

Marginal Suppliers, Taxation, and Rental Housing: Evidence from Microdata

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Abstract

Typically, when the effects of tax reform are measured, it is assumed that marginal suppliers belong to the highest income tax bracket. This assumption is critical because in competitive housing markets, tax shelter benefits from investments in rental housing will be passed on in the form of lower market rents that reflect the investor's tax bracket. We address that issue using a survey of landlords who leased 1,907 rental properties in Australia in 1993. User cost of capital estimates are obtained for each of those properties, and the marginal suppliers' income tax brackets are identified.

We find that most marginal landlords have marginal income tax rates lower than that in the highest income tax bracket. Tax reforms will then have a nonuniform impact in the rental housing market. This proposition is explored in two microsimulations. The first measures the change in suppliers' user costs if passive losses are not deductible from other sources of income. The second measures the effects of introducing a low-income housing tax credit.

Keywords: Low-Income Housing Tax Credit; Marginal landlords; Rental housing; User cost

Introduction

If housing markets are competitive, tax shelter benefits from investments in low-income rental housing will be passed on in the form of lower market rents that reflect the income tax bracket of the marginal investor. The tax bracket that marginal suppliers belong to is then of critical importance to the supply of affordable rental housing to low-income tenants. Simulations measuring the impact of tax reform on rents using the typical project model approach have generally assumed that suppliers belong to the top income tax bracket.¹ This has also been an important assumption invoked by researchers conducting simulations using the tax arbitrage model of tenure choice. (See Anstie, Findlay, and Harper 1983; Follain and Ling 1988; Gordon, Hines, and Summers 1987; Hendershott 1988; Nordvik 2000. See also Wood 2000a for a review of this literature.)

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¹ The approach uses measures of cash flows for a representative rental housing development to solve for the minimum rental rate at which investors can meet their user cost of capital. See, for example, Brueggeman, Fisher, and Stern (1982); De Leeuw and Ozanne (1981); Fisher and Lentz (1986); Follain, Hendershott, and Ling (1987); Hendershott, Follain, and Ling (1987); Hendershott and Ling (1984); Ling (1992); and MacNevin (1997a, 1997b).

Narwold (1992) offers a theoretical rationale, which begins by establishing that landlords' excess returns will be an increasing convex function of their marginal tax rate. If landlords in any tax bracket lower than the top bracket are receiving zero excess returns, they must be positive in higher tax brackets. Given perfect capital markets, this cannot be an equilibrium, as market rental rates will be driven down by the entry of top-bracket suppliers. In equilibrium, excess returns will be negative in tax brackets below the highest and zero in the top bracket.

Sunley (1987) argues that there are not enough top-bracket landlords with a net worth sufficient to hold the stock of rental housing. In the presence of incentive problems and costly monitoring of landlord actions, external suppliers of funds can demand bonds in the form of down payment requirements. As Litzenberger and Sosin (1978) point out, given sufficient demand for rental housing, landlords from high tax brackets will eventually exhaust the assets needed to finance these down payment requirements. Market rental rates will rise to attract landlords from lower tax brackets.

There is little empirical evidence that analysts can draw on in framing assumptions about such a key parameter. In the United States, Case (1991) cites a study by the Congressional Budget Office indicating that in the mid-1970s not enough landlords were in the top tax bracket to clear the market in low-income housing tax shelters. The Economic Recovery Tax Act of 1981 dropped the top marginal rate from 70 percent to 50 percent, and because this dramatically increased the number of filers in the top marginal bracket, Case (1991) argues that it is reasonable to assume that the marginal tax shelter landlord faces a 50 percent marginal rate. Narwold (1992) produces supporting evidence from cross-sectional regression models that demonstrate that combined state and federal top marginal rates have a statistically significant and negative impact on market rental rates. In contrast, in commenting on Poterba (1990), Hendershott claims that the weighted average marginal tax rate of suppliers in rental housing in the early 1980s was approximately 30 percent.

This article offers empirical evidence on that issue using a survey of private landlords conducted by the Australian Bureau of Statistics (ABS) in July 1993 (ABS 1995b). Our principal aims are measurement of landlords' marginal tax rates and cross-section variation in their user cost of capital, as well as identification of the marginal suppliers of rental housing. This information allows us to measure the impact that Australian federal government taxation arrangements have on the user cost of providing rental housing from existing properties, and how changes to those taxation arrangements can have differential effects on the user costs of marginal and intramarginal suppliers. However, we are also able to offer precise measures of neglected components of the user cost of capital, such as property² management costs and brokerage fees. Their role as a source of cross-section variation in user cost is explored.

In the following section of this article we explain the tax treatment of rental housing in Australia and define a landlord's user cost of capital, which reflects these tax arrangements. The next section describes the database on which estimates are based and addresses various measurement issues with respect to parameters of the user cost model. The subsequent section presents investor marginal tax rate and user cost estimates for the sample of rental properties. A de-composition analysis is conducted, which permits scrutiny of the sources of cross-

² In the Australian context, property refers to an individual housing unit.

section variation in user cost estimates. In addition, we identify the tax brackets marginal landlords belong to and the value segments of the rental housing market in which they supply rental housing. The importance of conducting microsimulations across a distribution of landlords and properties is illustrated by two measurement exercises. In the first we estimate the impact on user cost of changing the tax treatment of passive losses.³ The second measurement exercise estimates the impacts on landlords' user costs when a low-income housing tax credit is introduced to promote the retention of affordable housing. A final section offers some concluding comments.

The Model

Our analytical approach is based on the long-run equilibrium condition that a landlord's equity holding will be equal to the present value of after-tax cash inflows and outflows over the expected holding period. The gross cash inflows consist of gross nominal rents and the cash sum realized on sale of the property in some future year. The gross cash outflows include debt payments, operating expenses (maintenance and property management fees), economic depreciation, and property and land tax payments.⁴ A discrete time-discounted cash flow equation is then specified and solved for the reservation rental rate, which is the hurdle rate that rental rates must at least equal in the first year of operation if the project is to earn the required after-tax rate of return. On assuming that the long-run supply of funds to each investment alternative is perfectly elastic, we can use the reservation rental rate expression to compute the rent required to offset a tax reform's impact.

