2010 reweighted and Taxwell simulations.

higher incomes as working-age adults when there is no-sharing among family members. Among working-age women, there are two effects. Sharing involves first, transfers to them when they are secondary earners, and second, transfers from them when there are children in the family. The net impact is ambiguous *a priori*.

The data seem to suggest that the latter effect dominates for females aged 30–50—when it is more likely there are children in the family—and the former effect dominates at ages 50–60. Between ages 20 and 30 these two effects balance out, perhaps because more women here are primary earners as well as fewer having children at this age.

Finally, Figure 11C also suggests that assumptions about intra-family sharing become almost irrelevant from around age 60 for both males and females. This possibly reflects the fact the few individuals above this age have dependants/children in the family, and/or the universal gender-neutral aspect of New Zealand Superannuation payments.

7. Lifetime Fiscal Incidence

Lifetime tax incidence in generational accounts is typically reported as the total tax (net-of-transfers) liability of each age cohort in a given year (see, e.g., Auerbach *et al.* (1994), Ablett (1996), and Cardarelli *et al.* (2000), for the U.S., Australia, and the U.K., respectively). These are forward-looking but not backward-looking in that, for someone aged 50 in 2010, for example, the generational accounting estimate of lifetime incidence in 2010 relates to net tax paid over the *remainder* of their life, not over their total age span back to 1960.

From the fiscal incidence results for all individuals in aggregate, it is possible to estimate the cumulative future tax liability, as of 2010, if each age cohort's future time-path mirrors those of each existing age cohort in 2010. Under those assumptions, Figures 12A and 12B show the expected lifetime net tax (all taxes minus transfers: Figure 12A) and net fiscal (net tax plus education and health spending: Figure 12B) liabilities for each age cohort in 2010, separately for both males and females.

The resulting profiles in Figures 12A and 12B essentially abstract from inflation (all values are "real") and from productivity growth that might be expected to increase real incomes over time with consequent increases in fiscal aggregates.[24] This latter effect creates the so-called "overtaking" phenomenon in age–income profiles whereby, over time, at equivalent ages each cohort tends to earn a higher income than the cohort immediately preceding them.

We can account for this by adding a uniform growth rate to the (net) tax liabilities of each age cohort such that its net tax liability increases, other things equal, as each cohort ages over time. For example, using a growth rate of 1.5 percent per year to all fiscal values yields profiles similar to those reported in Figure 12 but where the sigmoid shape is enhanced. That is, positive net liabilities tend to be increased while negative net liabilities become more negative. To avoid

[24]Profiles shown are obtained from *aggregate* tax liability data by age and gender. Similarly shaped profiles are obtained if instead *per capita* values are used.

