ON THE DISTRIBUTIONAL EFFECTS OF TAXING IMPUTED RENT

Steven C. Bourassa
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*Series Editor:*
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Abstract

Bourassa and Hendershott use data from the 1986 Income Distribution Survey in Australia to argue a case for the taxation of imputed rent on owner occupied housing. They conclude that both on equity grounds and in terms of traditional economic efficiency, taxation of imputed rental income together with deductibility of mortgage interest would be better than the current situation which does not tax imputed rental income and penalises debt. Previous claims that a tax on imputed rent would be regressive are shown to be due to failure to control for life cycle effects and, more importantly mismeasurement of income.
On the Distributional Effects of Taxing Imputed Rent

Steven C. Bourassa and Patric H. Hendershott*

Introduction

In both Australia and the United States, owner-occupied housing has long been supported by government policy and roughly two-thirds of households have attained that tenure.1 While the U.S. Tax Reform Act of 1986 eliminated the deductibility of interest paid on other forms of consumer credit, the home mortgage interest deduction was at least partially retained and the tax-free status of imputed rental income was continued.2 Although mortgage interest is not deductible in Australia, owner-occupied housing is favoured because imputed rental income is not taxed.3 Capital gains tax provisions in both

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1 Home ownership rates in the two countries are currently about 70 and 64 per cent, respectively. The Australian rate is from the 1990 Survey of Income and Housing Costs and Amenities; the U.S. figure is from the 1988 Annual Housing Survey.

2 Follain and Ling show that the combination of the increase in the standard deduction and decreases in allowable non-housing related deductions effectively made much of mortgage interest non-deductible for many households. J. Follain and D. Ling, 'Federal Tax Subsidies to Housing and the Reduced Value of the Mortgage Interest Deduction,' National Tax Journal 44 (1991): 147-168.

3 It should be recalled that Australia taxed net imputed rental income at the national level between 1915, when the Commonwealth income tax was introduced, and 1923. For further details, see: B.F. Reece, 'Taxing Imputed Rents: Australian Precedents,' Community 2 (1975):
countries also favour owner-occupied housing. In the U.S., capital gains are not taxed if the proceeds are applied to the purchase of another house of equal or greater value, and a one-time write off of up to $125,000 in gains is also permitted. Australia introduced taxation of real capital gains in 1985, but exempted gains on the owner occupier's principal residence.

Although governments in both countries seem unlikely to tackle the tax-favoured status of owner-occupied housing, it is important to have a clear understanding of the issue so that policy analysts can at least make appropriate economic recommendations. The National Housing Strategy (NHS) in Australia advanced understanding by commissioning two studies dealing with this issue, both of which were published as background papers in 1992. One of the NHS papers, by Bourassa and Hendershott, compared user costs for owner-occupied housing and other capital assets to determine the extent to which the tax system favours the former. The second paper, by Apps, focused on the distributional effects of a hypothetical tax on net imputed rent.

Unfortunately, the two studies seemed to reach opposite conclusions. Bourassa and Hendershott concluded that the failure to tax owner-occupiers' imputed rent resulted in significant incentives to over-invest in housing in Australia. The natural implication is that a tax on imputed rent would increase

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social welfare._apps, however, argued that a tax on net imputed rent would be highly regressive and therefore undesirable on equity grounds. More specifically, she computed that the percentage increase in taxes would be six times as large for the lowest income decile as for the top half of the income distribution (see her table 1.2, p. 17). This finding is somewhat startling. When taxation of imputed rents was introduced in the United Kingdom and Australia, improving equity, not efficiency, was the rationale. Moreover, numerous academics have recently advanced the imputed rent tax on equity grounds.

In this paper, we show that Apps' results are due to a combination of not controlling for life cycle effects and mismeasuring income. On the former, the combination of a tax on imputed rent and mortgage interest deductibility would clearly favour those with high debt relative to those with low debt, i.e., the young relative to the old. However, over the full life cycle, this differential effect cancels out. On the latter, income should include imputed rental income on housing, as well as reported non-housing income. Those with large houses and modest non-housing income are not "poor" relative to those with small houses and somewhat larger non-housing income. With

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7We thank Barry Reece for this observation.

income properly measured and life-cycle effects held constant, a tax on imputed rental income is progressive.

This paper is divided into three sections. We first summarise the case for efficiency gains stemming from the taxation of imputed rents, then turn to the direct distributional effects, and conclude with some observations about general equilibrium and transitional issues.

