On the Equity Effects of Taxing Imputed Rent: Evidence from Australia

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Abstract

Taxation of net imputed rent from owner-occupied housing (and mortgage interest deductibility) has been advocated in Australia on grounds of both efficiency and equity. The current tax system (no taxation or deductibility) favors owner-occupied housing over business investments, and in the owner-occupied sector it favors high-income, low-debt households over others. Nevertheless, imputed rent taxation has been criticized on the empirical grounds that its direct burden would fall more heavily on low-income households than high-income households.

Using micro-level data from the 1986 Income Distribution Survey, we show that the burden does not fall more heavily on low-income households when net imputed rent is included in owners' incomes and when life cycle effects are controlled for. Moreover, for married couples aged 25 to 54, the taxation of imputed rental income would be not only progressive, but more progressive than the taxation of other household income.

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] Although 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 largely retained, and the tax-free status of imputed rental income was continued.[2] Although

[1] Homeownership rates in Australia and the United States are currently about 67 and 64 percent, respectively. The Australian rate is from the 1991 Census of Population and Housing; the U.S. figure is from the 1989 American Housing Survey.

[2] Follain and Ling (1991) show that the combination of the increase in the standard deduction and decreases in allowable non-housing-related deductions effectively made mortgage interest nondeductible for some classes of households.

mortgage interest is not deductible in Australia, owner-occupied housing is favored because imputed rental income is not taxed.[3] Capital gains tax provisions in both countries also favor owner-occupied housing. In the United States, 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. Gains on the owner-occupier's principal residence are never taxed in Australia.

Although governments in both countries seem unlikely to tackle the tax-favored 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 (1992b), compared user costs for owner-occupied housing and other capital assets to determine the extent to which the tax system favors owner-occupied housing. Bourassa and Hendershott concluded that the failure to tax owner-occupiers' imputed rent resulted in significant incentives to overinvest in housing in Australia. Moreover, they advocated a tax on imputed rent and conjectured that such a tax would be desirable on equity grounds as well (Bourassa and Hendershott 1992c).[4] The second paper, by Apps (1992), focused on the distributional effects of a hypothetical tax on net imputed rent. Apps 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 (Apps 1992, table 1.2). This finding is somewhat startling. When taxation of imputed rents was introduced in Australia, the rationale was to improve equity, not efficiency.[5] Moreover, other academics have advanced the imputed rent tax on equity grounds (Flood and Yates 1987; Wood 1991; Yates 1991).

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[3] The Australian government did tax net imputed rental income at the national level between 1915, when the income tax was introduced, and 1923. The states of South Australia (1885–1930), Victoria (1895–1936), and Queensland (1920–23) also taxed imputed rental income. For further details, see Reece (1975, 1985). At least eight countries in the Organization for Economic Cooperation and Development taxed imputed rents in the mid-1980s (Robinson 1988).

[4] The argument for an imputed rent tax was deleted from our NHS paper at the insistence of the NHS secretariat.

[5] We thank Barry Reece for this observation.

In this article, we show that Apps's results are due to a combination of mismeasuring income and not controlling for life cycle effects. Income should include imputed rental income on housing as well as reported nonhousing income. Those with expensive houses and modest nonhousing income are not "poor" relative to those with less expensive houses and somewhat larger nonhousing income. Life cycle effects are important because the combination of a tax on imputed rent and mortgage interest deductibility would clearly favor those with high debt over those with low debt (i.e., the young over the old). However, over the full life cycle, this differential effect cancels out. With income properly measured and life cycle effects held constant, a tax on imputed rental income is progressive. This finding is hardly surprising. In fact, the current debate in the United States is not about whether a tax on imputed rent would be progressive, but about whether such a tax would be more or less progressive than federal household income taxes generally (Follain, Ling, and McGill 1993).

The body of this article is divided into three sections. We first summarize the case for efficiency gains stemming from the taxation of imputed rents and then turn to the direct vertical and horizontal distributional effects of this taxation.