These gross cash flows are defined after allowance for income and capital gains tax considerations. The Australian federal government's tax treatment of rental property differs in important respects from that in the United States. Though operating expenses, interest payments on debt, and property and land taxes can be deducted from taxable income, landlords cannot access depreciation allowances with respect to existing property structures.⁵ Landlords in the United States can depreciate the full purchase price less the value of land during a 27.5-year tax life according to the straight-line method (DiPasquale and Wheaton 1996). Since the Tax Reform Act of 1986, landlords have been able to use real estate losses to offset income from other passive activities, but not other sources of ordinary income such as wages (Hendershott, Follain, and Ling 1987). In Australia, landlords are currently permitted to use passive losses on real estate activities to offset income from all other sources.

³ In Hendershott, Follain, and Ling (1987, 77), the definition of "passive income" under the 1986 U.S. Tax Reform Act is "income generated from business and trade activities in which the taxpayer does not materially participate, and from rental activities such as real estate." In Australia, leveraged rental investments that generate losses are referred to as negatively geared investments.

⁴ Property taxes, or rates, are levied by local government jurisdictions in Australia. State governments apply a land tax on real estate (see Other Parameters section for details).

⁵ Internal amenities such as furniture, washing machines, and carpets can be written off over their estimated lives. A "special building write-off" of 2.5 percent per annum is permitted for 100 percent of construction expenditure incurred on building a rental property or development. This special building write-off will affect the user costs of landlords who have financed the construction of rental housing. It commenced on July 18, 1985, which is eight years before the Rental Investors' Survey was conducted (in July 1993), on which our empirical analysis is based. Only 12.3 percent of our sample of properties were constructed eight or fewer years before the survey date, and 47.9 percent of these properties were first made available for rent in a year later than the year of construction. This tax allowance will therefore affect the user costs of a small number of landlords and for that reason has been ignored in our analysis.

Capital gains are also more generously treated under the Australian tax system. Australian landlords' real capital gains are subject to tax and measured as the difference between the amount received on disposal and an indexed cost base, which is the original acquisition price (including incidental costs of purchase and capital improvements) increased by an indexation factor based on movements in the Consumer Price Index. One-fifth of this real capital gain is added to income from all other sources and taxed at the landlord's highest marginal rate; this figure is then multiplied by five to arrive at the capital gains tax liability.⁶ The U.S. landlord is taxed on all capital gains realized, which are added to ordinary income from all other sources and taxed at the marginal rate in the landlord's income tax bracket. Furthermore, capital gains are measured with depreciation taken while the property was owned and recaptured at the time of sale (DiPasquale and Wheaton 1996).

Our specification of the discrete time discounted cash flow equation is adapted to incorporate the provisions of the Australian federal government's tax treatment of landlords in rental housing,⁷ state and local government taxation of real estate, and institutional arrangements governing agent fees. In Wood and Watson (1999), we show how a series of assumptions⁸ can be used to obtain the following expression for the long-run reservation rental rate:

$$\frac{R_m}{P_K} = \frac{(1-\beta)i}{1-\phi} + \frac{(1-\beta)(\gamma_s d - q)}{(1-t_y)(1-\phi)} + \frac{t_r - t_L(1-\gamma_s) + \mu}{1-\phi}, \quad (1)$$

where R_m is gross market rents, P_K is the property's current market value, β is brokerage costs as a proportion of sale price, i is the loan interest rate, ϕ is property management and letting fees⁹ as a proportion of R_m , γ_s is the ratio of the value of the building structure to market value of the property, d is the rate of economic depreciation of the building structure, q is the expected inflation rate, t_y is the landlord's effective marginal tax rate, t_r is property taxes per dollar of property value, t_L is the rate of land tax per dollar of site value, and μ is maintenance and building insurance outlays per dollar of property value. Equation 1 defines the reservation (minimum) rental rate needed in the current year of operation to equate the net present value of all after-tax cash flows, discounted by the landlord's required after-tax rate of return, with the landlord's equity holding. The right-hand side of equation 1 is a user cost of capital expression that reflects present Australian tax treatment of rents and operating ex-

⁶ In 1999 the Australian federal government removed the inflationary adjustment applied to the cost base used to compute taxable capital gains (see Wood 2000b). The rules as they applied in 1993, the year of the landlord survey used for the microsimulations, are assumed in this article.

⁷ For specifications of the discrete time-discounted cash flow equation under Canadian and U.S. taxation provisions, see MacNevin (1997b) and Ling (1992), respectively.

⁸ These assumptions are that house prices appreciate at the same rate as general price inflation and that landlords have an infinite expected holding period and a required after-tax rate of return equal to the after-tax loan interest rate. This last assumption means that debt inflows and outflows drop out of the discrete cash flow equation, and the model is then equivalent to Ling's capital budgeting approach (1992). It is an assumption also explicitly invoked by DiPasquale and Wheaton (1992). An important implication is that the user cost of capital becomes independent of the loan-to-value ratio.

⁹ Real estate agents in Australia who screen potential tenants and arrange lease contracts between landlord and tenant charge landlords a letting fee. In most states residential tenancies legislation prevents agents from charging tenants a letting fee. When agents manage properties during the term of the tenancy, the landlord pays a property management fee.

penses and represents the hurdle rate that rental rates must at least equal if the asset is to be retained. The principal difference between this specification and those obtained for landlords in the United States is the absence of depreciation allowances.¹⁰

The user cost of capital expression reveals a number of relationships that are important to an understanding of the supply of rental housing. As is apparent from equation 1, the higher the landlord's tax bracket, the greater the tax benefits from investments in rental housing. Under Australian tax arrangements these tax benefits arise as a result of the treatment of capital gains.¹¹ There are two main benefits. First, although nominal increases in gross rents are taxed as ordinary income, nominal increases in property value are tax exempt. Second, gross rents are taxed as they accrue, but (real) capital gains are taxed on a realized basis.¹² Provided the interest rate does not rise by a multiple of increases in the expected rate of inflation, the fall in user cost when expectations of future inflation increase will be greater, the higher the landlord's tax bracket. Thus, equation 1 demonstrates the importance of assumptions concerning the marginal landlord's tax bracket.

The role of brokerage fees and property management (and letting) fees are also worthy of comment. If a landlord decides to realize his or her equity at the onset of the current period, a brokerage fee of β is incurred. This is an unavoidable cost, as it must be met if realization is delayed by one year. However, if equity is realized now, the landlord sacrifices a pretax return of $i\beta$, which can be avoided if realization is delayed one year. By delaying disinvestment by one year, a landlord will lower user cost by $i\beta / (1 - \phi)$. Offsetting this is an increase in a brokerage fee of $\beta(q - \gamma_s d)$ if realization is delayed, which will contribute $\beta(q - \gamma_s d) / (1 - t_y)$ to a landlord's user cost of capital. The net effect of brokerage fees is then a priori indeterminate given an infinite expected holding period.