**The Case For Imputed Rent Taxation**

The user cost of capital takes into account all of the relevant costs and benefits—including the real after-tax financing rate, the economic depreciation rate, tax rates, expected inflation rates, subsidies, and tax credits and tax depreciation—associated with 'using' a unit of capital for one year. Neoclassical investment theory tells us that, in the absence of externalities, risk-adjusted net (of depreciation) user costs should be the same across capital assets so that marginal investments are equally productive. While home ownership may well provide externalities, it is unlikely that externalities result from investment in larger houses by middle or upper income households; i.e., encouraging middle and upper income households, who will be home owners in any event, to invest in additional owner-occupied housing is not sound policy. In fact, recent research by de Long suggests that large externalities are generated by business investment in equipment (machinery).9 Because technological innovations are introduced into the economy through equipment investment, encouraging this investment substantially increases labour productivity and thus economic well-being. This suggests that risk-adjusted net user costs should be lower for business investments on average (for equipment in particular) than for housing.

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Bourassa and Hendershott show that the typical user cost for business investments, including rental housing, was substantially higher than that for owner-occupied housing in both 1984-85 and 1990-91 in both Australia and the U.S.\textsuperscript{10} Calculations based on more recent data lead to similar conclusions. Australian business user costs for 1991-92 are reported in table 1. Business user costs vary largely due to differences in the relationship between tax depreciation and economic depreciation across assets. For example, on average equipment can be depreciated for tax purposes at about four times its economic depreciation rate. In contrast, residential buildings are depreciated for tax purposes at 1.5 times economic depreciation.\textsuperscript{11} As noted above, this may be good tax policy owing to positive externalities of equipment investment.

User costs for owner-occupied housing are shown in table 2. Owner-occupier costs decrease with increases in the taxpayer's marginal tax rate, because higher rates reduce the opportunity cost of alternative investments of owner equity, but increase with increases in the debt ratio because purchasers cannot deduct interest from income for tax purposes. Given the debt tax penalty, Australian purchasers attempt to reduce mortgage debt as quickly as possible. It is not surprising that the average housing debt ratio across all home owners and purchasers is only about 0.15 in Australia compared with 0.44 in the U.S., where mortgage interest is, in most cases, deductible.\textsuperscript{12} We


\textsuperscript{11}These comparisons are based on mean asset lives for privately-owned assets as reported in Australian Bureau of Statistics, \textit{Australian National Accounts: Concepts, Sources and Methods}, cat. no. 5216.0 (Canberra: ABS, 1990).

\textsuperscript{12}The Australian ratio was estimated from the 1986 Income Distribution Survey (see table 5); the U.S. ratio is from the Federal Reserve Bank's Flow of Funds Accounts.
emphasise that debt and equity are treated symmetrically in the U.S., but not in Australia.13

### Table 1 Net user costs for business investments, 1991-92a

<table>
<thead>
<tr>
<th>Capital asset</th>
<th>Net user cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corporate investments</strong></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>0.0750</td>
</tr>
<tr>
<td>Industrial manufacturing buildings and short-term</td>
<td></td>
</tr>
<tr>
<td>traveller accommodations</td>
<td>0.0868</td>
</tr>
<tr>
<td>Other buildings</td>
<td>0.0931</td>
</tr>
<tr>
<td><strong>Non-corporate investments</strong></td>
<td></td>
</tr>
<tr>
<td>Commercial buildings</td>
<td>0.0894</td>
</tr>
<tr>
<td>Residential buildingsb</td>
<td>0.0917</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>0.0872</td>
</tr>
</tbody>
</table>

Notes:
- a. Assumes 3% expected inflation and 9% nominal debt rates.
- b. Because the vast majority of rental housing is owned by non-corporate entities, we do not report user costs for corporate investments in rental housing.

### Table 2 Net user costs for owner-occupied housing, 1991-92a

<table>
<thead>
<tr>
<th>Marginal tax rateb</th>
<th>Net user cost</th>
<th>Loan-to-value ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>0</td>
<td>0.0934</td>
<td>0.0934</td>
</tr>
<tr>
<td>0.2125</td>
<td>0.0934</td>
<td>0.0841</td>
</tr>
<tr>
<td>0.3925c</td>
<td>0.0934</td>
<td>0.0762</td>
</tr>
<tr>
<td>0.4725</td>
<td>0.0934</td>
<td>0.0727</td>
</tr>
<tr>
<td>0.4825</td>
<td>0.0934</td>
<td>0.0723</td>
</tr>
</tbody>
</table>

Notes:
- a. Assumes 3% expected inflation and 9% nominal debt rates.
- b. Includes Medicare levies.
- c. Rate applicable to taxpayers with average incomes.