The case for imputed rent taxation

The user cost of capital takes into account all the relevant costs and benefits—including interest rates, 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. Although encouraging homeownership might be sound policy because of externalities from homeownership, there is no justification for encouraging middle- and upper-income households, who will be homeowners in any event, to invest in more expensive houses.[6]

[6] Recent research by De Long and Summers (1991, 1992) suggested that large externalities are generated by business investment in equipment because technological innovations are introduced into the economy through equipment investment. In this case, risk-adjusted net user costs should be lower for business investments on average (for equipment in particular) than for housing. However, see Auerbach, Hassett, and Oliner (1993) for a rebuttal of De Long and Summers.

Bourassa and Hendershott (1992a) showed that the typical net user cost for business investments, including rental housing, was substantially higher than that for owner-occupied housing in 1984–85 and 1990–91 in both Australia and the United States. Calculations based on more recent Australian data lead to similar conclusions. Australian business user costs for 1991–92 are reported in table 1. Business user costs vary largely because of differences in the relationship between tax 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.[7]

User costs for Australian owner-occupied housing are shown in table 2.[8] Owner-occupier costs decrease with increases in the tax payer's marginal tax rate because higher rates reduce the opportunity cost of alternative investments of owner equity, but the costs increase with increases in the loan-to-value (LTV) 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 LTV ratio across all homeowners and purchasers is only about 0.14 in Australia, compared with 0.41 in the United States, where mortgage interest is, in most cases, deductible.[9]

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[7] These comparisons are based on mean asset lives for privately owned assets as reported by the Australian Bureau of Statistics (1990).

[8] Ignoring subsidies for first-time buyers, the net (of depreciation) user costs of owner-occupied housing for household k in Australia are

$$r_k - d = r_k + w,$$

where r_k is the gross marginal product of capital, d is the economic depreciation rate, w is the property tax rate, and r_k is the real after-tax financing rate:

$$r_k = [(1 - v_k)(1 - t_k)i + v_k i + d - \quad]/(1 + \quad).$$

Here, v_k is the household's current LTV ratio, t_k is the household's marginal tax rate, i is the interest rate, d is the risk premium, and is the expected inflation rate. For married couples, the marginal tax rate is averaged across husbands and wives (there is no provision for joint filing of returns). We set d = 0.023, i = 0.09, d = 0.03, and = 0.03. The value of w varies from state to state (Bourassa and Hendershott 1992a). Details on the calculation of user costs may be found in Bourassa and Hendershott (1992a).

[9] The Australian ratio was estimated from the Australian Bureau of Statistics' 1990 Income and Housing Costs and Amenities Survey; the end-of-1992 U.S. ratio is from the Federal Reserve Bank's Balance Sheets Accounts.

Table 1. **Net User Costs for Business Investments, 1991–92**

Capital Asset	Net User Costs
Corporate investments	
Equipment	0.0750
Industrial manufacturing buildings and short-term traveler accommodations	0.0868
Other buildings	0.0931
Noncorporate investments	
Commercial buildings	0.0894
Residential buildings*	0.0917
Mean	*0.0872*

Note: Calculations assume 3 percent expected inflation and 9 percent nominal debt rates.
*Because the vast majority of rental housing is owned by noncorporate entities, we do not report user costs for corporate investments in rental housing.

Table 2. **Net User Costs for Owner-Occupied Housing, 1991–92**

Marginal Tax Rate[a]	Net User Costs If Loan-to-Value Ratio Is		
	1	0.5	0
0	0.0934	0.0934	0.0934
0.2125	0.0934	0.0841	0.0748
0.3925[b]	*0.0934*	*0.0762*	*0.0591*
0.4725	0.0934	0.0727	0.0521
0.4825	0.0934	0.0723	0.0512

Note: Calculations assume 3 percent expected inflation and 9 percent nominal debt rates.
[a] Includes Medicare levies.
[b] Rate applicable to tax payers with average incomes.

The Australian 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 percent, while that for owner-occupied housing is only about 6.4 percent (assuming a 0.14 average LTV ratio).[10] Effective tax rates calculated by Pender and Ross (1993) and Jorgenson (1993) also indicate that owner-occupied housing is favored relative to most business assets. Within the owner-occupied sector, the wide variation in user costs implies that individuals in low tax brackets and with low wealth (high debt) will tend to occupy less expensive houses relative to their expected lifetime resources than will those in high tax brackets and with high wealth. Moreover, households that expect to earn constant risk-adjusted incomes over their lifetimes will tend to own less expensive houses in their early (low-wealth) years than in their middle (high-wealth) years.