Under present institutional arrangements, property management and letting fees are set on an ad valorem basis with respect to gross rent. The fraction $(1 - \phi)$ in equation 1 therefore acts to convert cash flows on the right-hand side into a gross rental yield which, after subtraction of management and letting fees, ensures after-tax returns equal to the landlord's after-tax required rate of return.

¹⁰ In Gordon, Hines, and Summers (1987), the user cost of capital for landlords is given by

$$\frac{R_m}{P_K} = \frac{[(1-t_y)i - q + d](1-t_yz)}{(1-t_y)} + t_r + \mu,$$

where z is the present value of depreciation allowances permitted for tax purposes. Setting $z = 0$ and ignoring property management fees and land taxes yields an expression identical to equation 1 in the text.

¹¹ If we ignore operating and brokerage costs and set $d = t_r = t_L = 0$, we can rewrite equation 1 as

$$\frac{R_m}{P_K} = i - \frac{q}{1-t_y}.$$

The denominator $1 - t_y$ converts the rate of house price appreciation into a pretax value for ordinary income that ensures an after-tax return equal to the landlord's required return (Fisher and Lentz 1986). Note that if $t_y = 0$, the user cost of capital is equal to the real rate of interest.

¹² There is a third potential benefit that arises when the marginal tax rate applicable to capital gains is lower than that applied to increments in ordinary income. This benefit is due to the method of calculating a capital gains tax liability (as described previously).

Parameterization

The database employed in this study is the ABS Rental Investors Survey, which was undertaken in July 1993 in conjunction with the Monthly Population Survey conducted by the ABS. The initial sample, which included 34,858 households, yielded approximately 61,242 completed interviews. The survey was based on a multistage sample of private dwellings involving about two-thirds of 1 percent of the Australian population. It included rural and urban dwellings in all states and territories. Estimates derived from the survey use a ratio estimation procedure to ensure that they conform to an independently estimated distribution by age, sex, and area of residence. ABS (1994) presents detailed information on the survey design and descriptive statistics on key features of the dwellings broken down by investor characteristics. Yates and Wood (1997) present an analysis of the pattern of rental yields using the survey's unit record file.

The survey yielded a sample of 3,365 people from an estimated total population of 752,100 private rental landlords who solely or jointly own one or more rental properties. If the ownership structure of the most recently acquired property is assumed to be representative of the ownership structure of all dwellings, the rental property owned by private landlords in the survey will be representative of 63 percent of all rental dwellings in Australia in July 1993 (Yates and Wood 1997).¹³ To eliminate double counting of jointly owned property, user cost estimates are offered at a dwelling level. Following the elimination of records with missing values and the aggregation above, 1,907 dwelling-level records are available for use in the analysis. These properties are solely or jointly owned by 2,906 landlords.

The survey elicits landlord estimates of key market characteristics relating to the most recently acquired dwelling; estimates include the total weekly rent and the estimated market value.¹⁴ These values are central to our computation of land and property taxes, letting and management fees, and brokerage costs on sale and insurance premiums. Landlords were asked to report the total cost of repair and maintenance work completed in the past financial year and, after deduction of expenses, the net rent received in the past financial year.¹⁵ The net rent and the landlord's reported before-tax income from all other sources are used in the measurement of the landlord's effective marginal tax rate. We now present a detailed discussion of the measurement procedures used to estimate each of the parameters entering our expression for landlords' user costs of capital.

Effective Marginal Tax Rate

Landlords who do not receive government benefits have their effective marginal tax rate (t_y) computed as the fraction of net rent that must be met as a tax liability under 1992–93 Aus-

¹³ Private rental properties and developments that are owned and leased by public companies and government agencies are not included in the survey.

¹⁴ Where an investor owns a block of flats or a block of units, the estimated market value refers to the value of a single representative unit or flat within that block.

¹⁵ When a property is jointly owned, the landlord is asked to provide his or her share of maintenance costs and net rent.

tralian tax provisions. The tax liabilities of each landlord are first computed on gross income inclusive of net rents from the most recently acquired property investment. We have then calculated the tax liabilities of each landlord if net rents were zero. In each case, non-housing deductions have been taken into account in arriving at taxable income.¹⁶ Tax liabilities have also been adjusted for each landlord's tax credit (rebates) entitlements, given his or her gross income.¹⁷

The difference between the two computed tax liabilities is then expressed as a proportion of net rent to arrive at our measure of t_y . If net rents push landlords into a higher tax bracket, t_y will be a weighted average of marginal rates in the two brackets. If landlords are incurring passive losses, t_y is the ratio of tax savings to the reduction in taxable income arising from passive losses.

Of the sample of 2,906 individual landlords, 343 (11.8 percent) receive transfer payments. Typically, these cash transfers are progressively withdrawn as gross income from other sources increases. Our measure of t_y allows for interaction between means-tested transfer payments and the income tax schedule. Entitlements to transfer payments at gross incomes inclusive of net rents and after deduction of net rents have been computed. Any loss in entitlements to transfer payments is then added to the tax liabilities incurred on net rents in the computation of t_y .

Measurement of t_y is based on the landlord's reported net rent and income from all other sources in 1992–93. However, reported net rent will reflect lumpy maintenance outlays. We have therefore adjusted the reported net rent figure by adding to this figure the difference between landlords' reported maintenance outlays and the predicted values from a tobit model specification for maintenance outlays (see the section, Depreciation Rates and Maintenance).¹⁸

¹⁶ The average non-housing deduction in each income tax bracket is obtained by dividing the total amount of non-housing deductions by the number of taxpayers in the tax bracket. The mean non-housing deductions were as follows:

Grade of Taxable Income (A\$)	Average Deduction (A\$)
< 10,000	691
10,000 – 14,999	742
15,000 – 19,999	838
20,000 – 24,999	858
25,000 – 34,999	1,058
35,000 – 49,999	1,452
> 50,000	2,946

Source: Australian Taxation Office (1994).

¹⁷ A formal statement of this measurement exercise is presented in Wood and Watson (1999).