13Bourassa and Hendershott, 'Changes in the Relative Incentives to Invest in Housing.'
The user costs reported in tables 1 and 2 indicate substantial incentives to misallocate capital both between the owner-occupied and business sectors and within the owner-occupied sector. The average net user cost for business investments is about 8.7 per cent, while that for owner-occupied housing is only about 6.4 per cent (assuming a 0.15 average debt ratio). The wide variation in user costs across owner-occupiers implies that individuals in low tax brackets and with low wealth (high debt) will tend to occupy smaller houses relative to their expected lifetime resources than will high tax bracket and wealth individuals. Moreover, households who expect to earn constant risk-adjusted incomes over their lifetimes, will tend to own smaller houses in their early (low wealth) years than in their middle (high wealth) years.

The user costs also imply substantial inequities. Lower income/wealth households pay a higher after-tax price for each unit of owner-occupied housing than do higher income/wealth households. Moreover, renters pay a higher price, on average over their life cycles, than do owners, and renters, on average, have far lower incomes than owners. On both equity and efficiency grounds, it would seem that a tax on owner-occupiers' net imputed rent would be desirable.

Policy changes that would narrow the difference in user costs across individuals would increase the efficiency of the allocation of the owner-

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15Yates emphasizes the importance of these horizontal inequities; see, for example, J. Yates, *Australia's Owner-Occupied Housing Wealth and Its Impact on Income Distribution*. 
occupied stock. Variation across loan-to-value ratios would be eliminated by introduction of deductibility of home mortgage interest. User costs would then be independent of the loan-to-value ratio and would equal those in the last column of table 2 (under loan-to-value ratio = 0). Unfortunately, this action would reduce user costs for most individuals while raising user costs for none. Not only would a net loss of tax revenue occur, but the average user cost for owner-occupied housing would be about 5.9 per cent as compared to the 8.7 per cent user cost for business capital. That is, efficiency gains from a better allocation within the owner-occupied housing stock would come at the expense of efficiency losses from over-investment in housing.

The over-investment-in-housing problem can be addressed by simultaneously imposing a tax on estimated imputed rental income. In fact, this tax, along with mortgage interest deductibility, could remove all variation in owner user costs if the estimated rental income were set at \( i/(1 + \pi) \) or 0.087 in the present case (\( i \) is the 0.09 nominal debt rate and \( \pi \) is the 0.03

\[ r_k = [(1 - t_k)i + \partial - \pi]/(1 + \pi), \]

where \( t_k \) is the household's average marginal tax rate, \( i \) is the interest rate, \( \partial \) is the risk premium, and \( \pi \) is the expected inflation rate. This equation may be compared with equation [6] in Bourassa and Hendershott (1992), Appendix A. Note that \( r \) no longer depends on the debt ratio.

With an imputed rent tax and no subsidy, the net user cost for owner-occupied housing becomes:

\[ \rho - d = r_k + t_k x + w, \]

where \( \rho \) is the gross marginal product of capital, \( d \) is the economic depreciation rate, \( x \) is the fraction of house value taxed, \( w \) is the property tax rate, and the other variables are as defined in footnote 9. This equation may be compared with equation [1'] in Bourassa and Hendershott (1992), Appendix A.
expected inflation rate).\textsuperscript{18} If taxes were assessed on this fraction of house value and home mortgage interest were deductible, then the user cost would be 9.34 per cent for all individuals.\textsuperscript{19} That is, the user cost would be increased for most individuals and lowered for none. Here, the efficiency gains from a better allocation within the owner-occupied housing stock would come at the expense of efficiency losses from under-investment in owner-occupied housing.

A compromise can be struck to improve both the efficiency of capital allocation within the owner-occupied housing stock and between this housing and other capital: taxation of a lower estimate of imputed rental income along with the home mortgage interest deduction. Table 3 gives real user costs for estimates of imputed rental income ranging from 3 to 6 per cent of house value. With the 4.5 per cent estimate, individuals with a current debt ratio of about 50 per cent would be largely unaffected by the change, gaining as much from the deductibility of interest as they lose from the tax on imputed rental income (compare these user costs with those in the loan-to-value ratio = 0.5 column of table 2). In the process, the variation in user costs for owner-occupied housing would be halved from 4 to 2 percentage points, and the difference between the average costs of business capital and owner-occupied housing would decline from 3 to 1 percentage point. With imputed rental income at 6 per cent of value, the total variation of user costs across individuals would be reduced to 1 percentage point, and the difference between the average costs of business capital and owner-occupied housing would

\begin{align*}
\text{18} & \text{With } x = i/(1 + \pi), \text{ the net user cost of owner-occupied housing simplifies to:} \\
\rho - d &= \delta - \pi + w, \\
\text{which is independent of the individual's marginal tax rate.}
\end{align*}

\textsuperscript{19} The same result would be achieved if only real interest were taxed and deducted in the entire economy and estimated rental income were set equal to \((i - \pi)/(1 + \pi) = 0.058\) of house value.
decline to about 0.5 percentage point.  