The user costs also imply substantial inequities. Households with lower income or wealth pay a higher after-tax price for each unit of owner-occupied housing than do those with higher income or wealth. Moreover, on average over their life cycles, renters both pay a higher price and have far lower incomes than owners.[11] On both equity and efficiency grounds, it seems 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-occupied stock. Variation across LTV ratios would be eliminated by introducing deductibility of home mortgage interest. User costs would then be independent of the LTV ratio and would equal those in the last column of table 2 (under LTV ratio = 0).[12] Unfortunately, this action would reduce user costs

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[10] Some tax-favored investments are not included in the tables. Specifically, business investment in goodwill (advertising) is generally not taxed, nor is household investment in consumer durables. On the efficiency gains from taxing goodwill investment more heavily, see Fullerton and Lyon (1988). Taxing imputed rent would include taxing those durables (appliances, built-ins) incorporated in the house value.

[11] Yates (1991) emphasized the importance of these horizontal inequities.

[12] With deductibility of mortgage interest, the real after-tax financing rate for the kth owner-occupier is

$$r_k = [(1 - t_k)i + \delta - \quad]/(1 + \quad),$$

where the variables are defined in footnote 8. Note that r_k no longer depends on the LTV ratio.

for most individuals while raising user costs for none. Not only would a net loss of tax revenue occur, but also the average user cost for owner-occupied housing would be about 5.9 percent, compared with the 8.7 percent 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 overinvestment in housing.

The problem of overinvestment in housing can be addressed by simultaneously imposing a tax on estimated imputed rental income.[13] In fact, this tax, along with mortgage interest deductibility, could remove all variation in owner user costs if the fraction of house value used to estimate rental income were set at $i/(1 + \quad)$, or 0.087 in the present case (i is the 0.09 nominal debt rate, and $\quad$ is the 0.03 expected inflation rate).[14] If taxes were assessed on this fraction of house value and home mortgage interest were deductible, then the user cost would be 9.34 percent for all individuals.[15] 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 underinvestment in owner-occupied housing.

A compromise can be struck to improve the efficiency of capital allocation both 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. In table 3 are shown real user costs for estimates of imputed rental income ranging from 3 to 6 percent of house value. With the 4.5 percent estimate, individuals with a current LTV ratio of about 0.5 would be largely unaffected by the change, gaining as much from the deductibility of interest as

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

$$\rho_k - d = r_k + t_k x + w,$$

where x is the fraction of house value taxed, and the other variables are defined in footnote 8.

[14] With $x = i/(1 + \quad)$, the net user cost of owner-occupied housing simplifies to

$$\rho - d = \delta - \quad + w,$$

which is independent of the individual's marginal tax rate.

[15] 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 $(i - \quad)/(1 + \quad) = 0.058$ of house value.

Table 3. **Net User Costs for Owner-Occupied Housing with a Tax on Imputed Rental Income and Deductibility of Mortgage Interest**

Marginal Tax Rate	Net User Costs If Fraction of House Value Taxed Is		
	0.03	0.045	0.06
0	0.0934	0.0934	0.0934
0.2125	0.0812	0.0844	0.0876
0.3925	0.0709	0.0767	0.0826
0.4725	0.0663	0.0734	0.0804
0.4825	0.0657	0.0729	0.0802

Note: Calculations assume 3 percent expected inflation and 9 percent nominal debt rates.

they lose from the tax on imputed rental income (compare these user costs with those in table 2 for LTV ratio = 0.5). 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 percentage points to 1. With imputed rental income at 6 percent 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 decline to about 0.5 percentage point.[16]

