The Life-Cycle Model,

Savings and Growth

Andrew Coleman
Reserve Bank of New Zealand

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(1) Introduction

The standard life-cycle consumption model introduced by Modigliani and Brumberg (1954, 1980) assumes that individuals try to smooth consumption over their lifetimes. Since labour income flows are uneven over the course of life, this theory implies that savings rates will be uneven over the course of life. In particular, savings rates will be low during early adult years, will rise with age as income increases, and will decrease and become negative in retirement as earnings fall.

The life-cycle model is important for, if correct, it underpins how macroeconomists think about saving, interest rates, and the capital stock. It implies that the equilibrium size of the domestically-owned capital stock is independent of the aggregate saving rate, even in a closed economy, but that saving rates are an increasing function of income growth rates. Moreover, the model is important to central bankers because, if correct, asset price revaluations have different effects on the young and the old. As Irving Fisher (1907) pointed out, an increase in the present value of asset prices associated with a decline in interest rates should have much less effect on the young than the old because the young recognize that the future value of their retirement savings is little changed whereas the old will be enticed to spend immediately.

This paper uses the life-cycle paradigm to explore two aspects of New Zealand's saving and income patterns that were emphasised by Modigliani and Brumberg. First, it estimates an approximate age-saving profile for New Zealand households using a mixture of aggregate and micro-level data. The key difference between these estimates and estimates by other authors such as Gibson and Scobie (2001) is the manner in which pension and interest income are treated. In particular, interest payments and income are adjusted for the effects of inflation, while New Zealand Superannuation tax payments and benefits are treated as if they were saving and dissaving. When these adjustments are made, it proves there is a hump-shaped age-saving profile, in keeping with the basic tenets of the theory. Secondly, the paper uses census data to analyse income patterns over the last thirty-five years. The data show that the negative shock to male income that occurred in 1981 persisted for twenty years. While one cannot make strong inferences about saving from income data alone, the data rule out the possibility that high income growth could have caused high saving rates in New Zealand.

(2) The Basic Life-Cycle Framework.

The Modigliani-Brumberg model of life-cycle saving

The basic idea behind the life-cycle model associated with Modigliani and Brumberg is that individuals try to smooth their consumption over a finite lifetime. Since their labour income varies over time, and since their household size varies over time, their saving rates will vary over time. In particular, a typical household will accumulate assets during its working years, and decumulate during retirement (Modigliani and Brumberg (1954, 1980); Modigliani (1986)).

This simple observation has remarkable implications for aggregate saving behaviour. If the economy is demographically stable, and there is no income growth, the lifecycle model has a very strong prediction: the aggregate saving rate will be zero. This is because the aggregate saving by working people exactly offsets the dissaving by older, retired people. This statement is true even if older people leave bequests, so long as the average size of the bequest does not increase over time. In more complicated economies, aggregate saving will no longer be zero but will be an increasing function of population and income growth rates. The aggregate saving rate will be positive when income growth is positive because young people will have earned more than their elders at the same stage of life and thus the saving of the young will exceed the dissaving of the old.

In practice, net saving rates in most developed societies are greater than zero, although usually single digit. There are many reasons for this: societies are not demographically stable; incomes are growing in most countries; and the size of bequests gets larger. Nonetheless, the insight that the aggregate saving rate should tend to zero is so important it warrants additional comment.

(1) Accumulated Savings

Even though the saving rate of working people has little effect on the aggregate saving rate — it will be zero in a demographically stable economy with no income growth — it will affect the accumulation of savings. Individuals who save twenty per cent of their income while working will amass peak asset levels twice as high as those who save only ten per cent of their income. Consequently, a society in which working age people save twenty per cent of their income will have twice as many assets as a society in which working age people save ten per cent of their income. The key variables of interest are thus not aggregate saving rates, which tend to zero, but the saving rate of working age people and the implied level of aggregate assets. In their original formulation, Modigliani and Brumberg (1980) derived the optimal saving rate under the assumption agents were trying to smooth consumption. They showed that it depended on the length of time an agent expected to work and retire, and the growth rate of the economy.[1] While subsequent work has refined this formulation to take into account of other factors, the basic point remains: in equilibrium, the saving rate of those working and saving for retirement is much more informative than the aggregate saving rate, which in the limit provides no useful information at all.

(2) Saving in Retirement

If people accumulate assets for their own retirement, they should dissave when retired. In fact, most empirical evidence suggests that retired people typically do not spend all of their retirement "income". For instance, Poterba (1994, p8) found that saving rates among retired people were positive in six "Group of Seven" countries, and in excess of 30 per cent in Italy and Japan. Empirical evidence of this type has often been used to discredit the lifecycle model. However, this conclusion has been has been forcefully attacked by Jappelli and Modigliani (1998) on the basis that most household surveys use an incorrect definition of income, treating social security contributions as taxes and pension benefits as earned income.[2] In contrast, they argued that social security contributions should be treated as mandatory savings, and pension benefits should be treated as a mixture of capital income and capital decumulation. In cases where these adjustments have been made, it proves that saving rates of retired people are negative, even though retired people do not spend all of the cash-flow resources they receive. For example, Brugiavini and Padula (2003) estimated that retired people in Italy save about 20 per cent of their retirement "income" when their pension was treated as earned income, but negative 20 per cent when a portion of their pension was counted as capital decumulation.

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[1] In the simplest case that income is stationary, they showed that the ratio of assets to income in the economy largely depended on the expected length of retirement. As Deaton (2005 p2) notes, they predicted "the total wealth in the economy depends on the length of retirement, and in simple cases, the ratio of a country's wealth to its income is a half of the average length of retirement, a prediction remarkable for its precision, simplicity, and lack of unspecified parameters."

[2] Modigliani by himself was even more forceful. In an interview with Robert Solow he said *"Some people have spent a lot of time trying to show that the life-cycle model is wrong because people don't dissave in old age. That is because the poor guys have just done the thing wrong. They have treated the Social Security contribution as if it were a sort of income tax, instead of mandatory saving, and they have treated the pension as a hand out, rather than a drawing down of accumulated pension claims. If you treat Social security properly, measuring saving as income earned (net of personal taxes) minus consumption, you will find that people dissave tremendous amounts when they are old; they largely consume their pensions, while having no income."* Barnett and Solow (2000) p240

Most countries have social security systems in which people pay a sum to the Government while working and receive a transfer while retired. These systems can be operated on a pay-as-you-go or save-as-you-go basis. In a save-as-you-go system, each person has tax deducted from their income and placed in a fund that accumulates over time. In retirement this fund is run down as if it is an annuity. In a pay-as-you-go system, working people make transfers directly to retired people through the tax system. In New Zealand, the system is operated primarily on a pay-as-you-go basis, although since the adoption of the Cullen Fund it is partly save-as-you-go.

While these systems appear quite different, they have sufficient similarities that it is appropriate to treat contributions and benefits in both systems in the same manner. In particular, on a cash-flow basis the contributions and benefits of the two systems will be similar in equilibrium: in the save-as-you-go system the mandatory savings of the young are being used to buy securities sold by the old, while in the pay-as-you-go system the forced taxes on the young are simply being transferred to the old[3]. In save-as-you-go systems, contributions should clearly be counted as mandatory savings, and retirement payments should clearly be treated as annuity payments, that is, as a mixture of income and capital decumulation[4]. Because the two systems are so similar on a cash-flow basis, it is sensible to treat contributions and retirement payments in a pay-as-you-go system in the same fashion. Of course, the systems have other differences, as the save-as-you go system generates a stock of assets in equilibrium.

(3) Income growth and saving.

The life-cycle model predicts that aggregate saving rates should be an increasing function of the overall growth rate. This is because the lifetime income of the young is high relative to the old when economic growth is high, so the saving of the young should exceed the dissaving of the old.[5] This prediction is broadly consistent with the evidence from cross-country data – countries that have higher growth rates tend to have higher saving rates.

While the evidence is broadly in favour of the hypothesis, caution is needed as the direction of causality between saving and growth rates is not clear cut. Economic models suggest that countries that save more will also grow faster, at least in transition. Moreover, there are several reasons to be cautious about the extent to which economic growth primarily affects young cohorts. For instance, if technological innovation primarily increases the returns to capital, then it will lead to an increase in the incomes of the elderly but not of the young. Similarly, if a large component of individual saving comprises a mandatory public pension scheme, and if pension benefits are related to average wages, higher wages for young people will also mean higher pension benefits for older people[6].

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[3] See Gokhale et al (1996) for an excellent discussion of this point.

[4] Unfortunately, this convention has not been adopted until recently, leading to considerable confusion in the estimation and comparison of age-saving profiles in different countries. Börsch-Supan (2003) is one of the first studies that has used this convention to estimate saving rates in different countries.

[5] If income growth rates are extremely high, aggregate saving rates could be negative because people would be expected to foresee income growth in the future and dissave when young as well as when old. This possibility does not seem important in practice.

[6] There are two reasons why the returns to a social security system should rise with labour earnings. First, the growth in labour incomes should be the minimum level of return available to an economy. If capital returns are not as great as the growth in labour income, then it is efficient for the economy to eschew capital accumulation and use a pay as-you-go-scheme as a means of exchanging claims on output between workers and retired people (Blanchard and Fisher, 1989). Secondly, there are a range of private sector investments whose return is tied to the growth in labour income which would be available if a social security scheme did not exist. Urban land is an example; because it is not reproducible, its value rises in line with the incomes of the working (Chamley and Wright, 1987).

In the unusual circumstances that income growth is negative, the life-cycle theory predicts aggregate savings rates should be negative. There are two reasons for this. First, individual saving rates may fall, if households are slow to adjust their consumption to reduced economic circumstances.[7] Secondly, even if individual saving rates are unchanged, aggregate saving will be negative because the dissaving of the elderly will be greater than the saving of the young. The latter prediction is subject to the qualification that the assets of the elderly do not decrease in value when the incomes of young people fall. This qualification is plausible if these assets are issued by foreign entities, but implausible if the assets' returns are strongly linked to the performance of the domestic economy. Consequently, negative income growth is unlikely to generate strongly negative savings if a large fraction of retirement assets comprise local property or a large fraction of retirement income stems from pay-as-you-go pension schemes.