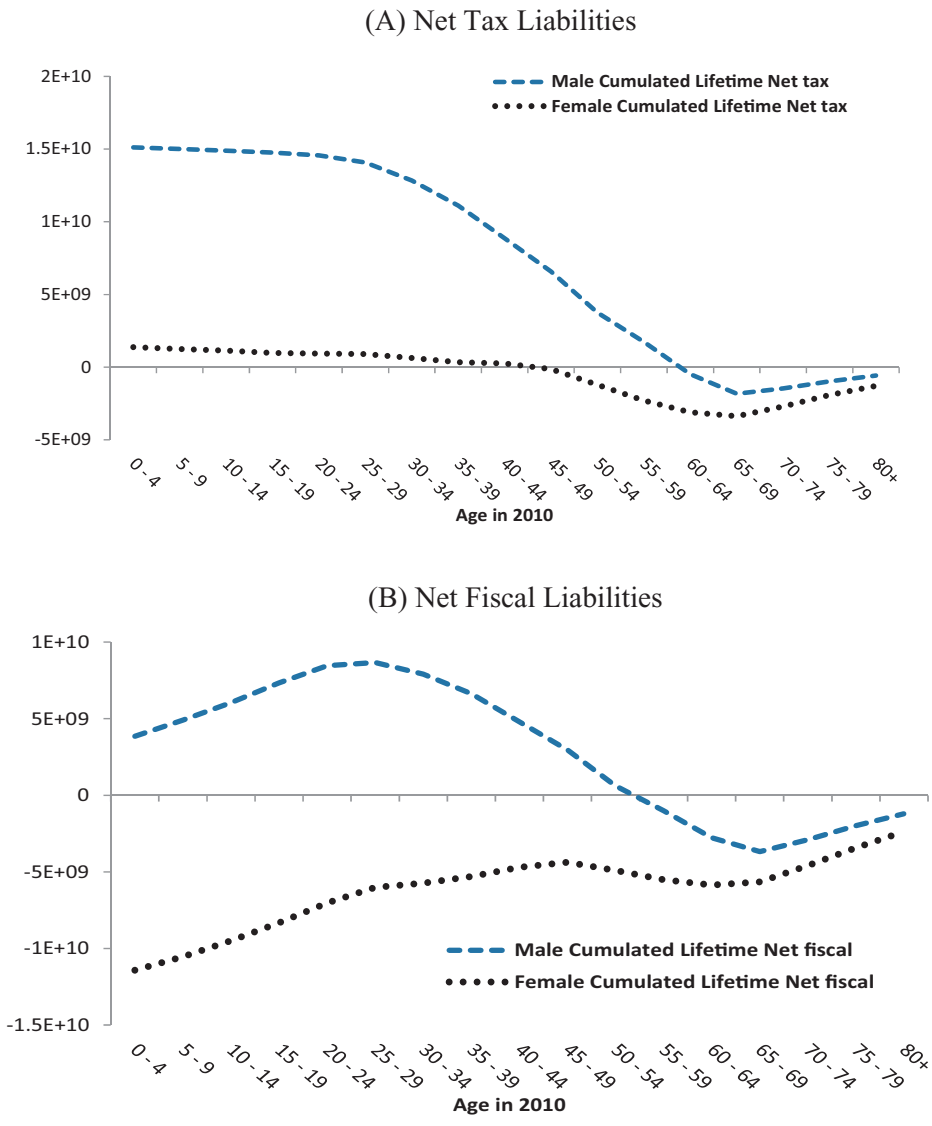

Figure 12. Lifetime Net Tax and Fiscal Liabilities: New Zealand, $NZ, 2010

arbitrary outcomes associated with a particular imposed productivity growth rate, Figure 12 reports results where no adjustment is made.[25]

The net tax and net fiscal profiles in the figure nevertheless reveal strong sigmoid shapes such that these tend to rise (or remain flat) from 0–4 age up to those aged around 25 in 2010, then fall steadily for those aged around 25–65 in 2010, before rising again among the older age cohorts. Stark differences between males

[25]We also do not discount future liabilities which would be required to obtain a net present value lifetime estimate.

and females are also evident; for example, a 0–4 year old boy in 2010 is predicted to have a positive lifetime net fiscal liability while that for a girl is substantially negative. For the oldest age cohort (80+), net tax or fiscal liabilities approach zero as these ages have fewer numbers and fewer remaining years to be net fiscal recipients or payers.

These sigmoid results in Figure 12 are similar to the U.S. evidence from Auerbach *et al*. (1994), though the U.S. evidence is based on net tax only (taxes minus transfers) and relates to average tax payments by each age cohort in the year 1991.[26] Nevertheless, Auerbach *et al*. (1994, tables 1 and 2) also found strongly sigmoid lifetime incidence profiles, higher net tax liabilities for males compared to females, and older age cohorts being net tax recipients rather than payers, but approaching zero (from below) toward the end-of-life.

This suggests that the annual age and gender distributions of fiscal incidence examined earlier play a large part in determining the estimated life-cycle patterns in the generational accounting approach. In addition, we found that amending our analysis in Figure 12 to allow for productivity growth and/or discounting has only a modest impact on our results, a feature found in some previous tax incidence comparisons based on both annual and life-cycle measures (see Creedy, 1999; Creedy and van de Ven, 2001).

8. Conclusions

This paper has examined net fiscal incidence, and its main components, by age and gender for New Zealand. The disaggregation by gender shows that the incidence of tax and government spending can differ substantially across age groups for males and females. Children and the elderly are on average net recipients in the fiscal system, whilst working age men contribute significantly more taxation and receive less income support than their female counterparts, largely due to higher workforce participation rates and higher wage rates in employment. Gender composition in the over 80 age bracket is significantly skewed toward women, resulting in an aggregate tendency toward higher net fiscal costs despite higher per capita direct and indirect taxation attributable to men over 80.

The transitions from market income to disposable income and then to final income produce distributional effects that can be described as a narrowing of gender income discrepancies. However, these results must be interpreted with several caveats in mind.

First, assumptions surrounding intra-household disposable income sharing influence the patterns of disposable income and indirect taxation. To account for this, we included a sensitivity test involving assumed equal sharing among all household members. Interestingly, this alters the distribution of indirect taxation particularly, but the overall effect on net fiscal incidence is small.

Second, though HES sampling errors for gross incomes of males and females are each around 4–6 percent, equivalent errors for 5-year age group

[26]It is also obtained using a 6 percent discount rate and a 0.75 percent assumed real productivity growth rate.

decompositions can be of the order of 12–25 percent. This suggests that caution is warranted when interpreting differences in average income or fiscal incidences across age/gender groups.

Third, the analysis provides a static snapshot of the fiscal system in 2010 and therefore does not take into account changes across time in behavior or policy. For this reason, caution is required when using the results to infer an individual's or population aggregate lifetime profiles, such as those discussed in Section 7. For example, the well-established phenomenon of "overtaking" of age–income profiles via productivity growth means that by the time a person aged 10 years old in 2010 reaches 65 years of age, their fiscal profile would be expected to look significantly different to that of a 65 year old in 2010.

Some key changes over the next 50 years that will potentially have significant implications for fiscal incidence can, however, be anticipated. For example, Statistics New Zealand projects increased labor force participation particularly for women and those over 65 years old.[27] This is likely to increase the market income of both groups, increasing their tax liabilities, and thus reducing gender discrepancies and net fiscal incidences.

Additionally, demographic structure is changing. Fertility is projected to reduce, which may result in lower family social welfare benefits, particularly affecting the fiscal incidences of women aged 25–45. The growth in the older demographic may also trigger changes in New Zealand Superannuation, changing fiscal incidence for those over 65.

Within the currently observed patterns of incidence, the evidence of significant variation by gender and age group implies that future policy changes may have quite different consequences for males and females, which could be obscured where policy impact measures focus only on intended *aggregate* distributional aspects. For example, women will be disproportionately affected by working age welfare system reforms and men by direct taxation policies. More systematic gender-based analysis would ensure that the distributional consequences of such policy options are more fully understood.

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[27]See Statistics New Zealand (2013).

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