For the efficiency gains to be substantial, the response to changed investment incentives must be significant. Regressions shown in appendix A indicate price elasticities of –0.75 for married couples aged 25 to 54. The significant price elasticity estimate suggests that efficiency gains should result from introduction of a tax on net imputed rent. We also note that income elasticity increases sharply with income, rising from only 0.34 for married couples aged 25 to 54 with median incomes of $28,500 to 0.58 for households with incomes in the 75th percentile ($40,000) and 0.78 for those with incomes in the 90th percentile ($55,000). That is, upper-income groups with the greatest tax

[16] 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 13, 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 0.08 across all taxable incomes.

incentives to overinvest in housing are indeed spending proportionately more on housing. Our price elasticity is similar to Yates's (1981) estimate of –0.72; however, our income elasticities are greater on average than her estimate of 0.12, perhaps because our income elasticities are based on an estimate of permanent rather than current income, and our income measure includes net imputed rent (see appendix A for details).

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 (1980) showed how business investment tax credits could be used in the United States to offset the tax-favored status of owner-occupied housing. Without mortgage interest deductibility, however, inefficiencies owing to the debt tax penalty would still exist.

Direct effects on vertical equity

In her NHS paper, Apps (1992) argued that a tax on imputed rent would be highly regressive and thus inappropriate. Using data from the 1986 Income Distribution Survey, she calculated net imputed rents for owner-occupying households in Australia, assuming a 5 percent gross rental yield. To calculate these rents she indexed the 1985–86 economic data, including incomes and house prices, to 1989–90 values 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 those data, and we apply 1985–86 tax rules.

Some details from the data set, as well as our calculations of net imputed rents and additional taxes, are provided in table 4, which may be compared with Apps's table 1.2. Notable aspects of the data are the relatively flat distribution of house prices across incomes, the increasing LTV ratio with income, and the inverse relationship between age of the household head and household income (which reflects the large proportion of pensioners in the lower income deciles). The rising LTV ratio largely reflects the strong negative relationship between debt usage and age, as shown in appendix B, owing to the tax penalty on debt.

We calculate net imputed rent assuming gross rent of 5 percent of current house price, minus 1 percent of house price for property taxes and 13 percent (the 1985–86 rate) of the outstanding mortgage loan for interest. We do not allow for deductibility of

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 Owning/Purchasing Households**

Decile	1 Household Income (A$)[a]	2 House Price (A$)	3 Loan (A$)	4 LTV Ratio	5 Head's Age (years)	6 Net Imputed Rent (A$)[b]	7 Additional Tax (A$)[c]	8 Additional Tax (%)[d]	9 Apps's Add'l Tax (%)[e]
1	4,615	73,092	5,229	0.072	62.4	2,244	251	5.4	11.3
2	8,118	72,788	3,088	0.042	63.7	2,510	417	5.1	6.7
3	11,080	81,377	4,312	0.053	60.4	2,694	570	5.1	5.1
4	15,897	83,000	9,010	0.109	50.8	2,149	431	2.7	3.7
5	20,848	83,871	12,709	0.152	45.7	1,703	434	2.1	2.7
6	25,473	84,100	14,405	0.171	43.8	1,491	421	1.7	2.3
7	29,988	86,915	15,956	0.184	42.5	1,402	428	1.4	1.9
8	34,960	95,960	18,497	0.193	41.1	1,434	498	1.4	1.4
9	42,562	103,910	20,813	0.200	42.6	1,451	604	1.4	1.6
10	67,675	130,910	19,106	0.146	43.9	2,753	1,345	2.0	1.7
All	*26,135*	*89,622*	*12,316*	*0.137*	*49.6*	*1,984*	*540*	*2.1*	*2.4*

Source: Authors' tabulations from the 1986 Income Distribution Survey.
[a] Household income *excluding* net imputed rent.
[b] Calculated as 5 percent of house price (column 2) less 1 percent of house price for property taxes and 13 percent (the assumed interest rate) of the outstanding mortgage loan (column 3).
[c] Tax paid on net imputed rent.
[d] Tax paid (column 7) as a percentage of household income *excluding* net imputed rent (column 1).
[e] From Apps 1992, table 1.2, column 6. Note that columns 5 through 9 of Apps's table are mislabeled.