Table 3 Net user costs for owner occupied housing tax on imputed rental income and deductibility of mortgage interest

<table>
<thead>
<tr>
<th>Marginal tax rate</th>
<th>Net user costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fraction of house value taxed</td>
</tr>
<tr>
<td>0</td>
<td>0.0934</td>
</tr>
<tr>
<td>0.2125</td>
<td>0.0812</td>
</tr>
<tr>
<td>0.3925</td>
<td>0.0709</td>
</tr>
<tr>
<td>0.4725</td>
<td>0.0663</td>
</tr>
<tr>
<td>0.4825</td>
<td>0.0657</td>
</tr>
</tbody>
</table>

Note:  
a. Assumes 3% expected inflation and 9% nominal debt rates.

For the efficiency gains to be substantial, the response to changed investment incentives must be significant. Regressions shown in Appendix A indicate price and income elasticities of -0.84 and 0.05, respectively.  

21 These price elasticities are roughly similar to Yates' estimates of -0.72 and 0.12.  

22 The large price elasticity suggests that efficiency gains should result from

20 The variation in user costs across taxable incomes could be completely eliminated if the fraction of house value subject to tax were graduated with the individual's marginal tax rate. Using the equation in footnote 10, and assuming property taxes, \( w \), of 0.01, the fraction of house value, \( x \), could be set equal to \( (0.07 - r_k)/t_k \). The net user cost would be 8 per cent across all taxable incomes.

21 We also note that income elasticity increases sharply with income, rising from only -0.08 for the bottom half of the income distribution to 0.30 for the top half, i.e., upper income groups with the greatest tax incentives to over-invest in housing are indeed spending proportionately more on housing.

introduction of a tax on net imputed rent.

There is, of course, more than one way to improve the efficiency of capital allocation. In lieu of taxing imputed income from housing investment, more generous tax treatment of non-owner-occupied housing investments would also eliminate non-neutrality. Hendershott and Hu showed how business investment tax credits could be used in the United States to offset the tax-favoured status of owner-occupied housing. Such an approach could be adopted as part of a shift toward greater reliance on consumption taxes. Such a shift is currently proposed by the Liberal and National Parties in Australia and has been advocated by some economists, although sharply criticised by others. Without mortgage interest deductibility, however, inefficiencies owing to the debt tax penalty would still exist.

The Direct Distributional Impacts of Imputed Rent Taxation

In her NHS paper, Apps' argues that a tax on imputed rent would be highly regressive and thus is inappropriate. Using data from the 1986 Income Distribution Survey, she calculates net imputed rents for owner-occupying households in Australia, assuming a 5 per cent gross rental yield. To calculate these rents she indexed the 1985-86 economic data, including incomes and house prices, to 1989-90 values using a subjective methodology, and then applied the 1989-90 marginal tax rate schedule. In the tables that follow, we also rely on data from the 1986 survey, but we do not index that data, and we apply 1985-86 tax rules. As is shown, the indexation and tax rule changes do

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24Some of this debate may be found in J.G. Head, ed., Fightback! An Economic Assessment (Sydney: Australian Tax Research Foundation, 1993).
not appear to matter, probably because the income tax rate changes generally were just an adjustment for tax bracket creep.

Table 4 gives some details from the data set as well as our calculations of net imputed rents and additional taxes. This table may be compared with table 1.2 in Apps (p. 17). Some notable aspects of the data are the relatively flat distribution of house prices across incomes, the increasing debt ratio with income, and the inverse relationship between age of the household head and household income. Although average income increases 14 times from the first to the tenth deciles, mean house price only doubles. The inverse relationship between age and income reflects the large proportion of pensioners in the lower income deciles. The rising debt ratio largely reflects the strong negative relation between debt usage and age, as shown in Appendix B, owing to the tax penalty on debt usage.

We calculate net imputed rent assuming gross rent of 5 per cent of current house price, less 1 per cent of house price for property taxes, and 13 per cent of the outstanding mortgage loan for interest (at the 1985-86 rate). We do not allow for deductibility of depreciation and maintenance (the user costs reported in tables 1 through 3 are all net of depreciation and maintenance). Our calculation of additional tax as a percentage of household income not including net imputed rent is given in column 9. These percentages are quite similar to Apps' percentages, shown in column 10, in spite of her indexing of the data and application of a different tax schedule. Apps concludes from her results that the incidence of the tax on net imputed rent would be steeply regressive. According to either her results in column 11 or ours in column 10, the ratio of additional taxes to income is about six times greater for the lowest decile households than for households in the upper half of the income distribution.