¹⁸ There are 1,045 missing observations on net rent (36 percent of all landlords). That affects 605 properties, or 31.7 percent of the 1,907 sample. Where a landlord is an outright owner and has reported a property value and a gross rent figure, we have computed a net rent figure by subtracting imputed measures of operating expenses and property and land taxes from reported gross rent. Though landlords report whether or not they have a mortgage, the outstanding loan balance (or balance at origination) is not elicited in the survey. Landlords who do not report net rent and have leveraged their rental property investment are given an imputed net rent figure equal to the median net rent figure reported by responding leveraged landlords in the property value decile in which the nonresponding landlord's property belongs. The median net rent figure has been adjusted to take into account the impact of lumpy maintenance expenditures. If a landlord reports a net rent equal to zero, the landlord's effective marginal tax is set equal to the marginal tax rate that would apply to an additional dollar of income.

The income tax brackets and tax rates are based on the 1992–93 federal income tax schedule.¹⁹ Australian permanent residents are required, subject to family income thresholds, to pay a Medicare levy of 1.25 percent of taxable income; this levy is included in the computation of t_y .²⁰ Shading-in rules apply if family income is below threshold levels, which are conditional on marital status and number of dependent children. These factors have been taken into account in computing the levy.²¹

Tax credits (or rebates) are granted under Australian federal government tax provisions for dependent spouses, sole parents, and pensioners.²² The detailed procedures invoked in the calculation of these tax credits are explained in Wood and Watson (1999). Landlord entitlements to transfer payments have been computed for those landlords who indicate that government benefits are one source of income.²³

One final point concerns the measurement of t_y in the user cost measure when two or more partners own the property (couples file separate tax returns in Australia). We have experimented with two alternative measures of t_y (see Wood and Watson 1999). In the first we have measured the user cost of capital using the weighted average of the partners' effective marginal tax rates, the weights being the respective ownership shares in the property.²⁴ The second measure is the effective marginal tax rate of the partner with the lower gross income from all sources, on the grounds that properties are indivisible. The property should then return a gross rental yield at least equal to that required by the partner with the lower effective marginal tax rate. We refer to this latter measure as the minimum effective marginal tax rate.

¹⁹ The 1992–93 tax rates and brackets were as follows:

A\$0–5,400	0
A\$5,401–20,700	20%
A\$20,701–36,000	A\$3,060 + 38%
A\$36,001–50,000	A\$8,874 + 46%
A\$50,001 and above	A\$15,314 + 47%.

²⁰ Where a spouse's income has not been reported, we have used the median income for reporting spouses as a proxy to allow the computation of taxes and transfer payments.

²¹ Landlords are asked about marital status and the presence of dependent children. It is assumed that landlords who report the presence of dependent children have two children.

²² There are also rebates for invalid and parent dependents, social security recipients, medical expenses, and zone allowances. These rebates have not been taken into account because of insufficient information on the socioeconomic status of the landlord.

²³ Landlords are asked in the Rental Investors Survey to identify important sources of income, but not how much is received from each source. From the demographic status of the landlord, we infer the type of transfer payment received. The means-tested transfer payments taken into account in this manner include sole parent benefit, age pension, and family allowance. The eligibility and entitlement criteria employed in the measurement of these transfer payments are presented in Wood and Watson (1999).

²⁴ This is an ABS-generated estimate in field 43 of the unit record file. If the landlord's partner is a spouse or dependent relative, the income of the partner is reported, and effective marginal tax rates can be calculated. However, if the landlord's partner did not respond to the survey, partners' incomes are not known. In these cases partners' effective marginal tax rates have not been taken into account in calculating the weighted average effective marginal tax rate.

Interest Rates and Expected Rates of Inflation

The baseline simulations assume an inflation rate of 4.75 percent. Public pronouncements made by Reserve Bank of Australia officials (for example, see Frazer 1993) during 1993 indicated that inflation of about 3.5 percent would be a reasonable outcome over the medium term. However, in the previous 10 years the average annual inflation rate had been 6 percent. The mid-inflation scenario of 4.75 percent allows for the possibility that landlords expected a lower rate of inflation, but did not treat the pronouncements of the Reserve Bank as credible, given the higher rates of inflation experienced in the years preceding 1993.²⁵ Microsimulations have been conducted at inflation rates of 3.5 percent and 6 percent; the results are reported in Wood and Watson (1999).

The interest rate has been set at 10 percent, the mortgage interest rate for owner-occupied housing in July 1993 (ABS 1995a). Other studies have included an interest rate premium to reflect risk (Brueggeman, Fisher, and Stern 1982; Fisher and Lentz 1986; Gordon, Hines, and Summers 1987; Hendershott, Follain, and Ling 1987; Hendershott and Ling 1984). However, that is by no means uniform practice; DiPasquale and Wheaton (1992) is one study that does not incorporate a risk premium into user cost measures. These authors point out that such a linear transformation of their user cost expression will produce identical results from their econometric model of the demand and supply of rental housing. A similar argument can be advanced in connection with the cross-section comparisons reported in this article. We also note that there are conflicting estimates of the beta for real estate. Sanger, Sirmans, and Turnbull (1990) report a positive and statistically significant beta value, as does Chinloy (1992). But Case and Schiller (1989) find that the beta for housing is virtually zero and, in a review of the literature, Leggett (1995) cites studies indicating that the beta for real estate is either negative or insignificantly different from zero. Landlords should then be happy to accept rates of return equal to the rate on risk-free investments of comparable maturity. However, Leggett (1995) interprets the evidence as suggesting that landlords are unwilling to accept the risk-free rate because of the relative illiquidity of real estate assets. Our microsimulations are based on detailed measurement of the transaction costs that contribute to this illiquidity.

Depreciation Rates and Maintenance

The rate of economic depreciation is set equal to 1.4 percent per annum, a rate chosen by Brueggeman, Fisher, and Stern (1982); De Leeuw and Ozanne (1981); and Gordon, Hines, and Summers (1987) in conducting measurement exercises similar to those reported in this article.²⁶ This 1.4 percent rate of depreciation is applied to that part of the market value of the property attributable to the building structure.

²⁵ The microsimulations are then based on the assumption that there are no systematic long-run differences in the rate of appreciation of house values. See Wood and Watson (1999) for a justification of that assumption.

²⁶ There is considerable variation in rates of depreciation chosen in North American project models. DiPasquale and Wheaton (1992) adopt a rate of 0.5 percent; Fisher and Lentz (1986), a rate of 3.0 percent; Hendershott, Follain and Ling (1987), a 2.5 percent rate; MacNevin (1997a, 1997b), a rate of 3.3 percent; and Tanzer (1987), a rate of 1.52 percent. The latter is the rate estimated by Chinloy (1980) for houses built between 1951 and 1960.