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 excluding net imputed rent is given in column 8.[17] Except for the first two deciles, these percentages are all within 1 percentage point of Apps's results, shown in column 9, in spite of her indexing of the data and application of a different tax schedule. Apps concluded from her results that a tax on net imputed rent would be steeply regressive. According to her results, the ratio of additional taxes to income for the lowest decile households is about six times that for households in the upper half of the income distribution. According to our calculations, the ratio is only about 3.5 times as great.

The negative relationship between additional taxes as a percentage and income level is driven significantly by the differences in household age. Older households have far lower LTV ratios than younger households and thus would suffer more 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 in the top half of the income distribution, and the former's average LTV ratio is only 0.05, versus about 0.18 for the latter.

Apps indicates 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 aged 25 to 54 with the husband employed full-time (Apps 1992, 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 1.8 percent for the first two deciles, to about 1.3 percent for the next three, to roughly 1.0 for deciles 6 through 9, before rising to 1.4 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 (1982) emphasized in an earlier study of the distributional impact of imputed rent

[17] For households headed by single persons, imputed rental income is assigned to the household head, and tax liability is based on the income of the household head only. For married couples, imputed rental income is divided equally between the spouses, and tax liability is calculated for the head and spouse and then summed (because there is no provision for joint filing).

taxation. Measuring income accurately is also important, and in this case that means including imputed rent in the income base. Income decile breaks for married couples aged 25 to 54 based on household income *including* estimates of imputed rent are shown in the first column of table 5. The remaining columns present calculations similar to those in table 4, the last being additional taxes paid as a percentage of income. 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 LTV ratio, as we would anticipate.

Comparable results for married couples aged 60 and older are reported in table 6. Here the general pattern of the ratio of additional taxes paid to income is less clear, owing in part to the smaller sample size (986, versus 2,724 for married couples aged 25 to 54). However, given that the additional tax as a percentage of income is about the same for the bottom and top halves of the income distribution, 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. To include renters in the analysis, we merged two renter samples with the home-owning/purchasing samples: 764 married couple renters aged 25 to 54 (22 percent of married couples in that age range rent) and 125 married couple renters aged 60 and older (11 percent of married couples in that age range rent). The results, by redefined income deciles (including net imputed rents of owners/purchasers), are reported in table 7. Because renters are a small fraction of all married couples, the results do not change markedly except for those in the lowest income decile, who are now seen to pay negligible additional taxes.

Follain, Ling, and McGill (1993) argued that taxation of owner-occupied housing in the United States is less progressive than federal taxation of households generally. To see whether this is the case in Australia, we need to compute, by income decile, the ratio of increased taxes to the tax burden before the taxation of owner-occupied housing. If this ratio is higher for lower income deciles, then the taxation of owner-occupied housing would be less progressive than other taxation, and a fiscally neutral substitution of taxation of owner-occupied housing for other taxes would reduce the progressivity of the total tax

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 Owning/Purchasing Married Couples with Heads Aged 25 to 54**

Decile	1 Household Income (A$)[a]	2 House Price (A$)	3 Loan (A$)	4 LTV Ratio	5 Head's Age (years)	6 Net Imputed Rent (A$)[b]	7 Additional Tax (A$)[c]	8 Additional Tax (%)[d]
1	10,298	80,032	24,221	0.303	39.4	52	39	0.4
2	19,324	75,874	18,136	0.239	38.4	677	133	0.7
3	23,906	78,502	18,471	0.235	38.8	739	153	0.6
4	27,537	79,793	18,530	0.232	39.7	783	175	0.6
5	30,913	90,284	20,431	0.226	39.1	955	239	0.8
6	34,177	93,957	16,702	0.178	39.8	1,587	449	1.3
7	38,050	90,968	17,985	0.198	39.1	1,301	391	1.0
8	43,137	107,644	17,669	0.164	40.3	2,009	709	1.6
9	50,704	112,924	19,332	0.171	39.4	2,004	818	1.6
10	78,361	154,853	17,513	0.113	42.3	3,917	1,953	2.5
All	*35,853*	*96,691*	*18,880*	*0.195*	*39.6*	*1,413*	*510*	*1.4*

Source: Authors' tabulations from the 1986 Income Distribution Survey.
[a] Household income *including* net imputed rent.
[b] Calculated as 5 percent of house price (column 2) less 1 percent of house price for property taxes and 13 percent (the assumed interest rate) of the outstanding mortgage loan (column 3).
[c] Tax paid on net imputed rent.
[d] Tax paid (column 7) as a percentage of household income *including* net imputed rent (column 1).