These results are driven significantly by the differences in household age. Older households have far less debt than younger households and thus would
Table 4 Mean household income, tax rates, house prices, mortgage debt, net imputed rent, additional taxes, and age of head, by decile of household income exclusive of net imputed rent, for all home-owning/purchasing households

<table>
<thead>
<tr>
<th>Decile</th>
<th>1 Household income ($)^a</th>
<th>2 Household MTR (%)^b</th>
<th>3 Revised MTR (%)^c</th>
<th>4 House price ($)</th>
<th>5 Loan ($)</th>
<th>6 Debt ratio (%)</th>
<th>7 Head's age (years)</th>
<th>8 Net imputed rent ($)^d</th>
<th>9 Additional tax ($)</th>
<th>10 Additional tax (%)^f</th>
<th>11 Apps' add'l tax (%)^g</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4,782</td>
<td>18.6</td>
<td>20.9</td>
<td>69,229</td>
<td>3,537</td>
<td>5.0</td>
<td>63.3</td>
<td>2,309</td>
<td>497</td>
<td>10.4</td>
<td>11.3</td>
</tr>
<tr>
<td>2</td>
<td>8,164</td>
<td>13.9</td>
<td>23.7</td>
<td>72,499</td>
<td>2,709</td>
<td>4.1</td>
<td>63.9</td>
<td>2,548</td>
<td>501</td>
<td>6.1</td>
<td>6.7</td>
</tr>
<tr>
<td>3</td>
<td>11,078</td>
<td>21.4</td>
<td>24.6</td>
<td>80,134</td>
<td>3,860</td>
<td>5.5</td>
<td>60.3</td>
<td>2,704</td>
<td>655</td>
<td>6.0</td>
<td>5.1</td>
</tr>
<tr>
<td>4</td>
<td>15,866</td>
<td>22.5</td>
<td>24.8</td>
<td>83,252</td>
<td>8,289</td>
<td>13.0</td>
<td>51.2</td>
<td>2,253</td>
<td>565</td>
<td>3.6</td>
<td>3.7</td>
</tr>
<tr>
<td>5</td>
<td>20,859</td>
<td>27.3</td>
<td>28.8</td>
<td>83,277</td>
<td>12,365</td>
<td>19.0</td>
<td>45.4</td>
<td>1,724</td>
<td>536</td>
<td>2.6</td>
<td>2.7</td>
</tr>
<tr>
<td>6</td>
<td>25,410</td>
<td>30.4</td>
<td>31.5</td>
<td>81,793</td>
<td>14,484</td>
<td>20.7</td>
<td>43.4</td>
<td>1,389</td>
<td>421</td>
<td>1.7</td>
<td>2.3</td>
</tr>
<tr>
<td>7</td>
<td>29,861</td>
<td>31.6</td>
<td>32.7</td>
<td>88,522</td>
<td>15,270</td>
<td>21.1</td>
<td>42.7</td>
<td>1,556</td>
<td>520</td>
<td>1.7</td>
<td>1.9</td>
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<tr>
<td>8</td>
<td>34,827</td>
<td>34.7</td>
<td>36.1</td>
<td>95,679</td>
<td>17,953</td>
<td>22.5</td>
<td>41.3</td>
<td>1,493</td>
<td>563</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>9</td>
<td>42,393</td>
<td>40.0</td>
<td>41.1</td>
<td>102,783</td>
<td>19,120</td>
<td>22.0</td>
<td>42.1</td>
<td>1,626</td>
<td>698</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>10</td>
<td>68,607</td>
<td>47.9</td>
<td>48.9</td>
<td>135,059</td>
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<td>16.7</td>
<td>44.2</td>
<td>3,049</td>
<td>1,559</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>All</td>
<td>26,163</td>
<td>28.8</td>
<td>31.3</td>
<td>89,203</td>
<td>11,566</td>
<td>15.0</td>
<td>49.8</td>
<td>2,065</td>
<td>651</td>
<td>2.5</td>
<td>2.4</td>
</tr>
</tbody>
</table>


Notes:

a. Household income excluding net imputed rent.

b. Household marginal tax rate excluding net imputed rent from income. This rate is calculated as the mean of spouses’ rates if married couple.

c. Household marginal tax rate if net imputed rent is included in income.

d. Calculated as 5% of house price (column 4) less 1% for property taxes and 13% (the assumed interest rate) of the outstanding mortgage loan (column 5).

e. Tax paid on net imputed rent assuming that the appropriate tax rate is the average of columns 2 and 3.

f. Tax paid (column 9) as a percentage of household income excluding net imputed rent (column 1).

suffer, relatively, from the introduction of both a tax on imputed rental income and home mortgage interest deductibility. As can be seen from table 4, the average age of the household head in the lowest three income quintiles is roughly 20 years greater than the average age of those in the top half of the income distribution, and the former's average debt ratio is only 0.05 versus about 0.20 for the latter.