The ratio of the value of the building structures to market value of properties will vary between metropolitan and nonmetropolitan residential housing markets. We have therefore estimated a value for the parameter γ_s that is typical of metropolitan and nonmetropolitan housing markets in each state. Our approach has been to calculate

$$\gamma_s = \left[1 - \frac{S_i}{P_i} \right], \quad (2)$$

where S_i is the mean site value²⁷ of residential land in housing market i , and P_i is the mean market value of residential housing in market i . The S_i values are obtained from the Commonwealth Grants Commission's (CGC) *Report on General Revenue Grant Relativities* (CGC 1995).²⁸ P_i is calculated from the landlord estimates of property value in our sample.

The parameter μ in equation 1 can be interpreted as the constant proportion of property value that will yield a stream of maintenance outlays that increase at rate q and, when discounted, have a present value equal to the present value of the lumpy future stream of actual maintenance outlays. There are measurement issues here. Landlords who happen to repair their property in the survey period have their expenditure recorded. But for landlords with no recorded maintenance outlays (29 percent of properties in the sample), we have no means of measuring their willingness to spend on maintenance at the time of the survey. Maximum likelihood estimates of a tobit model have therefore been obtained with landlords' reported maintenance expenditures in fiscal year 1992–93 as the dependent variable. The vector of independent variables includes the landlord's estimate of market value, property type, property age, number of bedrooms, metropolitan location, and landlord's marginal tax rate.²⁹ The coefficient estimates are presented in Wood and Watson (1999). The parameter μ is set equal to the predicted values from the tobit model, which is the mean conditional on positive maintenance expenditures and is expressed as a proportion of landlord estimates of property value.³⁰

²⁷ CGC defines "site value" as the capital sum the land might be expected to realize when offered for sale under reasonable terms and conditions. The site value is determined as if no building structures have been erected on the land site (CGC 1993).

²⁸ Site values of residential land are reported in CGC (1995) for state capitals and the rest of the state. We have therefore classified residential property in state capitals as belonging to metropolitan housing markets, and all other property is classified as belonging to nonmetropolitan housing markets. In each state the population is heavily concentrated in the state capital. In 1993 the proportion of each state's population that resided in the capital city was as follows: New South Wales (Sydney), 62 percent; Victoria (Melbourne), 71.4 percent; Queensland (Brisbane), 45.6 percent; South Australia (Adelaide), 73.2 percent; Western Australia (Perth), 72.9 percent; and Tasmania (Hobart), 44 percent (ABS 1995c).

²⁹ The landlord's effective marginal tax rate is endogenous because the predicted values from the maintenance regression are used to compute the net rents in the procedure for measuring effective marginal tax rates. We have therefore substituted an instrument for the effective marginal tax rate, which is the marginal rate in the tax bracket the landlord would belong to if net rent is equal to the median net rent received by landlords in the sample.

³⁰ A second measurement issue concerns possible upward bias in recorded maintenance expenditures. The tax treatment of real estate in Australia encourages landlords to disguise the capital costs of improvement expenditures as maintenance and repair expenses because maintenance expenses can be deducted from taxable income at the investor's marginal rate, and in the year they are incurred. Capital costs are deductible from taxable capital gains in the year of realization, and any capital losses can be subtracted only from other capital gains. Our measures of maintenance outlays and net rental income are then subject to this reservation. We are grateful to an anonymous referee for suggesting that point.

Brokerage Costs and Letting and Property Management Fees

Brokerage costs on sale have been obtained by applying Australian Real Estate Institute recommended maximum commission schedules in each of the states. Evidence offered by the Prices Surveillance Authority (1992) suggests that clients rarely negotiate over commission rates and that maximum rates applied to most transactions at that time. The schedules can be found in Wood (1996).

It is assumed that all landlords engage a real estate agent to screen tenants, arrange lease contracts, and manage the property during the lease term.³¹ Agents charge letting fees for screening tenants, arranging lease contracts, and preparing inventories. They charge property management fees for management services during the term of a lease. In Australia the fees real estate agents charge for these services have typically been regulated under state government rental tenancy legislation. Though most states have subsequently deregulated fees, in 1993 fees were subject to maximum schedules. Maximum regulated property management and letting fees are set according to ad valorem schedules based on gross rent during the term of the lease. Typically, the ad valorem rate differs according to whether the property is let furnished or unfurnished, but is independent of property value and the level of gross rent.

The maximum schedules have been obtained from the Government Gazettes of each state for 1993 (see Wood and Watson 1999). The relevant state schedules have then been used to obtain measures of the ad valorem rates for property management and letting fees. It has been assumed that lease terms are one year and that all properties are let fully furnished.

Other Parameters

The remaining parameters are land taxes, property taxes (rates), and building insurance premiums. Land taxes are a periodic tax levied by state governments on the site value of land a taxpayer owns.³² A progressive tax rate schedule is employed in each state, with a zero rate of tax payable if the aggregate site value of land holdings falls below a threshold that varies across states.³³ Land tax rate schedules were obtained from Ristrom and McDonald (1993). The rate of land tax (t_L in equation 1) for single-property landlords is obtained by imputing a site value using the parameter estimate γ_s obtained from the procedure outlined in relation to equation 2. The relevant state tax schedule is then used to impute the rate of land tax per dollar of site value.

³¹ In fact, 54 percent of all dwellings were managed by a real estate agent (ABS 1994). In the case of landlords who manage their own properties, it is assumed that the opportunity cost of managerial inputs can be represented by the fees that would be paid to real estate agents if management were contracted out to them.

³² There are tax exemptions granted to land used for primary production and owner-occupied housing in all states other than Tasmania.

³³ In June 1993 this threshold was A\$160,000 in New South Wales, A\$200,000 in Victoria, A\$179,043 in Queensland, A\$80,000 in South Australia, A\$5,000 in Western Australia, and A\$1,000 in Tasmania. For Queensland properties, the land tax liability is calculated on the total value of the holding once it exceeds the threshold. This calculation can lead to relatively high marginal rates of land tax on an additional property that increases aggregate holdings above the threshold.