(3) New Zealand Estimates of Household Savings

(3.1)Age-saving profiles from the Household Income and Expenditure Survey

In this section I make estimates of the New Zealand age-saving profile that take into account two largely neglected factors: the effect of inflation on interest payments and receipts; and the New Zealand superannuation system. The saving rates are estimated from the Household Income and Expenditure Surveys (HES). [8] The estimates, which were made in 1999, cover six surveys, 1987/8 to 1997/8. While two subsequent surveys are now available, I have not utilised these data since other authors, notably Gibson and Scobie (2001), have now used more sophisticated techniques to estimate saving profiles from the HES data.

Household savings is estimated as the difference between household income and household consumption. Because the income data are collected on an individual basis, but expenditure data are collected on a household data, a somewhat complex set of rules has to be adopted to allocate shares of expenditure between different household members in order to calculate age specific saving rates.[9] Consumption includes all expenditure except saving scheme payments, mortgage capital repayments, property purchase (or sale), gifts to relatives, and property maintenance expenses.

There are several potential problems with these estimates. It is well known that saving rates estimated from household data are noisy because they represent the difference between two large numbers, income and consumption, each of which is measured with error. For an individual, therefore, the saving rate is best considered an error-riddled residual. In large samples these errors may be hoped to cancel, although biases (like the under-reporting of the consumption of "sin" goods and services) will remain. These biases may be large. It is now well known that the average household saving rates estimated from the HES database are much larger than those estimated from other Statistics New Zealand sources (see table 1). In addition, the HES estimates of aggregate saving are roughly constant over time, unlike other estimates

[7] Modigliani was conscious that saving and consumption behaviour may depend on the previous peak of income or consumption, in which case saving could be negative when income declined; this is the so called Duesenberry-Modigliani consumption function (Modigliani 1949).

[8] Also known as the Household Economics Survey. These estimates were made by Matthew Bell, New Zealand Treasury, in 1999.

[9] There are two main problems. One concerns two-parent nuclear families with children, where the income of one parent is much larger than the other, normally because the woman is spending less time in the paid workforce than the man. If consumption is split equally, the man is typically estimated to have a positive saving rate and the woman is estimated to have a negative saving rate. To avoid this outcome, income and consumption are split equally. This solution is not appropriate in cases where the household comprises several adults. In this case consumption is divided equally (with children allotted a smaller share that is attributed to their guardians) and subtracted from income.

that decline sharply towards the end of the 1990s. The average aggregate household saving rate from HES data was approximately 12 per cent over the period. The estimates made in the New Zealand Institutional Sector Accounts were roughly 5-6 per cent at the end of the 1980s and 2 per cent at the end of the 1990s. There is no official explanation for these differences.

Table 2 and Figure 1 show the estimated saving rates for different age groups during the period. Saving rates are positive for all age groups in all years, except for 19 – 24 and 25 – 29 year olds in 1989/90. Other than the 19 – 24 and 60 – 64 age groups, the saving rates are not particularly volatile, although there appears to have been a temporary saving reduction among younger age groups in 1989/90. The saving rates for the 60 – 64 year group are very volatile, possibly reflecting the significant changes to New Zealand Superannuation arrangements and employment opportunities that occurred during the period.

The average saving rates for each age group are presented in Table 3, along with the fraction of the population in each age group and their income relative to the all-group average. In calculating an average rate over these six surveys, I am implicitly assuming that cohort effects are relatively unimportant - that, for example, the saving rate of people born in 1947 and aged 40 in 1987 is more or less the same as the saving rate of people born in 1957 and aged 40 in 1997. Given the voluminous overseas evidence that cohort effects can be and usually are important, such an assumption might seem foolhardy (see for instance Paxson (1996) or Börsch-Supan and Lusardi (2003)). Moreover, Gibson and Scobie (2001) and Scobie and Gibson (2003) have estimated cohort saving effects using HES data and have argued that they are quite large. Nonetheless, since the age-saving profile is only estimated over a ten year period, this procedure will not be too problematic if the slope of the cohort saving pattern is not too steep, that is, if the cohort effects of cohorts separated by fewer than ten years are small. While Scobie and Gibson estimate quite large cohort effects using their preferred measure of saving in which durables, medical and educational expenditure, and insurance are excluded from consumption, the cohort effects are considerably smaller when they are estimated with these variables included in consumption. Since my estimates also include these variables as part of consumption, calculating the age profile of saving without making explicit adjustments for cohort effects may not be too problematic.

There are two notable features of these estimates of the age-saving profile. First, saving rates for working age people increase with age to peak at 20% at age 50 – 59. Moreover, because earning for middle aged people are higher than earnings for young people, total savings for people aged 40 – 59 are considerably higher than for those aged less than 40.

Secondly, saving rates out of cash-flow "income" (income, government transfers, and annuity income) for retired people are positive and high. This evidence is in accordance with data from other countries. The extremely high saving rate of those over 75 is probably anomalous. The HES is a survey of households and the elderly living in "rest-homes" or in hospital, who are normally dissaving, are not sampled. This is group is not small; in the 1996 census, the number of people in "elderly homes" was 11 per cent of the number of people aged over 75.

(3.2)Inflation Adjustments to saving rates.

It is generally recognized that a portion of the interest earnings on capital are not true earnings but merely a compensation for inflation. By failing to make an adjustment for inflation, one overstates the real earnings of the lender, and the real payments made by the borrower. For example, if a lender loans $100 000 at 8 per cent but the inflation rate is 3 per cent, only $5000 of the return should be considered real earnings, while $3000 should be considered compensation for inflation.[10] Similarly, the borrower is only making a real payment of $5000,

[10] More precisely, the real earnings are $5000/1.03.

for the real value of the debt has reduced from $100 000 to $97000.[11] It follows that the saving rate of lenders is overstated when inflation is positive, and the saving rate of borrowers is understated. The National Income and Outlay Accounts do not make an adjustment for inflation, in part because it is thought the necessary adjustment is small in a low inflation environment. Such adjustments are reasonably straightforward to make, however, and the System of National Accounts guidelines recommend including such gains and losses as a memorandum item.[12]

There are two reasons for wishing to make these adjustments. First, because household debt is issued mainly by young and middle aged households and held by older households, failure to make an inflation adjustment will understate the saving rate of young and middle aged households, and overstate the saving rate of older households. Secondly, because New Zealand households are net debtors in aggregate, failure to make an inflation adjustment will understate aggregate household saving. While it might be imagined the inflation adjustment is small in a low inflation economy, it proves not to be negligible. In 2004 the average mortgage was $133000 and the inflation rate was 1.6 per cent. Consequently, the inflation adjustment for someone with an average mortgage was $2100; in the last three years, it has totalled $10000. In the year to March 2005, the inflation adjustment caused aggregate household savings to be understated by an estimated $1500 million.

Table 4 provides an estimate of the size of the inflation effect on aggregate household savings, as measured in the Household Income and Outlay Accounts. Theoretically, the adjustment should be made by multiplying the total stock of debt assets and liabilities by the inflation rate. These data are not part of the accounts, however, so alternative procedures were used.

(a) The inflation component of interest payments is set equal to total interest payments multiplied by the ratio of the inflation rate to the mortgage rate. This component is added to household saving. The mortgage rate is the average monthly mortgage rate for the year ending March, and inflation rate is the annual change in the Consumer Price Index for the year ending March.
(b) The inflation component of interest receipts is set equal to total interest receipts multiplied by the ratio of the inflation rate to the six month deposit rate. This component is subtracted from household saving.

Table 4 indicates that the inflation effect was roughly equal for savers and borrowers until 2000. From 2000 onwards, household borrowing increased at a much faster rate than household lending and, in combination with rising inflation rates, the inflation effect caused saving to be understated. The understatement was $221 million in 2000, rising to $1498 million in 2005. The inflation adjustment therefore accounts for an eighth of the reported $10 billion deterioration in

[11] Since I have found many people are reluctant to accept the interest component of mortgage payments are saving, an example showing the effect of inflation on debt is provided in the appendix.

[12] See Section 19.82 of the 1993 System of National Accounts published jointly by the United Nations, the Commission of the European Communities, the International Monetary Fund, the Organisation for Economic Co-operation and Development, and the World Bank. "*The element of compensation for inflation should not be considered as a return to capital by the lender and a current cost by the borrower. The System treats these components of explicit or implicit indexation as interest received and paid in the current accounts, and this treatment does not create great difficulties when inflation is low. However, the measurement of these components is essential when inflation is high if one wants to interpret correctly figures such as government disposable income or saving (or government deficit) and the corresponding figures for creditor sectors, etc. For this reason, the System recommends showing real holding gains and losses on monetary assets as memorandum items to the current accounts. Countries with high inflation would benefit greatly from following this procedure and, in addition, giving great emphasis to a careful scrutiny of holding gains and losses in the revaluation account.*"

household saving since 2000. It is worth noting that since New Zealanders are net borrowers, the current account deficit has been overstated by at least as much over the same period.[13]

The effect on the age distribution of household savings is more difficult to estimate as data concerning the age distribution of the holders and issuers of debt are sketchy. The best information concerns the age distribution of mortgage debt, which can be estimated from the Survey of Family, Income, and Employment Dynamics. In 2004, household mortgage debt was estimated to be $72 billion, of which 3 per cent was owed by 15-24 year olds, 17 per cent by 25-34 year olds, 35 per cent by 35-44 year olds, 31 per cent by 45-54 year olds, and 12 per cent by 55-64 year olds.