But Apps shows that her results hold, although much less strongly, when life cycle effects (age) are held roughly constant. When similar calculations are made for couple income units with the husband employed full-time and aged 25 to 54 (Apps' table 1.9), the average age of household heads varies only between 37 and 40 across income deciles and still the ratio of additional taxes to income drops from 0.018 for the first two deciles to about 0.013 for the next three, to roughly 0.010 for deciles 6 through 9, before rising to 0.014 for decile 10. Note, though, that the ratio of the additional tax burden of the lowest income decile to that of the top half of the income distribution has been lowered from six to less than two.

Controlling for the life-cycle, as Apps has largely done with the analysis of 25 to 54 year olds, is appropriate when measuring equity effects of a policy change, as Yates emphasized in an earlier study of the distributional impact of imputed rent taxation.25 Measuring income accurately is also important, and in this case that means including imputed rent in the income base.26 Income decile breaks for married couples ages 25 to 54 based on household income including estimates of imputed rent are shown in the first column of table 5.


Table 5  Mean household income, tax rates, house prices, mortgage debt, net imputed rent, additional taxes, and age of head, by decile of household income inclusive of net imputed rent, for all home-owning/purchasing married couples with heads ages 25 to 54

<table>
<thead>
<tr>
<th>Decile</th>
<th>1 Household income ($)</th>
<th>2 Household MTR (%)</th>
<th>3 Revised MTR (%)</th>
<th>4 House price ($)</th>
<th>5 Loan ($)</th>
<th>6 Debt ratio (%)</th>
<th>7 Head's age (years)</th>
<th>8 Net imputed rent ($)</th>
<th>9 Additional tax ($)</th>
<th>10 Additional tax (%)</th>
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<tr>
<td>1</td>
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<td>14.9</td>
<td>74,153</td>
<td>19,483</td>
<td>29.0</td>
<td>39.2</td>
<td>433</td>
<td>74</td>
<td>0.6</td>
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<td>2</td>
<td>19,839</td>
<td>20.6</td>
<td>20.5</td>
<td>76,242</td>
<td>17,902</td>
<td>27.4</td>
<td>38.7</td>
<td>722</td>
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<tr>
<td>3</td>
<td>24,300</td>
<td>24.6</td>
<td>25.4</td>
<td>78,023</td>
<td>16,971</td>
<td>24.1</td>
<td>38.7</td>
<td>915</td>
<td>208</td>
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<tr>
<td>4</td>
<td>27,831</td>
<td>27.1</td>
<td>27.8</td>
<td>79,142</td>
<td>18,144</td>
<td>24.9</td>
<td>39.6</td>
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<td>30.1</td>
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<td>18,901</td>
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<td>35.3</td>
<td>94,561</td>
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<td>39.9</td>
<td>106,937</td>
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<td>9</td>
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<td>158,525</td>
<td>16,261</td>
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<td>42.5</td>
<td>4,227</td>
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<tr>
<td>All</td>
<td>36,073</td>
<td>31.1</td>
<td>32.1</td>
<td>96,289</td>
<td>17,730</td>
<td>22.2</td>
<td>39.7</td>
<td>1,547</td>
<td>564</td>
<td>1.6</td>
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</table>


Notes:
a. Household income including net imputed rent.
b-e. See table 4.
f. Tax paid (column 9) as a percentage of household income including net imputed rent (column 1).
The remaining columns present calculations similar to those in table 4, the last being the ratio of additional taxes paid to income. As can be seen, when the life cycle is held constant (note the relative constancy of the household head's age) and income is measured correctly, this ratio rises almost monotonically with income, i.e., the imputed rent tax is clearly progressive. (Note further that the ratio is almost perfectly negatively correlated with the debt ratio, as we would anticipate.)

Table 6 reports comparable results for married couples ages 60 and older. Here the general pattern of the ratio of additional taxes paid to income is less clear, owing in part to the smaller sample size (996 versus 2,674 for married couples ages 25-54). Given that the ratio rises least for the two lowest income deciles, the tax could hardly be described as regressive.