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 Owning/Purchasing Married Couples with Heads Aged 60 and Older**

Decile	1 Household Income (A$)[a]	2 House Price (A$)	3 Loan (A$)	4 LTV Ratio	5 Head's Age (years)	6 Net Imputed Rent (A$)[b]	7 Additional Tax (A$)[c]	8 Additional Tax (%)[d]
1	9,328	63,083	2,883	0.046	69.0	2,149	222	2.4
2	11,155	62,037	2,136	0.034	69.3	2,204	437	3.9
3	11,949	64,842	246	0.004	69.6	2,562	561	4.7
4	12,878	71,511	522	0.007	69.8	2,793	634	4.9
5	14,053	80,424	561	0.007	69.5	3,144	738	5.3
6	15,931	92,554	1,027	0.011	66.9	3,569	809	5.1
7	18,887	92,227	245	0.003	67.1	3,657	738	3.9
8	23,646	95,474	2,031	0.021	66.0	3,555	819	3.5
9	32,099	101,793	1,074	0.011	65.3	3,932	1,150	3.6
10	61,411	146,462	1,724	0.012	65.3	5,634	2,397	3.9
All	*20,982*	*86,829*	*1,243*	*0.014*	*67.8*	*3,312*	*846*	*4.0*

Source: Authors' tabulations from the 1986 Income Distribution Survey.
[a] Household income *including* net imputed rent.
[b] Calculated as 5 percent of house price (column 2) less 1 percent of house price for property taxes and 13 percent (the assumed interest rate) of the outstanding mortgage loan (column 3).
[c] Tax paid on net imputed rent.
[d] Tax paid (column 7) as a percentage of household income *including* net imputed rent (column 1).

Table 7. **Mean Household Income, Additional Taxes, and Incremental Tax Rates by Decile of Household Income Inclusive of Net Imputed Rent for Married Couples with Heads Aged 25 to 54 and 60 and Older, with Separate Decile Ranks**

	Ages 25 to 54				Ages 60 and Older			
Decile	1 Household Income (A$)	2 Additional Tax (A$)	3 Add'l Tax as % of Income	4 Add'l Tax as % of Burden	5 Household Income (A$)	6 Additional Tax (A$)	7 Add'l Tax as % of Income	8 Add'l Tax as % of Burden
1	9,022	0	0.0	0.1	8,435	67	0.8	108.6
2	17,444	88	0.5	3.2	10,741	327	3.0	351.5
3	22,147	134	0.6	3.3	11,591	504	4.3	484.5
4	26,003	109	0.4	2.0	12,555	582	4.6	203.3
5	29,474	210	0.7	3.2	13,730	681	5.0	139.6
6	32,984	228	0.7	3.1	15,488	747	4.8	80.7
7	36,818	408	1.1	4.7	18,355	704	3.8	39.5
8	41,417	475	1.1	4.6	22,975	727	3.2	21.8
9	48,554	623	1.3	4.7	31,520	1,024	3.2	17.4
10	74,540	1,670	2.2	6.4	59,485	2,191	3.7	12.2

Source: Authors' tabulations from the 1986 Income Distribution Survey.

system. Columns 4 and 8 of table 7 indicate that taxation of net imputed rent would result in a more progressive tax system for married couples aged 25 to 54, but a less progressive tax system for those aged 60 and older. This problem could be offset by, for example, exempting pensioners with low incomes from the tax.