Landlords who have multiple holdings report the number of rental dwellings currently leased, but not their value. We have assumed that the mean value of the multiple holdings is equal to the landlord's estimate of the current market value of the most recently acquired residential dwelling. An aggregate site value is once again imputed using the parameter estimate γ_s . The rate of land tax is measured with respect to the site value of the most recently acquired dwelling. It is obtained by calculating land tax liabilities on aggregate imputed site value, gross and net of the most recently acquired dwelling's site value. The difference in land tax liabilities is then expressed as a proportion of the most recently acquired dwelling's imputed site value, and this value is used as our estimate of t_L in equation 1.

Property taxes are periodic taxes payable by landlords and other owners of residential and business property; they are levied by local governments in Australia on the assessed value of property. In most local government jurisdictions the assessed values are site values, but there is variation in valuation procedures and a trend toward capital improved values.³⁴ We have imputed a property tax rate for each property in the sample, as property tax liabilities are not reported in the survey. We have used the predicted values from a regression model that has been estimated using the unit record file of the ABS Income, Housing Costs and Amenities Survey conducted in 1990.³⁵

Annual building insurance premiums were obtained using a premium calculator supplied by a domestic insurance provider on the Internet.³⁶ Using the mean building structure value, we computed insurance premiums for furnished properties with common structural and security characteristics in 20 randomly selected suburbs in each state capital.³⁷ We took the average of these rates as a proportion of the estimated market value to arrive at a common insurance premium rate for each state.

Table 1 presents descriptive statistics for the parameters composing our user cost expression (see equation 1). A few points of clarification are warranted. There is little variation in the management and letting fees parameter ϕ , as all states had similar maximum regulated schedules (see Wood and Watson 1999). Though 62 percent of sample properties are jointly owned, the difference in mean weighted average effective marginal tax rates and minimum effective marginal tax rates is only 8.2 percentage points. The microsimulations reported in the results section use weighted average effective marginal tax rates and produce results very

³⁴ Capital improved value is the freehold market value of land and of the reversible physical structures erected on that land, assuming that the property's income potential is maximized.

³⁵ The survey elicits property tax payments from the owners of 10,158 owner-occupied properties. We regress the property tax rate (t_r), as measured by the ratio of property tax payments to owner estimates of property value, on property value P_i (in 100,000 units), and on a dummy variable process in which WA equals 1 if the property is located in Western Australia, 0 otherwise; NSW equals 1 if the property is located in New South Wales, 0 otherwise; VIC equals 1 if the property is located in Victoria, 0 otherwise; QLD equals 1 if the property is located in Queensland, 0 otherwise; SA equals 1 if the property is located in South Australia, 0 otherwise. Properties in the rest of Australia (Tasmania, Northern Territory, and Australia Capital Territory) compose the omitted category. The coefficient estimates and standard errors (in parentheses) are as follows:

$$t_r = 0.894 (0.02) - 0.049 (0.003) P_i - 0.165 (0.02) WA - 0.184 (0.02) NSW - 0.178 (0.02) VIC - 0.032 (0.02) QLD - 0.127 (0.02) SA$$

³⁶ World Wide Web <<http://203.17.138.189/Scripts/MMI/h1.idi>>.

³⁷ The suburbs were selected by random drawings from postcodes for metropolitan properties reported in the survey.

Table 1. Descriptive Statistics for the Parameters of User Cost Expression^a

Parameter/Variable ^b	Mean	Median	Maximum	Minimum	Standard Deviation
Property value (A\$ thousands)	122.7	110.0	800.0	9.0	68.0
Brokerage cost (β)	0.030	0.029	0.05	0	0.005
Management and letting fee (ϕ)	0.179	0.18	0.19	0.17	0.009
Weighted average effective marginal tax rate (t_y)	0.287	0.298	0.87	0	0.144
Minimum effective marginal tax rate (t_y)	0.205	0.20	0.87	0	0.150
Building structure ratio (γ_s)	0.432	0.405	0.78	0.20	0.170
Property tax rate (t_r)	0.007	0.007	0.01	0	0.0008
Land tax rate (t_L)	0.003	0	0.05	0	0.005
Maintenance (μ)	0.017	0.014	0.17	0	0.011

^a Descriptive statistics for the sample show that there is little variation in the brokerage cost, management fee, and land tax rate parameters. The mean land tax rate is low because most landlords' properties are exempt.

^b The parameters i , d , and q are fixed. There is a sample size of 1,907 properties. In the Australian context, *property* refers to an individual housing unit.

similar to those based on minimum effective marginal tax rates (see Wood and Watson 1999).³⁸ The mean land tax rate is very low. This fact reflects the use of threshold site values below which a property is exempt. As a consequence, most (71 percent) single-holding landlords have a zero land tax liability.

Results

Effective Marginal Tax Rates, User Costs, and Marginal Suppliers

We begin by investigating variation in effective marginal tax rates and the user cost of capital. Our findings clearly demonstrate that, typically, suppliers of rental housing have effective marginal tax rates lower than the top-bracket marginal rate of 48.25 percent (inclusive of the Medicare levy). When we examine the 2,906 individual landlords, our computations indicate that only 315 (10.8 percent) have marginal effective tax rates of 48.25 percent or greater.³⁹ The typical landlord is not, therefore, paying tax on net rent income at the top-bracket marginal rate. This implies that rental housing supply is price inelastic at the reservation rental rates of landlords who belong to the top bracket. The Australian income tax system features five tax brackets, with marginal rates increasing from 0 percent in the lowest tax bracket to 48.25 percent in the highest bracket. Only 7.5 percent of Australian taxpayers belong to the top bracket (Australian Taxation Office 1994), but 19.5 percent of all

³⁸ Where net rent is not reported by a responding landlord in the Rental Investors Survey, we have imputed a net rent figure for the purposes of calculating effective marginal tax rates (see footnote 18). The microsimulations have been conducted on the subsample of dwellings for which there are no missing observations on net rent. The results are very similar to those obtained on the full sample (see Wood and Watson 1999).

³⁹ There are 135 individual landlords with effective marginal tax rates above the top-bracket marginal income tax rate as a result of the interaction of means-tested transfer payments and income tax schedules.