The above calculations ignore renters. Because renters pay no additional tax and are more heavily represented in lower income deciles, tables 5 and 6 understate the progressivity of an imputed rent tax. Table 7 reports results when samples of 737 married couple renters between ages 25 to 54 (representing 22 per cent of married couples ages 25 to 54) and 143 couple renters ages 60 and older (representing 13 per cent of married couples ages 60 and older) are merged with the home-owning/purchasing samples, and the income deciles (including net imputed rents of owners/purchasers) are redefined. Because renting married couples are a small fraction of all married couples, the results do not change markedly, except for the lowest income decile, who are now seen to pay negligible additional taxes. The percentage increase in taxes for the lowest income decile would be only about one-sixth the increase for the top half of the income distribution, rather than the six times increase Apps reports in her table 1.2.
Table 6  Mean household income, tax rates, house prices, mortgage debt, net imputed rent, additional taxes, and age of head, by decile of household income inclusive of net imputed rent, for all home-owning/purchasing married couples with heads ages 60 and older

<table>
<thead>
<tr>
<th>Decile</th>
<th>1 Household income ($)^a</th>
<th>2 Household MTR (%)^b</th>
<th>3 Revised MTR (%)^c</th>
<th>4 House price ($)</th>
<th>5 Loan ($)</th>
<th>6 Debt ratio (%)</th>
<th>7 Head's age (years)</th>
<th>8 Net imputed rent ($)^d</th>
<th>9 Additional tax ($)^e</th>
<th>10 Additional tax (%)^f</th>
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<td>69.3</td>
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<td>7.0</td>
<td>24.0</td>
<td>60,924</td>
<td>2,017</td>
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<td>69.5</td>
<td>2,175</td>
<td>323</td>
<td>2.9</td>
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<tr>
<td>3</td>
<td>11,911</td>
<td>13.4</td>
<td>24.8</td>
<td>61,772</td>
<td>374</td>
<td>0.5</td>
<td>69.5</td>
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<tr>
<td>4</td>
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<td>24.6</td>
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<td>492</td>
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<td>544</td>
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<td>24.9</td>
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<td>687</td>
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<td>803</td>
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<td>22.4</td>
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<td>1,911</td>
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<td>831</td>
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<td>31.6</td>
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<td>4,107</td>
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<td>1,818</td>
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<td>5,779</td>
<td>2,575</td>
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<td>26.4</td>
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<td>1,171</td>
<td>1.5</td>
<td>67.9</td>
<td>3,306</td>
<td>837</td>
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Notes: See table 5.
Table 7 Mean household income, additional taxes, and incremental tax rates by decile of household income inclusive of net imputed rent for all married couples with heads ages 25 to 54 and 60 and older, respectively

<table>
<thead>
<tr>
<th>Decile</th>
<th>Household income</th>
<th>Additional tax ($)</th>
<th>Additional tax (%)</th>
<th>Household income</th>
<th>Additional tax ($)</th>
<th>Additional tax (%)</th>
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<td>7,976</td>
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<td>0.5</td>
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<tr>
<td>2</td>
<td>17,818</td>
<td>85</td>
<td>0.5</td>
<td>10,605</td>
<td>233</td>
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</tr>
<tr>
<td>3</td>
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<td>372</td>
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<td>4</td>
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<td>1,817</td>
<td>2.4</td>
<td>60,522</td>
<td>2,352</td>
<td>3.9</td>
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</table>

Conclusion

All policy changes create winners and losers, and economists have sufficient difficulty inducing politicians to adopt efficiency-improving policies without the over-statement of the losers' losses. The difficulty is compounded if lower income households are mistakenly identified as the losers. Moreover, even if an efficiency-improving tax is regressive, arguing against it on these grounds is not in the best tradition of economics. Rather, one should look for ways to use the added tax revenues to reduce the regressivity of the tax increase in order to facilitate generating the efficiency gains.

Fortunately, we are able to show that when the life cycle is controlled for and income is measured appropriately, the direct distributional impact of a tax on imputed rental income is progressive, not regressive. This would seem to argue for returning the tax revenues raised disproportionately to higher income households, unless one wishes to increase the progressivity of the tax system.
An imputed rental tax with mortgage interest deductibility would induce many behavioural responses. For example, the demand for owner-occupied housing of younger households would rise, while that of older households would fall. The most striking behavioural response would likely be a sharp increase in mortgage debt, possibly raising the aggregate loan-to-value ratio from 0.15 to above 0.4 as in the U.S. This increase would reduce the revenue raised from the tax to the extent that the debt is used to fund consumption or investment in partially taxed assets. That is, there will be less revenue to redistribute than the average ratios of additional taxes paid to income listed in tables 4 to 6 suggest.

An appropriate use of such revenue would be to phase in the tax for older owner/purchaser households. As we have noted, these households have little debt and thus would lose relative to younger owner/purchaser households with much debt. While this effect washes out for yet unformed owner/purchaser households, who would presumably be both young and old at different stages, currently older owner/purchaser households would not have had the benefit of mortgage interest deductions when they were young and thus should not be taxed disproportionately heavily now. An appropriate rule whereby currently older owner/purchasers would pay tax on only a fraction of imputed rental income could easily be devised.