Direct effects on horizontal equity

It is clear a priori that a tax on net imputed rent would increase horizontal equity between owners and renters. The primary problem with horizontal distribution involves different classes of owner. It was noted above that a tax on net imputed rent would favor owners with high debt over those with low debt. Because the low-debt owners are older than high-debt owners, net imputed rent taxation would directly affect older households much more severely than younger households. In tables 8 and 9, married couples aged 25 to 54 are compared with couples aged 60 and over, and single persons aged 25 to 54 with singles aged 60 and over. In these tables, the decile ranks are based on the

Table 8. **Mean Household Income, Additional Taxes, and Incremental Tax Rates by Decile of Household Income Inclusive of Net Imputed Rent for Married Couples with Heads Aged 25 to 54 and 60 and Older, with Deciles Based on Combined Samples**

		Ages 25 to 54		Ages 60 and Older	
Decile	1 Household Income (A$)	2 Additional Tax (A$)	3 Additional Tax (%)	4 Additional Tax (A$)	5 Additional Tax (%)
1	8,322	–48	–0.6	217	2.6
2	12,832	82	0.6	599	4.7
3	16,827	107	0.6	724	4.3
4	21,350	96	0.4	741	3.5
5	25,677	128	0.5	786	3.1
6	29,818	197	0.7	953	3.2
7	34,010	307	0.9	1,144	3.4
8	38,918	385	1.0	1,407	3.6
9	46,235	601	1.3	1,742	3.8
10	71,873	1,538	2.1	2,781	3.9

Source: Authors' tabulations from the 1986 Income Distribution Survey.

Table 9. **Mean Household Income, Additional Taxes, and Incremental Tax Rates by Decile of Household Income Inclusive of Net Imputed Rent for Single Persons Aged 25 to 54 and 60 and Older, with Deciles Based on Combined Samples**

		Ages 25 to 54		Ages 60 and Older	
Decile	1 Household Income (A$)	2 Additional Tax (A$)	3 Additional Tax (%)	4 Additional Tax (A$)	5 Additional Tax (%)
1	4,026	–47	–1.2	2	0.0
2	5,762	26	0.5	55	1.0
3	6,994	94	1.3	381	5.4
4	8,021	125	1.6	540	6.7
5	9,235	206	2.2	589	6.4
6	11,776	88	0.7	750	6.4
7	15,957	130	0.8	1,039	6.5
8	20,154	137	0.7	978	4.9
9	24,761	54	0.2	1,760	7.1
10	38,567	452	1.2	1,827	4.7

Source: Authors' tabulations from the 1986 Income Distribution Survey.

combined samples. For both married couples and singles, it is clear that the older age group would be taxed at significantly higher rates. Even though younger people will eventually be older, the tax would still be unfair to older households at the time it is introduced. Not only have they never had the benefit of mortgage interest deductions, but they also cannot adjust by modifying their work effort.[18] This inequity can be addressed by phasing in the tax by initially either excluding older households from taxation or allowing such households to pay tax on only a fraction of imputed rental income. Our calculations indicate that

[18] Tax expenditures on homeownership by older Australians have for some time served as de facto retirement income supplements. Until the recent introduction of mandatory employer contributions to retirement plans, many retired private employees depended on income from their own individual investments or small means-tested pensions provided by the government. For many households, investment in owner-occupied housing has been the primary retirement savings vehicle. In addition to its tax-free status, owner-occupied housing is excluded from the means test for government retirement benefits. Thus, levying an imputed rent tax on retired homeowners would be particularly unfair.

imputed rental income would have to be reduced from 4 percent of house price to 1.5 percent (after the 1 percent deduction for property taxes) for households above age 60 to be taxed at the same rate as younger ones. A sliding scale could be devised that would require current younger homeowners and first-time buyers to pay tax on the maximum percentage of imputed rental income and older households to pay tax on a declining percentage. These households would continue to pay tax on the same fraction of house value; the fraction would not drop for individual households as they aged. This approach would cushion the tax's impact on today's older homeowners.

Conclusion

All policy changes create winners and losers, and economists have enough difficulty inducing politicians to adopt efficiency-improving policies without overstating the losers' losses. The difficulty is compounded if lower income households are mistakenly identified as the losers. We show that when the life cycle is controlled for and income is measured appropriately, the direct vertical distribution of a tax on net imputed rental income is progressive or neutral at worst. For married couples aged 25 to 54, the tax on imputed rent would be more progressive than the existing taxes on other household income.