Australian households reside in the private rental tenure (Yates and Wulff 2000). So it is not altogether surprising to observe landlords from lower tax brackets.⁴⁰

Table 2 arranges properties into deciles according to our user cost of capital measure. Mean user cost increases from 4.25 percent in the lowest decile to 12.05 percent in the highest decile. There is then considerable variation in user cost across the existing stock of rental housing. As expected, this is clearly associated with the landlord's effective marginal tax rates, which fall monotonically from a mean of 48.2 percent in the lowest decile to 13.9 percent in the highest. Mean owner estimates of property value also fall systematically from A\$177,560 in the lowest decile, to A\$63,604 in the highest decile. These relationships have an important implication because the high-cost (marginal) suppliers are most vulnerable in the event of an adverse shock to the rental housing market. Table 2 indicates that lower-value rental properties are predominant among the properties held by marginal suppliers. These properties are most likely to be affordable to low-income households, but in a unitary market their landlords are also most likely to exit the market in response to an adverse shock.

Table 2. Mean Property Value (Australian Dollars), Weighted Average Effective Tax Rate, and User Cost by Decile of User Cost^a

Decile	Mean Property Value (A\$)	Weighted Effective Marginal Tax Rate (%)	User Cost ^b (%)
1	177,560	48.2	4.25
2	143,466	41.8	6.17
3	142,873	37.1	6.91
4	133,944	33.3	7.48
5	122,050	29.9	7.98
6	125,003	26.0	8.43
7	119,327	20.6	8.91
8	104,543	20.2	9.41
9	94,147	15.5	10.07
10	63,604	13.9	12.05
All	122,654	28.7	8.17

^a Marginal landlords (those in the highest user cost decile) typically have relatively low effective marginal rates of tax. They are also concentrated at the bottom end of the rental housing market.

^b The user cost estimates are computed with respect to the baseline assumptions that $i = 10.0\%$ and $q = 4.75\%$.

As pointed out in the introduction, down payment requirements can be invoked to explain the entry into private rental markets of marginal suppliers from lower tax brackets. But that does not explain why properties and their landlords in any given user cost decile are not spread evenly across value segments in the rental housing market. It is evident from table 2 that landlords with low effective marginal tax rates who typically have high user costs are

⁴⁰ This observation suggests that in cross-national comparisons, the price elasticity of supply will be a function of the progressivity of income tax systems. Malpezzi and Mayo (1997) find that supply elasticities differ dramatically from one country to another. They argue that these differences are attributable to the relative stringency of the regulatory environment, but they do not explore the role of differential tax progressivity.

concentrated at the bottom end of the market and landlords with high effective marginal tax rates who typically have low user costs are concentrated at the top end of the market.

A potentially important factor here is the emergence of clientele groups associated with the asymmetric tax treatment of rental income and capital gains. Those submarkets with high expected rates of capital appreciation will attract investors from high tax brackets because they pay lower taxes on capital gains than if they receive an equivalent sum in rental income. The entry of top-bracket investors into these submarkets will drive up house price levels and depress market rental rates. In submarkets with a tax-disadvantaged package of returns, top-bracket investors' demand for properties will be weak, property prices will fall, and market rental rates will correspondingly rise. Low-bracket investors, particularly those whose time preference for consumption is such that they are spending from wealth, will then be attracted to these submarkets. An equilibrium will be established when differential market rental rates equalize after-tax returns. This clientele effect mechanism features the capitalization of the preferential tax treatment of capital gains into property prices and results in the concentration of high-bracket landlords at the top end of the market and low-bracket landlords at the bottom end of the market, as observed in table 2.

Other factors responsible for variation in user cost are explored in table 3, in which the mean user cost is de-composed into four components—real finance costs, property and land tax liabilities, maintenance and insurance costs, and management and brokerage costs. The real finance component is obtained by setting $\beta = \phi = t_r = \mu = t_L = 0$ in equation 1 to yield

$$i + \frac{\gamma_s d - q}{1 - t_y} \tag{3}$$

The property and land tax component is the sum $t_r + t_L(1 - \gamma_s)$, and the maintenance and insurance component is represented by μ . To measure the management and brokerage cost

Table 3. Mean Real Finance Cost, Property and Land Tax, Maintenance and Insurance, and Management and Brokerage Cost Components by Decile of User Cost*

Decile	Real Finance Cost (%)	Property and Land Tax (%)	Maintenance and Insurance (%)	Management and Brokerage Cost (%)
1	1.31	0.85	1.37	0.72
2	2.70	0.86	1.60	1.02
3	3.25	0.88	1.64	1.13
4	3.66	0.89	1.71	1.22
5	4.00	0.90	1.77	1.31
6	4.32	0.92	1.82	1.38
7	4.69	0.85	1.92	1.45
8	4.77	0.91	2.20	1.54
9	5.11	0.92	2.40	1.64
10	5.30	0.89	3.88	1.98
All	3.91	0.89	2.03	1.34

* The real finance component is the most important contributor to variation in mean user cost across deciles. This reflects the asymmetric tax treatment of rental income and capital gains, which means that a landlord's tax bracket is a critical determinant of user cost.

component (M), we set $\beta = \phi = 0$ and subtract this benchmark measure from the user cost computed in equation 1. The component M is then defined by

$$M = \frac{\phi - \beta}{(1 - \phi)} \left[i + \frac{\gamma_s d - q}{1 - t_y} \right] + \frac{\phi}{1 - \phi} (t_r + t_L [1 - \gamma_s] + \mu). \tag{4}$$

At the mean user cost value of 8.2 percent, the real finance cost component is the most important contributor (3.9 percentage points), followed by maintenance and insurance (2.0 percentage points), management and brokerage (1.3 percentage points), and property and land tax components (0.9 percentage points). The de-composition analysis also reveals real finance costs as the primary determinant of variation in user cost, and this in turn reflects the importance of landlords’ effective marginal rates of tax. However, two of the other cost components also play a role. The contribution made by management and brokerage costs and maintenance and insurance costs systematically increases as we move from low to high user cost deciles. Increases in management and brokerage cost are such that their mean value in the highest decile (2.0 percentage points) is nearly three times the mean value in the lowest decile (0.7 percentage points).⁴¹ The relative increase in the maintenance and insurance cost component is of a similar magnitude, but the absolute size of the increase in this cost component (2.5 percentage points) is greater.⁴²

Passive Losses and User Cost

Our key finding that marginal suppliers typically have low effective marginal tax rates can also be explored by considering the income tax brackets landlords belong to. Table 4 classifies the sample of landlords into marginal and intramarginal suppliers according to whether their rental property is one of the 10 percent of properties with the highest user cost. The distribution of landlords by income tax bracket is presented for both marginal and intramarginal suppliers. The results clearly demonstrate that the distribution of marginal suppliers is skewed toward the lower tax brackets and the distribution of intramarginal suppliers is skewed toward the higher tax brackets. We find that 30 percent of intramarginal suppliers belong to the top two income tax brackets, where there is only a one percentage point difference in marginal tax rates. Only 6 percent of marginal landlords belong to these top two tax brackets.