---

27They may, of course, have had the benefit of various first-time home owner subsidies.
Appendix A: Income and Price Elasticity Estimates

We regress the log of the quantity of housing demanded, $Q_k$, on the log of household income, $Y_k$, and the log of the real price of housing, $P_k$. The quantity of housing demanded, $Q_k$, is defined as $V_k/(P_j/P)$, where:

$V_k$ = the value of the house occupied by household $k$;

$P_j$ = the price of a constant-quality three-bedroom house in the capital city, $j$, of the state of residence (details of the derivation of these prices are available from the authors); and

$P$ = the weighted average price of a constant-quality three-bedroom house across all capital cities (except Darwin).

The real price of housing is a function of the relative price of a constant-quality house in the capital city of the state of residence and the household's user cost of owner occupied housing:

$$ P_k = (P_j/P)[v_k i_m + (1 - v_k)(1 - t_k)i + d + w_k + \partial - \pi], $$

where:

$P_k$ = the real price of housing faced by household $k$;

$v_k$ = the household's current mortgage loan-to-value ratio;

$i$ = the risk-free interest rate ($= 0.13$);

$i_m$ = the mortgage interest rate ($= 0.13$; this value did not exceed the risk-free rate owing to the effective subsidy resulting from interest rate regulation);

$t_k$ = the household's average marginal tax rate (calculated as the average rate of the household head and spouse if a couple or simply the head's rate otherwise);

$d$ = depreciation and maintenance ($= 0.035$);

$w_k$ = property taxes paid by the household as a fraction of house value;
\[ \vartheta = \text{a risk premium} \ (= \ 0.03); \text{ and} \]
\[ \pi = \text{expected inflation} \ (= \ 0.07). \]

The data set did not allow us to separate out capital city residents from others.

Using a sample of 2,674 married couples with heads aged between 25 and 54 we obtained (with standard errors in parentheses):

\[
\ln Q_k = 8.93 + 0.047 \ln Y_k - 0.843 \ln P_k \quad (R^2 = 0.29).
\]

For the bottom 50 per cent of incomes in this sample (below $31,544):

\[
\ln Q_k = 10.02 - 0.078 \ln Y_k - 0.902 \ln P_k \quad (R^2 = 0.25).
\]

For the top 50 per cent:

\[
\ln Q_k = 6.52 + 0.303 \ln Y_k - 0.716 \ln P_k \quad (R^2 = 0.32).
\]

The results from a large sample of 5,391 households of all ages and marital statuses were:

\[
\ln Q_k = 8.55 + 0.115 \ln Y_k - 0.695 \ln P_k \quad (R^2 = 0.26).
\]

For the bottom 50 per cent of incomes (below $23,157):

\[
\ln Q_k = 9.31 + 0.050 \ln Y_k - 0.617 \ln P_k \quad (R^2 = 0.14).
\]

For the top 50 per cent of incomes:

\[
\ln Q_k = 6.89 + 0.267 \ln Y_k - 0.717 \ln P_k \quad (R^2 = 0.30).
\]
Appendix B: Effects of Income and Age on Mortgage Debt Ratio

Following Yates' suggestion, we use age of the household head as a proxy for life cycle effects. We regressed the loan-to-value ratio, v, on the log of household income, Y, and dummy variables, AGE$_{1-J}$, for all of the home-owning households in the age groups defined in the 1986 Income Distribution Survey, with the exception of those groups ages 60 and older (previous estimations showed that the coefficients for 60-plus age groups were not significantly different from zero). The results were (with standard errors in parentheses):

\[
v = -0.053 + 0.0070 \ln Y + 0.639 \text{AGE}_{18-20} + 0.489 \text{AGE}_{21-24} + 0.432 \text{AGE}_{25-29} \\
+ 0.332 \text{AGE}_{30-34} + 0.222 \text{AGE}_{35-39} + 0.136 \text{AGE}_{40-44} + 0.104 \text{AGE}_{45-49} \\
+ 0.058 \text{AGE}_{50-54} + 0.023 \text{AGE}_{55-59}
\]

\(R^2 = 0.40\)


No.23 Greig, Alastair W., *Retailing is More Than Shopkeeping: Manufacturing Interlinkages and Technological Change in the Australian Clothing Industry*, August 1990. [Since published as ‘Technological change and innovation in the clothing industry: the role of retailing’, *Labour and Industry* 3 (2 & 3) June/October 1990]


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<th>Title</th>
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<td>November 1991</td>
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<td><em>Planning the Good City in Australia: Elizabeth as a New Town</em></td>
<td>February 1992</td>
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<td><em>Changes in the Relative Incentives to Invest in Housing: Australia, Sweden and the United States</em></td>
<td>February 1992</td>
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[ Retail price: $7.50]