Nevertheless, horizontal inequities between younger and older households remain a problem. As we have noted, older households have little debt and thus would lose relative to younger owner/purchaser households with much debt. While this effect washes out for currently young households and as yet unformed owner/purchaser households, who would experience the new system both while they are young and when they become old, current older owner/purchaser households did not have the benefit of mortgage interest deductions when they were young and thus should not be taxed disproportionately now.[19] An appropriate rule could easily be devised for phasing in the tax on imputed rental income.

An imputed rental tax with mortgage interest deductibility would induce many behavioral responses. For example, the demand for owner-occupied housing of younger households would rise, while that of older households would fall. The most striking behavioral response would likely be a sharp increase in mortgage

[19] They may, of course, have had the benefit of various first-time homeowner subsidies.

debt, possibly raising the aggregate LTV ratio from 0.14 to above 0.40 as in the United States. 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 would be less revenue to redistribute than the average additional tax as a percentage of income would suggest.

Appendix A
Income and price elasticity estimates

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

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; and

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

Derivation of the constant-quality house prices is discussed in Bourassa and Hendershott (1993). Household data are from the 1986 Income Distribution Survey.

Permanent income is calculated as the fitted value from a regression of current income (including net imputed rent) on dummy variables for the age, sex, highest educational qualification, occupation, and marital status of the household head, as well as dummies for the different states and a dummy for households that include a working spouse. Net imputed rent is calculated as described earlier. Detailed estimation results are available from the authors.

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:

$$P_k = (P_j/\overline{P})[v_k i_m + (1 - v_k)(1 - t_k)i + d + w_k + \delta - \quad],$$

where

P_k = the real price of housing faced by household k;
v_k = the household's current mortgage LTV 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 for couples 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;
δ = a risk premium (0.03); and
= expected inflation (0.07).

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

Using a sample of 2,724 married couples with heads aged 25 to 54, we obtained (with standard errors in parentheses)

$$\ln Q_k = \underset{}{42.85} - \underset{(7.09)}{6.837} \ln Y_k + \underset{(1.357)}{0.350} (\ln Y_k)^2 - \underset{(0.067)}{0.752} \ln P_k \quad (R^2 = 0.30). \qquad (0.026)$$

The results from a sample of 5,434 households of all ages and marital statuses were

$$\ln Q_k = \underset{}{18.35} - \underset{(1.65)}{2.029} \ln Y_k + \underset{(0.333)}{0.116} (\ln Y_k)^2 - \underset{(0.017)}{0.694} \ln P_k \quad (R^2 = 0.29). \qquad (0.019)$$

These results indicate that both income and price are significantly related to demand and that the income elasticity of demand increases with income.

Appendix B
Effects of income and age on mortgage LTV ratio

We regressed the LTV ratio, v, on the log of household income, Y, and age-group dummy variables for all the home-owning households in the 1986 Income Distribution Survey, with the exception of those aged 60 and older (preliminary estimations showed that the coefficients for 60-plus age groups were not significantly different from zero). In this estimation, age is essentially a

proxy for wealth. The results were (with standard errors in parentheses)

$$
\begin{aligned}
v = {} & -0.053 + 0.0070 \ln Y + 0.639\ \mathrm{AGE}_{18\text{–}20} + 0.489\ \mathrm{AGE}_{21\text{–}24} \\
& \quad (0.032) \quad (0.0035) \qquad (0.092) \qquad (0.021) \\
& + 0.432\ \mathrm{AGE}_{25\text{–}29} + 0.332\ \mathrm{AGE}_{30\text{–}34} + 0.222\ \mathrm{AGE}_{35\text{–}39} \\
& \quad (0.011) \qquad (0.009) \qquad (0.009) \\
& + 0.136\ \mathrm{AGE}_{40\text{–}44} + 0.104\ \mathrm{AGE}_{45\text{–}49} + 0.058\ \mathrm{AGE}_{50\text{–}54} \\
& \quad (0.009) \qquad (0.010) \qquad (0.010) \\
& + 0.023\ \mathrm{AGE}_{55\text{–}59} \\
& \quad (0.009) \\
& (R^2 = 0.40).
\end{aligned}
$$

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