Information on the age distribution of debt holdings is less reliable. The 2001 Household Saving Survey provides detailed information on the size of bank holdings by age group for couples and individuals without partners. This profile suggests that bank deposits increase with age and are much higher for retired people than others. There are problems with these data, however, as the total size of bank deposits implied by the survey data is much smaller than the quantity of bank deposits owned by households. Nonetheless, if one combines demographic information on the size of each population group with information on the size of their bank deposit holdings, one can make a crude estimate of the fraction of total interest income owned by each age group. According to this estimate, 6 per cent was owned by 25-34 year olds, 13 per cent by 35-44 year olds, 19 per cent by 45-54 year olds, 18 per cent by 55-64 year olds, 21 per cent by 65 – 74 year olds, and 18 per cent by those over 75.[14] This age profile can then be used to calculate how much of the inflation adjustment to interest income is borne by different age groups.

Table 3 and figure 3 show how the age-saving profile changes when interest earnings and payments are adjusted for inflation. The profile is calculated by distributing the total inflation adjustments for each survey year from the National Accounts data in Table 3 across the appropriate age groups, and adding these adjustments to the total savings of each age group from the HES data. The adjustments raise the estimated saving rates by 2 or 3 per cent among the working age population, and lower them significantly for the retired population. Indeed, these estimates suggest the saving rate of those over 75 was 13 per cent, not 27 per cent, when their interest income is adjusted for the effects of inflation. This adjustment largely reflects the high inflation of the late 1980s; but even in the low inflation 1990s the effect is sizeable, reducing the measured saving rate of those over 75 from 24 per cent to 17 per cent.

(3.3)Adjusting saving rates for Superannuation and Health Expenditure.

Superannuation

As discussed in Section 2, the age-saving profile will change if the New Zealand pay-as-you-go pension scheme is treated differently in the accounts. Currently the transfer from the working to the retired is treated as a tax on the working and a transfer paid to the retired. When the contributions of the currently working are treated as mandatory savings, and the pension payments received by the retired are treated as the decumulation of previous pension contributions, the estimated age-saving profile is markedly different. Note, however, that this adjustment leaves the aggregate saving rate unchanged, for the additional saving of the working

[13] According to the author's calculations, the inflation component of net foreign investment earnings has averaged 1.5 per cent of GDP since the beginning of the low inflation era (1992) and 1.9 per cent of GDP since 2000. This means the average current account deficit has been 3.2 per cent of GDP, not 4.7 per cent of GDP over this period. Incidentally, Modigliani made a similar argument about the overstatement of Italy's public debt position when Italy had high inflation in the 1980s and 1990s but needed to meet the Maastricht conditions to join the Euro.

[14] These estimates are based on the median size of bank accounts owned by different age groups, not the mean size. Since the distribution of wealth is skewed, there could be considerable error in these estimates.

age population is offset by the dissaving of the old.

In Appendix 2, the contribution by working age people that is needed to fund the pension is estimated at about 5 – 6 per cent of gross income. If this contribution is treated as mandatory saving, the saving rate of workers will increase by 5 – 6 per cent of gross income. At the same time, if the pension is treated as a mixture of capital income and the decumulation of retirement savings, the saving rate of the elderly will decline. The pension provides approximately 80 per cent of income for retired people[15]. If the pension is treated as cash flow from an annuity, so that 50 per cent of the payment is treated as income and 50 per cent is treated as dissaving, the saving rate for retired people becomes negative[16]. The revised estimates of saving rates are in Table 5.

The revised estimates show that savings rates including mandatory pension contributions have a pattern much more in keeping with the pattern associated with the life cycle theory. In particular, people are estimated to dissave in retirement as they run down their accumulated pension benefits. This adjustment is in keeping with the estimates for Italy produced by Jappelli and Modigliani (1998) and Brugiavini and Padula (2003).

Health Expenditure.

A second adjustment can be made to take into account the pattern of medical expenditure expenses. Because most medical expenditure is consumed by the elderly, a public health scheme (or, for that matter, a private insurance scheme) has a very large intergenerational transfer component to it. These intergenerational transfers can either be funded by a pay-as-you-go or a save-as-you-go system; as such the payments can be considered mandatory saving, and the expenditures can be considered as dissaving.

Table 6 shows per capita health expenditure by age group in 1998. It shows that three quarters of total expenditure was spent on people over 65. Government health expenditure has varied between 5 and 6 per cent of GDP since 1975. If the three quarters of this sum that is spent on the elderly is treated in the same fashion that pension transfers were treated, the saving rate of the working age population increases by approximately 4 percentage points of GDP. On the other hand, in 1998 the average expenditure on public health for those aged 65 – 74 was 26 per cent of average cash flow income ($14600), while for those aged 75 plus it was 59 per cent of average cash flow income ($13400). If saving rates were adjusted for these expenses, the new saving rates for the elderly are extremely negative, of the order of –100 per cent. The revised estimates are presented in Table 5.[17] They accentuate the life-cycle pattern evident from making accounting adjustments to New Zealand Superannuation.

These two adjustments show how a society's institutional arrangements affect the measured age-profile of saving. Since New Zealand has pay-as-you-go systems for both Government superannuation and health expenditure, the saving rates of the working appear quite low, and the elderly appear to save. Nonetheless, it is clear from the above table that the working population does not in fact spend a very high proportion of its income on itself. If the transfers to retired people were classified as mandatory saving, the saving rates of the working population would be much higher.

[15] The distribution is very skewed. Only 30 per cent of retired people have non-pension income greater than $2000.

[16] Suppose 60 per cent of cashflow is income, and s is the saving rate out of cashflow. Then the saving rate out of income is (1 – (1-s)/0.6)

[17] These saving rates are calculated under the assumption that income is only 60 per cent of pension cashflow. The expenditure is subtracted from cashflow income, and then the whole amount is divided by 0.6 of cashflow income.

Superannuation, health, and aggregate saving patterns through time.
The above adjustments to the age-profile of savings have, by construction, not altered the aggregate saving rate. However, changes in the amount of taxes paid by households to the Government have been a factor in the measured decline of the aggregate household saving rate since 2000. In particular, net taxes paid to the Government — that is, taxes paid minus direct and in-kind transfers to households —increased sharply after 2000. An argument can be made that these taxes should be considered as part of saving, as they would be if they were paid directly into a save-as-you-go pension scheme.[18]

The argument is as follows. By definition, household income net of transfers is either (i) spent directly on consumer items, (ii) given to the government as tax to be spent on consumer items such as health and education, (iii) given to the government as tax to be invested, saved, or spent on other items, or (iv) saved directly. Since saving is the difference between income and consumption, the last two items reflect household saving or non-consumption.

In the National Accounts, the amount of household saving is defined as the difference between net disposable income and final consumption expenditure. The latter includes indirect tax payments such as GST. In this definition, therefore, household savings only includes the direct savings of households but not net transfers to the Government. Consequently, for a given level of income, a decline in measured household savings could have occurred either because of an increase in household consumption or because of an increase in tax transfers to the Government that are invested or saved.

Table 7 contains estimates of total household tax payments, government transfer payments such as superannuation, and government consumption expenditure such as health. The data are sourced directly from the National Income and Outlay Accounts.[19] The difference between these aggregates is the net contribution to the Government that is not spent on consumption. The net contribution is graphed in figure 4. The figure shows that the net contribution to the Government increased between 2000 and 2005 by approximately $3.7 billion. It follows, therefore, that the recorded decline in household saving does not just reflect higher consumption expenditure; rather, a large fraction, over a third, is associated with increased tax transfers to the Government that are available for investment and saving. Under different accounting conventions, these tax transfers would be considered mandatory saving and would be included in estimates of the aggregate household saving rate.

Aggregate Health expenditure through time.
Health expenditure patterns are of interest for one other reason: in the United States, it appears that the secular increase in health expenditure since the 1960s is responsible for much of the decline in the aggregate saving rate. Gokhale, Kotlikoff, and Sabelhaus (1996) examined consumption patterns in the Consumer Expenditure Survey between 1960 and 1990 paying careful attention to medical consumption, particularly that provided by the Government. This expenditure had been ignored in most other studies. They showed that there was a large increase

[18] Indeed, a large part of these additional taxes have been transferred into a Government run save-as-you-go pension scheme, the Cullen Fund.

[19] Table 7 was calculated from the Household Income and Outlay accounts as follows. (a) Taxation payments equal "Income tax" plus "other current taxes" plus an estimate of indirect consumption tax. The latter term is estimated as the GST rate (12.5/112.5 per cent after 1990) multiplied by final consumption expenditure minus the gross operating surplus from owner occupied dwellings. (b) Transfers are "social assistance benefits in cash" plus "social assistance benefits in kind" plus "central government non-market goods and services" plus "local government non-market goods and services".

in medical consumption over the thirty year period. Medical consumption as a fraction of GDP was only 4 per cent in the 1950s, but increased to 5 per cent in the 1960s, 7 per cent in the 1970s, and 13 per cent in the late 1980s. This nine percentage point rise in medical consumption was only offset by a 2.3% decline in other consumption, so total consumption rose – and saving fell – by 6.5 per cent of GDP over the thirty years.

A large fraction of this medical expenditure is consumed by the elderly. This increase in consumption implies their saving rate has declined – a decline that the authors attribute to be the primary cause of the aggregate decline in the saving rate. They noted (p20):
"In the early 1960s, the elderly (those 65 and over) accounted for 10.6 percent of U.S. household consumption and 14.1 percent of the U.S. population. By the late 1980s, the elderly accounted for 17.8 percent of total household consumption and 16.4 percent of the total population. Based on demographics alone, the elderly's share of consumption should have increased by 16.3 percent; instead it rose by 67.9 percent."

The authors use these data to provide a new interpretation of why the demographic structure has reduced the US saving rate over the last thirty years. It is not because of a big increase in the fraction of the population that is retired. Rather, the resources available to the retired have increased sharply, most notably because of an increase in "in-kind" medical transfers which by definition are consumed. Since this group is consuming a larger fraction of its resources than it used to, and has so many more resources, aggregate consumption is rising and aggregate saving is falling. As they argued (p2)
"Most of the decline in U.S. saving can be traced to two factors:
(1) the Government's redistribution of resources to older generations with high consumption propensities from younger ones, including those not yet born, with low or zero consumption propensities; and
(2) *a dramatic rise in the consumption propensities of older Americans. The form taken by Government transfers to the elderly – the fact that they are annuitized, and in the case of health care are in kind –may help to explain the rise in the elderly's spending rate."*

Given the shape of the adjusted age-saving profile derived above, it is of interest to know how much of the decline in New Zealand saving can be attributed to an increase in medical expenditure. According to the New Zealand Ministry of Health (2002, 2004), health expenditure increased from 6.6 per cent of GDP in 1989 to 8.2% of GDP in 2001. Given that most, but not all, of this increase was the result of higher Government expenditure, it follows that some of the increase in aggregate consumption and some of the decrease in aggregate saving is a result of additional health consumption by retired people.

(3.4) Discussion

This section has established two main results. First, if appropriate adjustments are made to the way income and taxes are treated, the age profile of saving rates has the shape predicted by the life-cycle model: that is, saving rates rise with age up to retirement, whereupon they decline and become negative. The adjustments make clear that retired people are dissaving — indeed, they may be dissaving at extremely high rates. This of course is what the life-cycle model says retired people should be doing.

It should be noted that Scobie, Gibson, and Le (2005) made a similar point about the treatment of New Zealand Superannuation. They used survey data to estimate the level of household wealth including the imputed value of New Zealand Superannuation for different households. They showed that the imputed value of New Zealand Superannuation is a major fraction of total wealth for most New Zealanders, and one that, by construction, is spent in retirement. This analysis differs from theirs by trying to estimate the implications of New Zealand Superannuation for saving rates, not wealth levels.

It is possible that the measured decline in aggregate saving largely reflects the spending habits of the retired. In part the increase in their consumption reflects an increase in Government provided healthcare. It is also possible that private consumption amongst the retired has increased rapidly since 2000, given the large increase in the value of New Zealand assets, particularly land, that has taken place since then.[20]

Secondly, the paper shows that the aggregate effects on measured household savings of these adjustments have been large since 2000. In particular, some $5.0 billion of the $10 billion measured decline in household saving between 2000 and 2005 can be accounted for by the increase in net taxes paid by households to the Government and by the effect of inflation on interest income.

These results raise questions about the interpretation of the measured decline in the aggregate saving rate. As Modigliani and Brumberg argued, the aggregate saving rate by itself has little meaning as it reflects the saving decisions of the currently working and the dissaving of the retired. The more important statistic is the saving rates of those working, as this ultimately determines the stock of assets owned by domestic households. The adjusted age-profile of saving rates suggests that working generations are saving — or at least not consuming — at quite high rates. Whether they are saving "enough" is an open question. But in debating this question, recognition must be taken of the mandatory contributions they make to the Government.

(4) New Zealand Age- Earnings profiles.

(4.1) Census Data Estimates

In this section I present estimates of the age-earnings profile in New Zealand using census data from 1966 to 2001. These data is not new – it is briefly examined in a different context in Easton (1997) – but it is suggestive of a reason why New Zealand saving rates may have faltered in the 1980s and 1990s. Basically, income growth faltered, and male incomes fell. In contrast to rapidly growing countries, income growth cannot be expected to have generated high aggregate saving rates in New Zealand. Moreover, many families found themselves forced to make the uneasy transition to lower incomes following the closure of well-paid jobs in traditional areas such as the railways or freezing works. Saving rates may have fallen as families adjusted slowly to their new circumstances.

The analysis below is based on an analysis of census data 1966 – 2001. Each census has a table indicating the income distribution of males and females by age. For example, Table 8 shows the number of people aged 30-34 in different income bands in 1996. The data are used to estimate the mean and medium levels of income for each demographic group in each census year. There are several points to note about the data in Table 8, each of which is representative of the data for all age groups in all years.

First, women have much lower participation rates than men, indicated by the much higher fraction of women earning less than $5000. A far greater fraction of women earn between $5000 and $15000 as well, indicative of part-time work. For this reason, average incomes are calculated two ways, either including or excluding those who earn zero. The averages are quite different for women, and have different trends through time that reflect changing labour force participation rates.

[20] In house estimates of consumption by people over 55 using HES data show that consumption among this group has increased significantly since 1998.

Secondly, mean incomes are greater than median incomes for both men and women, by about 10 per cent for men but by 30 per cent for women. It turns out that the major trends in the data are true for both median and mean statistics, but this is neither necessarily true nor always true because of the skewness in the data. In particular, male mean incomes have increased faster than male median incomes because of an increase in the number of people earning very high incomes.

Thirdly, the estimates of the means have large variances, because an estimate has to be made of the mean income of the highest income bracket. This is problematic because the highest income bracket changes from census to census: in 1991, for example, it was only $50000, much lower in real terms than in other years. This means that the mean estimates are a little more volatile than the median estimates.

The averages for each age group and each year were calculated in current dollars and converted into 1996 dollar terms using the CPI index.[21] To the extent that the CPI is an upwardly biased estimator of true price changes, real wage growth will be understated; this understatement could be of the order of 1 per cent per year. The data are analysed from two different perspectives. First, the earning for each age group are tracked through time. If there were earnings growth through time, graphs of these data would show an upward trend. Second, the earnings for a particular cohort were tracked as they aged through time. According to the life-cycle hypothesis, these graphs should be hump shaped, as earnings first rise and then fall with age. The data were calculated separately for men and women, and a "male-female" average was also calculated.

(4.2) Average Earnings by Age

Figure 5 shows median earnings by age (excluding zeros) for males, females, and mean income including zeros for the combined average. The male and female patterns are quite different. For men, *in any given year*, earnings increase with age until age 40 – 50, after which average earnings start to decline. For *each age group*, earnings increased from 1966 until 1981, when they peaked, before falling through 1986 until 1991. Between 1991 and 2001, median male earnings were flat, and although mean earnings increased neither the mean nor the median reached the peak levels of 1981 or even 1976. For men, the period between 1976 and 1981 was a golden era, with high wages, and low unemployment. These statistics are consistent with the stories of the time, when farming returns were adequate and there were large numbers of high paid jobs in the farm processing and transport sectors. In contrast, the years between 1981 and 2001 were an earnings nightmare. The farming downturn, and the shake-outs within many industrial sectors post 1984 have directly contributed to declining incomes.

The story for women is quite different. Earnings *for each age group* increased census by census except for a dip in 1986. Part of this increase presumably reflects a shift to higher wage occupations, while the early part of the increase reflects a catch-up with male wages for similar work. Economic power for women, as represented by their direct earnings, has been rising for thirty-five years[22].

The earning-age patterns by age *in any given year* are quite different to those of males. Male earnings increased steadily by age group up to a peak aged 40 – 50 in each of the census years. The female earnings patterns were quite different prior to 1981 and after 1981, reflecting quite

[21] The CPI index excludes interest rates and is adjusted for the effect of GST.

[22] The exception is those aged 20 – 24, whose average earnings fell sharply between 1986 and 1996. This decline reflects the changing number of part-time workers. In 1996, 39% of women aged 20 – 24 earned less than $10000. In 1991, 31% of women earned less than $9000, the CPI adjusted equivalent. In 1986, 27% of women earned less than $6400, the same real amount.

different social patterns. In the earlier period, average earnings were highest for those aged 20 – 24, at which age participation was highest, and lowest for women aged 25 – 34, who were presumably raising children. Towards the end of the period, average earnings were systematically higher for women aged from 25 to 30 and 35 to 50 than those of other ages. The relative rise in incomes of women aged 35 – 50 may reflect both greater participation rates and better paying jobs over the period.

Combined mean earnings (including zeros) for men and women reflect these two patterns. An analysis of the combined income of couples of similar age shows mean income rises with age to peak at ages 40 – 50: the male pattern dominates. However, the decline in male age group earnings since 1981 is not seen in the combined data. Combined incomes reach a peak in 1986 rather than 1981; and while there is a decline in 1991, by 2001 combined incomes exceeded their 1980s levels. Nonetheless, the overall growth in mean combined income is rather low. Between 1986 and 2001, combined mean incomes for 45 – 49 and 50 – 54 year olds increased by 12 per cent and 16 per cent respectively; however, they only increased by 4 per cent, 3 per cent, and 8 per cent for 30 – 34, 35 – 39, and 40 – 45 year olds.

These patterns, which are broadly similar with those in the United States, make irrelevant the life-cycle argument that higher growth leads to higher savings. There simply has not been enough income growth in New Zealand in the last twenty years to run an argument that the young earn more than the old, and therefore can be expected to save more than the old dissave.

(4.3)Earnings Over Time for Cohorts.

Figure 6 shows how income has increased with age for different age cohorts. Each line traces out the mean earnings for a cohort as the members of the cohort aged. The first cohort is those born in 1926; the first data collected for this cohort are their earnings aged 40. The last data are the earnings aged 20 to 30 for those who were born in 1971.

The first graph, for males, has three important features.

First, male earnings typically have a hump shaped pattern, rising sharply from ages 20 through 30, and falling after age 50.

Secondly, for males born between 1926 and 1951, successive cohorts earned more than earlier cohorts *at young ages.* That is, men born in 1946 earned more at ages 20 – 35 than men born in 1941; and these in turn earned more than those born in 1936 and so on. Ordinarily, one would have expected that these higher cohort earnings would have lasted right throughout life, as they do in growing economies. This did not occur, however. For men of all cohorts born between 1931 and 1951, earnings peaked at the age they turned in 1981. Thus peak earnings for those born in 1931 occurred at age 50; peak earnings for those born in 1941 occurred when they turned 40; and peak earning for those born in 1951 occurred at age 30. This pattern is highly unusual; basically the downturn in male average earning between 1981 and 1991 was so severe that it dominated rises in income that usually would have occurred with age and experience. Worse, those born in 1951 earned less at age 35 than did those who were five and ten years older than themselves; and those born in 1941 earned less at age 50 than did those who were five to fifteen years older than themselves. Males entering into their prime saving ages in the 1980s found their incomes were much lower than they could have reasonably expected given the previous pattern of rising incomes. Those emulating the savings patterns of people a few years older than themselves would have seen their plans fail along with their incomes.

These income patterns taken alone suggest a reason for a saving decline during the 1980s and early 1990s. Consumption habits are hard to break, both for psychological reasons and because it is difficult to reverse durable purchases already undertaken. Rather than reduce consumption

immediately when incomes fall, people seem to prefer to take a bigger consumption adjustment later when it can no longer be avoided. Consequently, if incomes fall, or even fail to increase as fast as expected, saving will be much less than previously anticipated. Males expecting to save after they turned 40 or 50 in the 1980s and 1990s were earning substantially less than they would have imagined given earnings patterns in the 1970s.

This "habit" argument is different to that offered in the previous section. There it was argued that the lack of growth in household incomes is consistent with low savings, given that the saving of the young will not be markedly different from the dissaving of the retired as they have similar incomes. The "habit" argument argues that the failure of incomes to rise as fast as could have been reasonably anticipated is a reason for low savings, if in fact people are slow to adjust to worse than expected (or in many cases declining) incomes. Nonetheless, this argument must be qualified by the observation that female incomes were rising as male incomes were falling, so that average household incomes were static. Nonetheless, it remains true that the failure of male incomes to rise as they had previously done still means that household incomes rose considerably less than could reasonably have been expected on the basis of past income trends.

The third feature of the graph is the successive fall in incomes at young ages for cohorts born after 1961. The pattern of rising incomes, cohort by cohort, ended in the 1970s, and from the mid 1980s was replaced by a pattern of declining incomes at young ages. Those born in 1966 had lower incomes at ages 25 – 35 than males born in the previous 25 years.

The pattern in female earnings is very different. Age earnings profiles have been steadily rising over the whole period, with the exception of 1986-1991, which are at 1981 levels. There does not appear to be a distinctive peak in the age-earnings profiles. It appears, therefore, that successive generations of women have earned more over their whole life-times than those who are older than themselves. The social implications of this pattern are discussed in Easton (1997); their implications for saving are unclear, given that their main effect in the last fifteen years has been to offset the decline in male earnings.

(4.4) Summary

The main intention of this section has been to present data on the age-earnings profiles in New Zealand from 1966 to 2001. The data show in clear detail what is already well known; incomes in New Zealand have increased by little since the end of the 1970s. What the detail does reveal, however, is the sharp curtailment of male earning power post 1981. Incomes for most cohorts born prior to 1951 peaked prematurely in 1981; subsequent earnings were much lower than could reasonably have been expected given previous income patterns; and earnings for young males fell. In the Modigliani-Brumberg life-cycle model, these patterns would suggest that aggregate saving rates should be near zero, at least in equilibrium.

(5)Conclusion

This paper has examined the relevance of the life-cycle hypothesis as an explanation of New Zealand saving patterns over the last fifteen years. The hypothesis is extremely important because of the compelling logic of its three main implications:

> (1) if people try to smooth consumption over time, their saving rates should rise with age, peaking before retirement, and then turn negative;
> (2) if people save to spend, and income is constant over time, aggregate saving rates will tend towards zero in the long term, as the saving of the young is offset by the dissaving of the retired; and

(3) saving rates should increase with income growth, because the amount saved by the young will be greater than the amount dissaved by the retired as the young have higher lifetime incomes.

The paper argues that while the saving rates of retired people are often estimated to be positive, these estimates reflect mismeasurement, as much retirement "income" should be treated as the decumulation of capital amassed when young. This mismeasurement is particularly acute in countries where there is a large pay-as-you-go social security system, for the contributions of the young are not counted as saving, and the payments to the old are not counted as asset decumulation. The paper estimates New Zealand age-saving profiles when superannuation contributions are treated as transfers and when they are treated as mandatory savings. The differences are considerable: in the "transfer" case, those over 65 are estimated to have savings rates of 15 – 30 per cent; while in the mandatory saving case, savings rate are near –100 per cent. These adjustments have no effect on the current aggregate saving rate, for by construction the additional saving of the working exactly offsets the additional dissaving of the retired.

The paper also argues that the way income and taxes are treated in the National Accounts may lead to some misleading inferences about the aggregate level of household savings. In particular, the inflation adjustment to interest income and the increase in net taxes paid by households to the Government account for some $5 billion of the $10 billion measured decline in household saving between 2000 and 2005.

The last section of the paper examines income dynamics in New Zealand over the last thirty five years by exploring the changing pattern of earnings of different cohorts through time. The data show that average household incomes have not increased much since 1981, with the decline in male incomes offset by rising earnings and participation rates for females. No firm conclusions can be drawn from the earnings data. Nonetheless, New Zealand's low income growth rate and low saving rate are consistent with international data that show that growth rates and saving rates are positively correlated. For whatever reason, low – and lower than expected - income growth could be a reason for the poor saving performance compared to many rapidly growing countries.

The results of this study raise three questions that need further analysis and discussion.

Taxes and Consumption

In section 3 it is shown that part of the measured decline in aggregate household savings since 2000 is associated with a $3.7 billion increase in the net tax contribution to the Government. The increased tax take need not have reduced measured saving, however; households could have reduced their consumption by $3.7 billion and measured saving would not have declined. Nonetheless, the evidence that households did not reduce consumption in the face of higher taxes is in keeping with international evidence that consumption is rather insensitive to changes in tax (see for instance Gruber (2004)). It appears that as Governments taxed households more highly, households maintained their consumption by saving less.[23] It would be of interest to test this hypothesis directly by examining the consumption patterns of working age households after the tax changes that occurred between 1998 and 2004.

Dissaving in retirement

The life-cycle model assumes that households run down their assets and dissave in retirement. Nonetheless, the ease with which households can do this depends on the institutional

[23] The fact that measured saving is negative does not, of course, imply that working age households dissaved in order to maintain consumption. They could simply have saved less than previously.

arrangements of the society in which they live. Without proper institutions, it can be very difficult for a person to know how to run down their assets appropriately in retirement in the face of uncertainty about how long they have left to live, their future health status, and the return they will earn on their assets.

Most societies have evolved various mechanisms to help retired people solve this problem. Insurance companies provide annuities, for instance, and Governments provide mandatory pension schemes that pay out benefits for the length of a person's life. The way a society makes these arrangements can be expected to have a large effect on the consumption and dissaving patterns of retired people. An increase in government provided healthcare resources to the elderly is very likely to increase consumption, for example, with a commensurate increase in their dissaving.

St John (2006) has recently shown that New Zealand's institutional arrangements surrounding retirement are changing ─ indeed, they appear to be falling apart, as the private sector market for annuities has basically disappeared. This means the main annuity-style income option for future households in retirement is New Zealand Superannuation, a scheme that is among the least generous in the world. From a public policy perspective, this is troubling. While it may be appropriate to have a retirement saving strategy based on a mixture of private and public saving, such schemes will not be welfare maximising unless individuals can find ways to appropriately spend their retirement assets in retirement. Given the absence of annuity providers in New Zealand, it may be time to ask whether the Government should step in, possibly by offering to sell annuities to those individuals who wish to purchase them when they retire[24].

Saving versus Investment

The equivalence of pay-as-you-go and save-as-you-go retirement schemes in cash flow terms should not distract one from their major difference: save-as-you-go systems generate a stock of assets in equilibrium whereas pay-as-you-go systems do not. A pay-as-you-go system has clear advantages over a save-as-you-go system when the returns to holding assets are less than the growth rate of incomes. However, given how slowly incomes have increased in New Zealand in the last thirty years, these circumstances are unlikely to have prevailed. Since New Zealand's mandatory pension saving scheme is largely operated on a pay-as-you-go basis, the real question may not be whether the saving rates of working people are high enough, but whether their savings are being appropriately invested. Rather than attempt to further increase the saving rates of working age people through further mandatory saving schemes, it may be sufficient just to make sure they are getting good value from the scheme they already have.

[24] It is well known that there are considerable adverse selection problems in the provision of annuities; at age 65, the people most likely to purchase an annuity are those whose expect to live longer than average. Presumably this is the reason why the market in New Zealand is failing. One way private companies circumvent this problem elsewhere is to have a long term saving arrangements with people: basically people start contributing years before retirement with the understanding that their accumulated funds will be paid out as an annuity upon retirement. In the absence of such schemes in New Zealand, there may be a role for the Government to intervene.

BIBLIOGRAPHY

Barnett, William and Robert Solow (2000) "An interview with Franco Modigliani" Macroeconomic Dynamics 4 222-256

Blanchard, Olivier Jean and Stanley Fisher (1989) *Lectures on macroeconomics* (Cambridge: The MIT Press)

Browning, Martin, and Annamaria Lusardi (1996) "Household Saving: Micro Theories and Micro Facts." *Journal of Economic Literature* 34 1797-1855

Börsch-Supan, Axel and Annamaria Lusardi (2003) "Saving: A cross-national perspective." in Axel Börsch-Supan, ed., (2003) *Life-cycle Saving and Public Policy* (Amsterdam: Academic press)

Bosworth, Barry, Gary Burtless and John Sabelhaus (1991) "The Decline in Saving: Evidence from Household Surveys." *Brookings Papers in Economic Activity* 1 183 – 241.

Brugiavini, Agar and Mario Padula (2003) "Household saving behaviour and pension policies in Italy" pp101- 148 in Axel Börsch-Supan, ed., (2003) *Life-cycle Saving and Public Policy* (Amsterdam: Academic press)

Chamley, Christophe and Brian D Wright (1987) "Fiscal Incidence in an Overlapping Generations Model with a Fixed Asset." *Journal of Public Economics* 32(1) 3-24

Easton, Brian (1997) *In Stormy Seas: The Post-War New Zealand Economy* (Dunedin: University of Otago Press)

Deaton, Angus (2005) "Franco Modigliani and the life-cycle theory of consumption." Mimeo, Princeton University.

Fisher, Irving (1907) *The Rate of Interest* (New York: The Macmillan Company)

Gibson, John and Grant Scobie (2001) "A Cohort Analysis of Household Income, Consumption and Saving" *New Zealand Economic Papers* 35(2) 196-216

Gokhale, Jagadeesh, Laurence J. Kotlikoff, and John Sabelhaus (1996) "Understanding the Postwar Decline in U.S. Saving: A Cohort Analysis" *NBER Working Paper 5571*

Gruber, Jonathon (2004) Public Finance and Public Policy (New York: Worth Publishers)

Jappelli, Tullio and Franco Modigliani (1998) "The Age-Saving Profile and the Life-Cycle Hypothesis" *Centro Studi in Economia e Finanza Working Paper* 9 November 1998

Modigliani, Franco (1949) "Fluctuations in the saving-income ratio: a problem in economic forecasting." pp 371-402 in *Studies in Income and Wealth* Vol 11 (New York: National Bureau of Economic Research, 1949)

Modigliani, Franco (1986) "Life Cycle, Individual Thrift, and the Wealth of Nations." *American Economic Review* 76(3) 297 – 313

Modigliani, Franco and Brumberg, Richard (1954) "Utility analysis and the consumption function: an interpretation of the cross-section data." pp 388-436 in Kenneth Kurihara (ed) *Post-Keynsian Economics* (New Brunswick, NJ: Rutgers University Press, 1954)

Modigliani, Franco and Brumberg, Richard (1980) "Utility analysis and aggregate consumption functions: an attempt at integration." pp 128-197 in Andrew Abel, ed., *The Collected papers of Franco Modigliani: Volume 2, The Life Cycle Hypothesis of Saving* (Cambridge, MA., The MIT Press)

New Zealand Ministry of Health (2002) *Health Expenditure Trends in New Zealand, 1980 – 2000* (Wellington: New Zealand Ministry of Health)

New Zealand Ministry of Health (2004) *Health Expenditure Trends in New Zealand, 1990 – 2002* (Wellington: New Zealand Ministry of Health)

Paxson, Christina (1996) "Saving and Growth: Evidence from Micro Data" *European Economic Review* 40 (1996) 255 – 288

Poterba, James M. (1994) *International Comparisons of Household Saving* (Chicago: University of Chicago Press)

Scobie, Grant M. and John Gibson (2003) "Household Saving Behaviour in New Zealand: Why do Cohorts behave Differently?" *New Zealand Treasury Working Paper* 03/32

Scobie, Grant M., John Gibson and Trinh Le (2005) *Household wealth in New Zealand* (Wellington: Institute of Policy Studies.)

St John, Susan (2006) "The Policy Implications of Decumulation in Retirement in New Zealand." mimeo, Department of Economics, University of Auckland.

Statistics New Zealand (2002) *The Net Worth of New Zealanders* (Wellington: Statistics New Zealand)

Appendix 1: Mortgage payments, inflation rates, and saving.

The following example shows how the saving rate of a borrower is understated when inflation is positive. Consider a household that has real income of $40000 each year, real consumption spending on non-housing goods of services of $25000, and a mortgage of $150000. The following table calculates their real saving when real mortgage rates are 6 per cent, and inflation is either zero or 3 per cent. Note that real income, real consumption, and real interest rates are exactly the same in each case, so real saving is the same. The recorded nominal saving is clearly very different, however. The inflation component of the mortgage is calculated as the inflation rate multiplied by the beginning year mortgage. It is expressed in nominal terms, that is to say not adjusted for the change in the price level.

	inflation				nominal interest rate			
	0				0.06			
Period	Price level	Income nominal	Spending nominal	mortgage nominal	interest payments	Saving nominal	mortgage real	inflation component of mortgage
0	100			150000			150000	
1	100	40000	25000	144000	9000	6000	144000	0
2	100	40000	25000	137640	8640	6360	137640	0
3	100	40000	25000	130898	8258	6742	130898	0
4	100	40000	25000	123752	7854	7146	123752	0
5	100	40000	25000	116177	7425	7575	116177	0

	inflation				nominal interest rate			
	0.03				0.0918			
Period	Price level	Income nominal	Spending nominal	mortgage nominal	interest payments	Saving nominal	mortgage real	inflation component of mortgage
0	100.00			150000			150000	
1	103.00	41200	25750	148320	13770	1680	144000	4500
2	106.09	42436	26523	146022	13616	2298	137640	4450
3	109.27	43709	27318	143036	13405	2986	130898	4381
4	112.55	45020	28138	139284	13131	3752	123752	4291
5	115.93	46371	28982	134681	12786	4603	116177	4179

Appendix 2: Estimate of Tax Necessary to Pay for Pension

The following table shows an estimate of the average income tax needed to pay the pension. The data come from a mixture of NZISA and NZ Government sources. The logic of the calculations is as follows. In 1987, gross household income including gross pensions were $49716 million, and gross pensions were 3650. Of this pension, an "estimated" 25 per cent was paid back to the government as various forms of tax[25]. Thus working people, on the earnings of $49716 – 3650 = $46066, were required to provide a net amount of $2738 or 5.9 per cent of their income as a pension transfer.

Estimate of Tax Necessary to Pay for Pension

	1987	**1989**	**1991**	**1993**	**1995**	**1997**
Gross income inc pension	49716	60863	68009	67708	74666	85212
Gross pension	3650	4314	5174	5316	5083	5206
Net pension (est 25% tax)	2738	2990	3880	3987	3812	3904
Gross Income - gross pension	46066	52894	62835	62392	69583	80006
Net pension/ Net Income	5.9%	5.7%	6.2%	6.4%	5.2%	4.9%

[25] The 25 per cent is a guess by the author based on personal income taxes and GST. The exact rate is unimportant for the purpose of this argument.

APPENDIX 3: AGE-EARNINGS PROFILES

Earnings data, from 1966 – 2001 censuses.

Table 1 - Male Median Income excluding zeros

Year	Earnings at Age: 15	20	25	30	35	40	45	50	55	60
1966	11063	21662	27492	27492	29427	29427	28460	28460	25450	25450
1971	11475	23534	30840	30840	32836	32836	31734	31734	26918	26918
1976	14002	25885	32245	35755	36506	36221	35452	34162	31587	27490
1981	13070	25696	32348	36890	38447	38196	37087	36026	33763	24292
1986	14333	21151	27776	30835	33415	33781	32717	30816	28892	19001
1991	9900	18002	25704	29695	31758	32914	32114	29832	25938	13078
1996	7606	16725	26204	29787	32107	33237	33546	31274	27388	16576
2001	4077	16048	26183	30455	31950	32590	32386	31252	27530	20913

Table 1 - Female Median Income excluding zeros

	Earnings at Age: 15	20	25	30	35	40	45	50	55	60
1966	10094	15218	12538	12538	10856	10856	11361	11361	9685	9685
1971	10521	16964	10406	10406	9936	9936	11168	11168	8788	8788
1976	12945	21582	16887	12321	13498	14527	15060	14689	12568	6849
1981	11174	22401	20085	13660	14881	16517	16802	15324	11456	5105
1986	12959	17107	14681	11923	13458	14960	15264	13948	11224	11121
1991	9457	15509	16376	14355	15386	17125	17468	15224	11036	11191
1996	5952	13758	18813	15589	15638	18150	19376	17678	13194	10787
2001	3609	13040	20784	19049	18026	19654	21400	20398	16054	11471

Table 1 - Male Mean Income including zeros

Year	Earnings at Age: 15	20	25	30	35	40	45	50	55	60
1966	8022	21545	30331	30331	34835	34835	34045	34045	28384	28384
1971	8388	23587	33409	33409	37456	37456	36693	36693	29841	29841
1976	9314	24964	33629	38954	40738	40826	40494	39049	35441	25340
1981	9122	24443	33252	39990	42892	43400	42085	40782	37425	23202
1986	17547	25767	32994	36573	38965	39231	38490	36975	35137	27744
1991	10588	18706	26452	31121	33417	34794	34108	31890	27972	17634
1996	8842	17431	27291	33319	37021	38801	39517	37481	32786	23799
2001	5479	16982	27918	34939	38874	41062	41337	40403	35670	27707

Table 1 - Female Mean Income including zeros

Year	Earnings at Age: 20	25	30	35	40	45	50	55	60
1966	8550	4379	4379	5342	5342	6386	6386	5454	5454
1971	10301	6073	6073	7271	7271	7929	7929	6138	6138
1976	13667	9301	8462	10262	11431	11316	10402	8384	5743
1981	15469	12248	11172	13270	14840	14528	12848	10317	6496
1986	20310	19787	18023	19359	20504	20143	18240	16352	17925
1991	16458	18544	17313	18143	19553	19226	17052	14260	13578
1996	14623	19325	18242	18617	20753	21455	19924	16763	13834
2001	14453	21529	21670	21444	23178	24600	23619	20233	15779

Table 1 - Combined Mean Income including zeros

Year	Earnings at Age: 20	25	30	35	40	45	50	55	60
1966	15047	17355	17355	20088	20088	20215	20215	16919	16919
1971	16944	19741	19741	22364	22364	22311	22311	17989	17989
1976	19315	21465	23708	25500	26128	25905	24726	21912	15542
1981	19956	22750	25581	28081	29120	28306	26815	23871	14849
1986	23039	26390	27298	29162	29868	29316	27608	25744	22834
1991	17582	22498	24217	25780	27173	26667	24471	21116	15606
1996	16027	23308	25780	27819	29777	30486	28703	24775	18817
2001	15718	24723	28305	30159	32120	32968	32011	27951	21743

Table 1: Aggregate household saving rate estimated from the Household Income and Expenditure Survey and the New Zealand Institutional Sector Accounts

Year	1987/8	1989/90	1991/92	1993/4	1995/6	1997/8
HES Saving rate	11.2	7.1	12.5	13.4	12.7	15.4
NZISA Saving rate	5.0	6.2	4.0	4.3	1.7	1.8

Source: calculations by author and Matthew Bell, NZ Treasury, using Household Income and Expenditure Survey data and New Zealand Institutional Sector Accounts data

Table 2: Estimated saving rate by cohort and year, HES data 1987/8-1997/8.

	1987/88	1989/90	1991/92	1993/94	1995/96	1997/98	Mean	s. dev
25 to 29	6.1%	-3.6%	10.4%	7.8%	6.5%	13.7%	6.8%	5.8%
30 to 39	6.0%	1.3%	10.7%	9.0%	7.2%	11.5%	7.6%	3.7%
40 to 49	7.6%	12.6%	12.7%	15.3%	15.0%	16.2%	13.2%	3.1%
50 to 59	18.9%	16.3%	17.1%	19.4%	22.4%	26.8%	20.2%	3.9%
60 to 64	17.9%	3.5%	1.5%	11.4%	20.8%	12.5%	11.3%	7.7%
65 to 74	19.5%	16.8%	16.9%	13.7%	11.1%	12.6%	15.1%	3.1%
75 +	31.5%	24.3%	28.3%	32.0%	24.9%	22.5%	27.3%	4.0%
total	11.3%	7.2%	12.6%	13.4%	12.8%	15.4%	12.1%	2.8%

Source: calculations by author and Matthew Bell, NZ Treasury, using Household Income and Expenditure Survey data.

Table 3: Average saving rates by age.

Group	**Population Share 1995-98**	**Relative Income**	**Saving rate**	**Saving rate adjusted for inflation**
19-24	12.3%	83.8%	3.5%	4.4%
25-29	11.2%	97.6%	6.8%	9.0%
30-39	22.4%	108.4%	7.6%	10.3%
40-49	19.4%	122.5%	13.2%	16.5%
50-59	13.9%	105.8%	20.2%	22.1%
60-64	5.2%	82.2%	11.3%	11.1%
65-74	9.4%	73.2%	15.1%	7.7%
75+	6.9%	71.6%	27.3%	12.8%

Source: calculations by author and Matthew Bell, NZ Treasury, using Household Income and Expenditure Survey data.

Table 4: Inflation adjustment on interest earnings and payments

	Interest earnings	Inflation adjustment	Interest payments	Inflation adjustment	of which mortgage Adjustment	Net inflation adjustment
1988	2829	**-1530**	-2826	**1287**	957	**-243**
1989	2802	**-858**	-2893	**726**	525	**-132**
1990	2964	**-1852**	-3313	**1555**	1085	**-297**
1991	3217	**-1257**	-3651	**1101**	757	**-157**
1992	2889	**-289**	-3421	**226**	161	**-63**
1993	2512	**-379**	-2863	**288**	197	**-91**
1994	2285	**-492**	-2676	**416**	280	**-76**
1995	2433	**-1348**	-3061	**1391**	991	**43**
1996	3128	**-830**	-3891	**827**	611	**-3**
1997	3638	**-783**	-4742	**820**	615	**36**
1998	3355	**-583**	-5078	**690**	540	**107**
1999	2925	**+46**	-4912	**-51**	-41	**-5**
2000	2286	**-685**	-4529	**906**	719	**221**
2001	2902	**-1386**	-4952	**1857**	1451	**471**
2002	2673	**-1373**	-5451	**1892**	1474	**519**
2003	2876	**-1314**	-5971	**2025**	1544	**711**
2004	2884	**-883**	-6831	**1503**	1150	**620**
2005	3472	**-1592**	-8091	**3090**	2414	**1498**

Source: authors calculations using Household Income and Outlay Accounts.
A positive number means real interest earnings or payments are overstated. A positive number in the "Net inflation adjustment" column means savings is understated.

Table 5: **Saving Rates Treating New Zealand superannuation and health-care on a save-as-you-go basis.**

Age	HES Saving Rate	Saving Rate with mandatory saving/pensions	Saving Rate with mandatory pensions and healthcare
19-24	3.5%	9.5%	13.5%
25-29	6.8%	12.8%	16.8%
30-39	7.6%	13.6%	17.6%
40-49	13.2%	19.2%	23.2%
50-59	20.2%	26.2%	30.2%
60-64	11.3%		
65-74	15.1%	-41%	-85%
75+	27.3%	-21%	-117%

Source: authors calculations.

Table 6: Health Expenditure by Age Cohort, 1998

Age	0-1	1-4	5-14	15-24	25-44	45-64	65-74	75+
Per capita Expense	$5667	$634	$312	$592	$925	$1011	$3852	$7973
Fraction spent on age group	6.7%	3.0%	1.9%	3.4%	5.0%	5.4%	22.7%	51.8%

Source: authors estimates New Zealand Treasury Health funding data.

Table 7. Estimated tax payments, transfer receipts, and direct consumption expenditure

	Income tax	Estimated GST	Total	Transfers	Direct expenditure	Total	Net Balance
1988	11578	2955	14533	8192	5086	13278	1255
1989	12639	3158	15797	9315	5520	14835	962
1990	12900	3380	16280	10266	5748	16014	266
1991	13875	4303	18178	11595	5755	17350	828
1992	12751	4253	17004	11451	6018	17469	-465
1993	13133	4356	17489	11616	6215	17831	-342
1994	13910	4575	18485	12073	6156	18229	256
1995	14875	4958	19833	12609	6140	18749	1084
1996	15827	5257	21084	13357	6443	19800	1284
1997	16104	5579	21683	13945	6738	20683	1000
1998	16218	5803	22021	14778	7165	21943	78
1999	15596	6077	21673	15209	7476	22685	-1012
2000	15662	6359	22021	15191	7922	23113	-1092
2001	17421	6654	24075	15913	8069	23982	93
2002	18315	7022	25337	16392	8514	24906	431
2003	19943	7525	27468	16614	8962	25576	1892
2004	20865	8024	28889	17438	9583	27021	1868
2005	21995	8613	30608	17842	10182	28024	2584

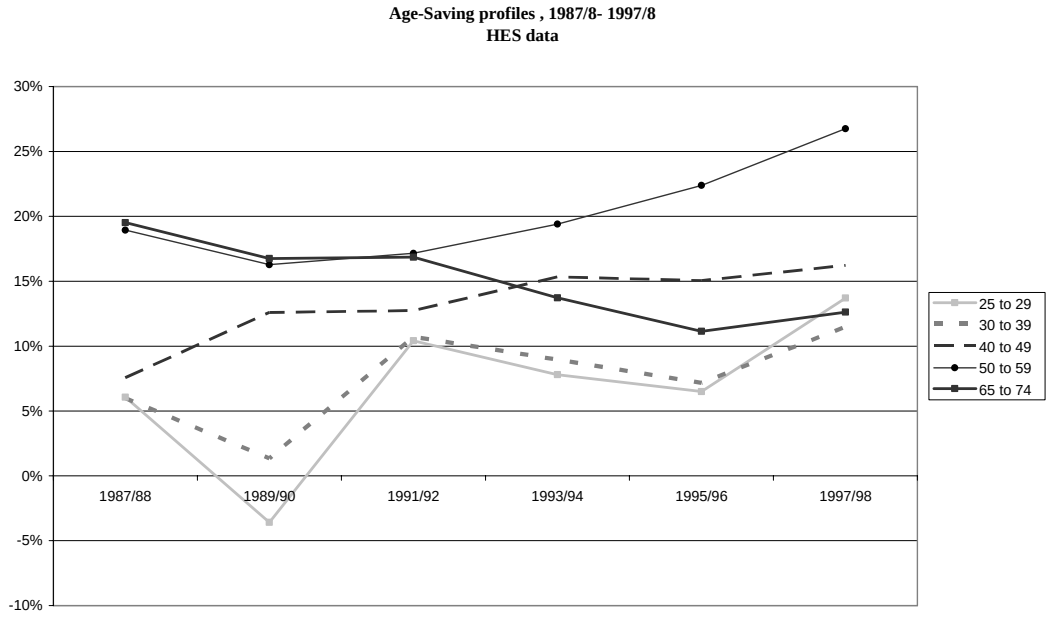
Source: authors calculations using Household Income and Outlay Accounts.

Table 8: Income Distribution, 30 – 34 year olds, 1996 Census

Income Band	Males 30 – 34	Females 30 - 34
0	1803	13032
$1 – 5000	4140	20040
$5001 – 10000	10356	18654
$10001 – 15000	9837	21663
$15001 – 20000	9801	14028
$20001 – 25000	13020	10770
$25001 – 30000	17643	11526
$30001 – 40000	27375	15669
$40001 – 50000	16620	6138
$50001 – 70000	11685	3492
$70001 – 100000	4602	1263
$10000+	3015	777
Not specified	12555	13977
Total	129897	133203
Median – including zeros	$29532	$14180
Mean – including zeros	$33319	$18617
Median – excluding zeros	$29787	$15638
Median – excluding zeros	$33788	$20349

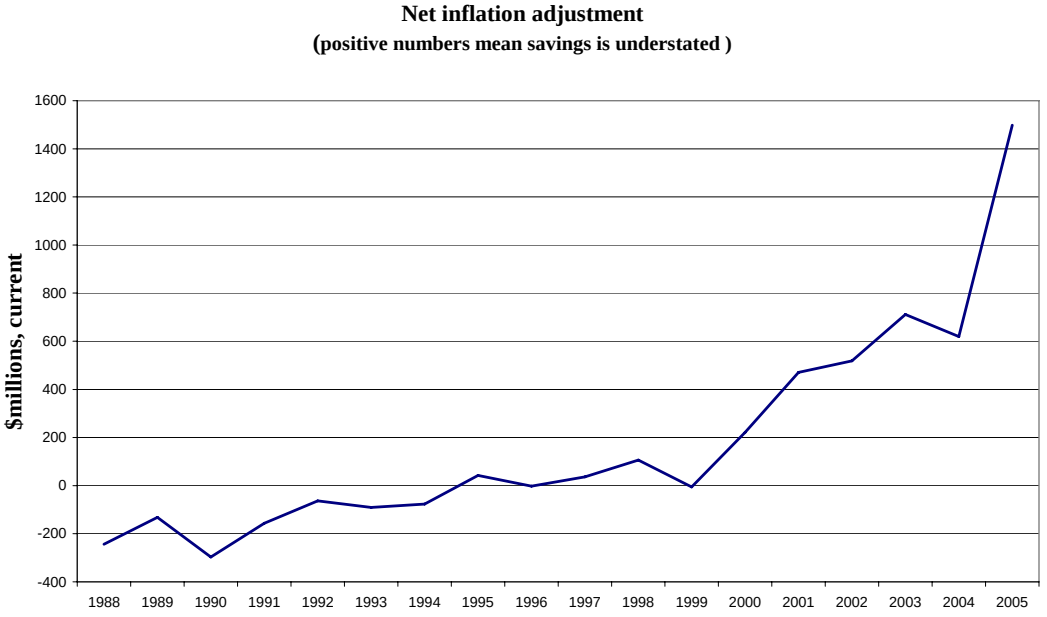
Source: Statistics New Zealand, 1996 Census. Means and medians estimated by the author.

Figure 1: Age- Saving Profiles.



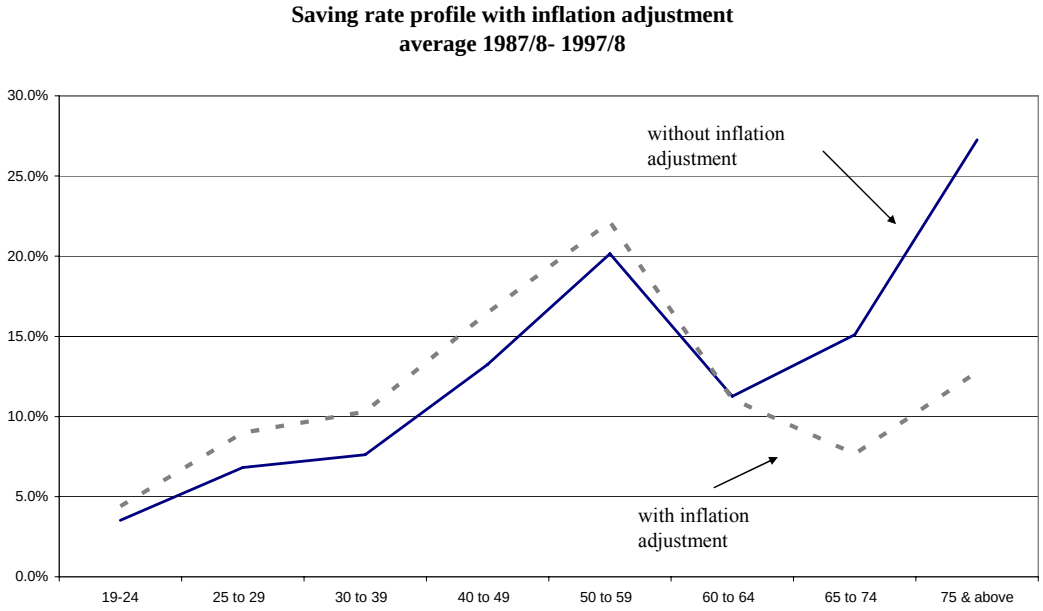
Source: HES data, estimates by author and Matthew Bell.

Figure 2: Net Inflation adjustment to saving, 1988- 2005



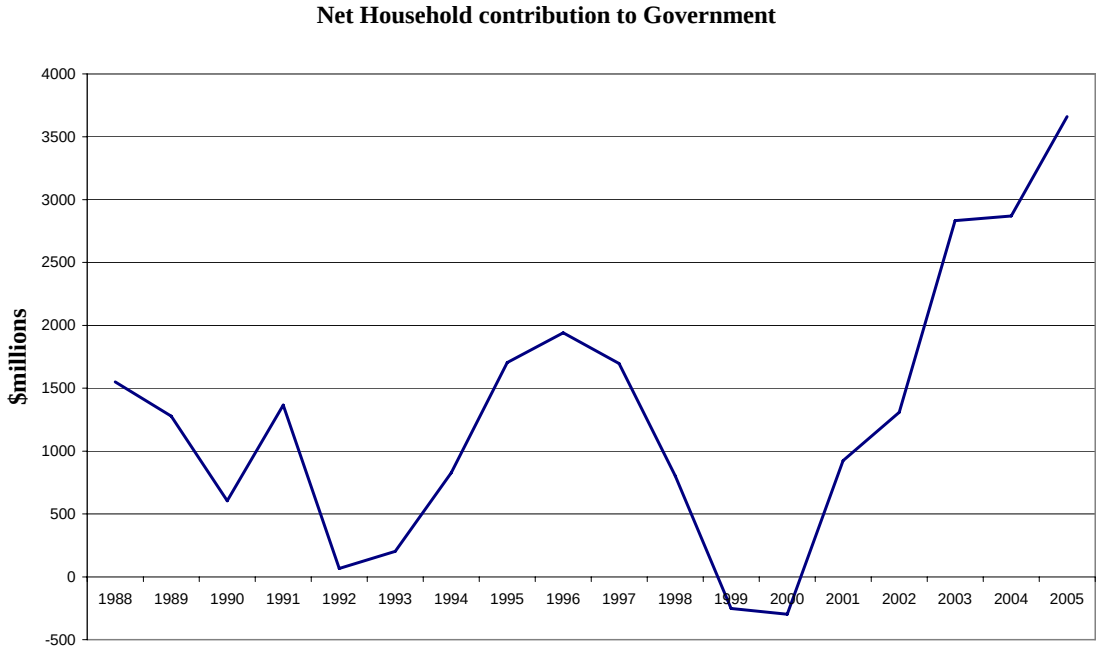
Source: authors calculations using Household Income and Outlay Accounts.

Figure 3: Saving rate profile by age, with inflation adjustment.



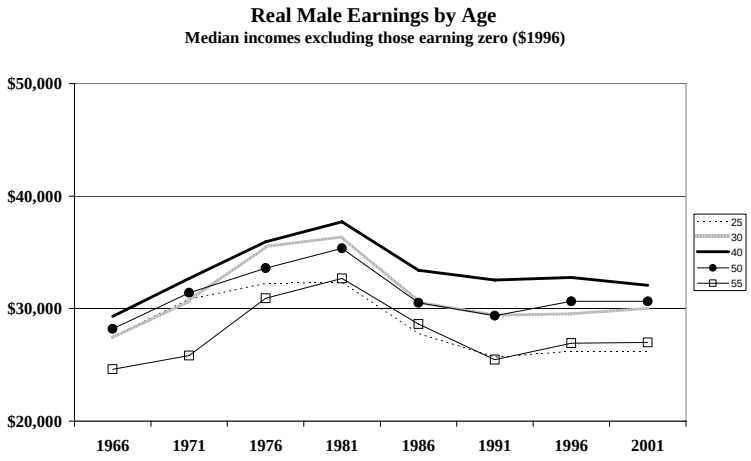
Source: author's calculations using Household Income and Outlay Accounts and HES data

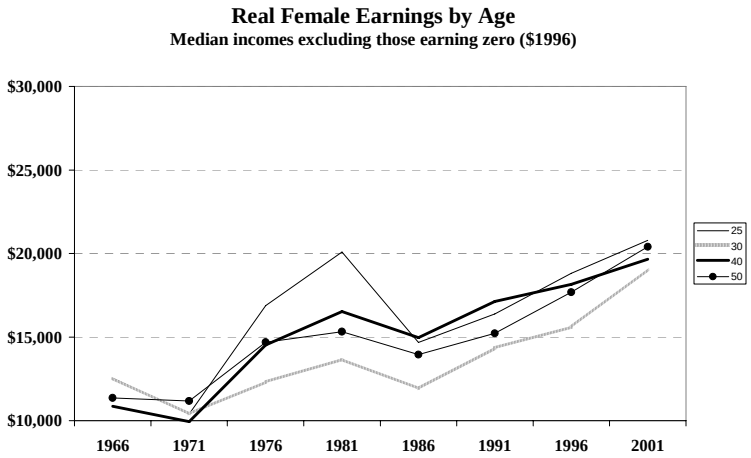
Figure 4: Net Household tax contribution to Government.



Source: authors calculations using Household Income and Outlay Accounts.

Figure 5: Earning by age





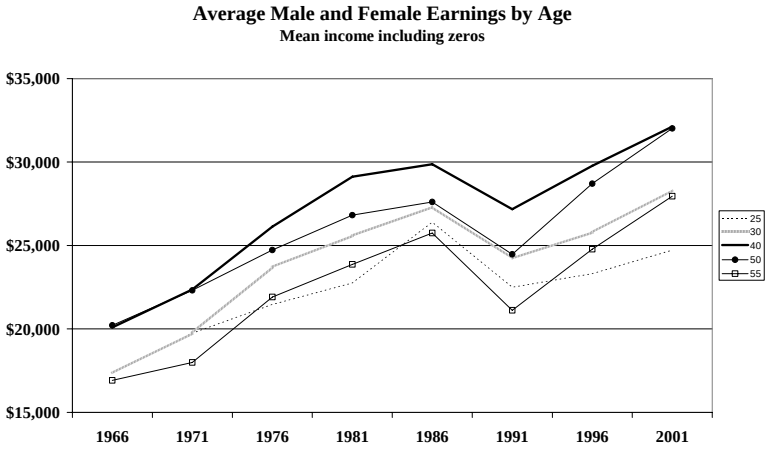


Figure 6: Earning by Cohort