There are significant policy implications that follow from those observations. Most important, they indicate that tax reforms, which change the treatment of deductible expenses or passive losses, will have relatively small effects on marginal suppliers. Because the effects of tax reforms on rents are commonly measured by reference to the marginal supplier, previous studies will exaggerate the effect on rents because of the assumption that marginal suppliers belong to the top income tax bracket.

⁴¹ This systematic variation in the management and brokerage cost component arises because management and letting fees are struck as a percentage of gross rent. Gross rent yields are typically higher on lower-value properties that tend also to have higher user costs. Mean gross rental yields in each user cost decile are as follows:

	1	2	3	4	5	6	7	8	9	10
Rental yield %	5.86	6.44	6.18	6.60	6.55	6.86	6.74	7.31	7.47	8.95

⁴² The tobit model estimates imply that maintenance outlays increase less than proportionately with property value.

Table 4. Marginal and Intramarginal Suppliers by Income Tax Bracket*

Tax Bracket (percent)	Marginal Suppliers		Intramarginal Suppliers	
	Number	Percent	Number	Percent
0	42	22.1	71	4.1
20	95	50.0	434	25.3
38	42	22.1	628	36.6
46	8	4.2	308	17.9
47	3	1.6	276	16.1
All	190	100	1,717	100

* The distribution of marginal (intramarginal) suppliers is skewed toward low (high) tax brackets.

We illustrate this point by conducting a microsimulation that estimates the effects on user cost of preventing landlords from deducting passive losses on rental properties to offset taxable income from other sources. The research exercise is simplified by assuming that losses in any one year cannot be “banked” and used to offset passive income in future years.⁴³

In table 5, properties are once again arranged into deciles according to pretax change values for user cost, and the proportion of landlords in each decile who are generating passive losses from their property is presented. The systematic decline in this proportion, from 53.7 percent in decile 1 to only 17.4 percent in decile 10, clearly indicates that limitations on passive loss provisions will have a more widespread effect on intramarginal suppliers than on marginal suppliers. For those intramarginal and marginal suppliers that generate passive losses, curbs on passive losses will be more significant for the former because typically they have higher effective marginal tax rates.⁴⁴

These expectations of a nonuniform impact are borne out by a comparison of pretax and post-tax change in mean user cost shown in table 5.⁴⁵ The sample mean user cost increases from 8.17 percent to 8.47 percent, given baseline parameter values for i and q . But the increase

⁴³ The discrete time-discounted cash flow equations used to measure tax reform effects employ a discount rate that is constant. Thus the investor's next best alternative after-tax rate of return is assumed to be invariant with respect to tax reform. As a practical matter, this assumption is tenable because the revenue gain from “quarantining” passive losses will be small relative to aggregate tax revenues and the government's budget position. In 1987–88, when the Australian federal government temporarily quarantined passive losses on new investments in rental housing, the revenue gain was estimated to be A\$30 million (Department of Treasury 1992). If this had been retrospectively applied to all rental housing, we estimate a revenue gain of A\$85 million. This estimate assumes that the incidence of passive losses among landlords in 1987–88 is the same as that found among landlords in the ABS survey (ABS 1995b). This revenue gain would represent a 0.003 percent addition to total income tax revenues (Australian Taxation Office 1989) and a negligible change in the government's budget position. It is then reasonable to ignore second-order impacts on interest rates or offsetting cuts in marginal tax rates.

⁴⁴ The impacts on landlords who generate passive losses are reported in Wood and Watson (1999).

⁴⁵ The change in user cost is estimated by expressing the current year tax savings from passive losses as a proportion of owner estimates of property value. This is biased upward, as the nominal value of these tax savings decline if interest rates remain constant over the expected holding period. A theoretically precise measure of the change in user cost is not possible without knowledge of the landlord's debt position. ABS 1995b did not elicit information on the size of debt. However, this research exercise is more concerned with demonstrating that the impact of changes to passive loss provisions will be nonuniform. Our estimates will represent the order of magnitude of impacts on user cost, provided landlords with passive losses have expected holding periods and loan-to-value ratios that are similar across deciles.

Table 5. User Cost of Capital and the Deduction of Passive Losses, All Landlords*

Decile	Percentage of Properties with Passive Losses (%)	Pretax Change User Cost (%)	Posttax Change User Cost (%)
1	53.7	4.25	4.77
2	45.6	6.17	6.66
3	38.7	6.91	7.41
4	23.0	7.48	7.82
5	21.6	7.98	8.26
6	17.8	8.43	8.69
7	16.8	8.91	9.06
8	15.7	9.41	9.67
9	18.9	10.07	10.19
10	17.4	12.05	12.11
All	26.9	8.17	8.47

* Tax savings as a result of the deduction of passive losses are concentrated on low user cost suppliers.

is higher in low user cost deciles, and correspondingly lower in high user cost deciles. Indeed, of the 190 marginal suppliers in the highest user cost decile, only 33 are affected by the tax change and mean user cost increases by a negligible 0.06 percentage points. In the lowest user cost decile, 103 suppliers are affected and mean user cost increases by 0.52 percentage points. Even those 33 marginal suppliers who generate passive losses experience a relatively small increase in mean user cost of 0.38 percentage points. Intramarginal suppliers who generate passive losses find that the mean user cost increases by 1.2 percentage points.

*Low-Income Housing Tax Credits and User Cost*⁴⁶

Because marginal suppliers typically belong to the lowest tax brackets, tax expenditures that seek to promote the supply of affordable rental housing are more effective if offered in the form of tax credits that reduce landlords' tax liabilities dollar for dollar. This is a particularly important consideration in view of our finding that marginal suppliers also tend to hold affordable housing. Furthermore, there is evidence of a contraction in the supply of affordable rental housing. Yates and Wulff (2000) report that Australian census of population and dwellings data show that the number of dwellings in the private rental housing tenure increased by 34.4 percent between 1986 and 1996. But the number that were let at a low rent of less than A\$100 per week at constant 1996 prices declined by 28.1 percent. In the United States, Malpezzi and Green (1996) cite figures to show that there was contraction in the stock of low-cost market-rate units (less than US\$300 per month at constant 1989 prices) between 1974 and 1989, and this reduction was accompanied by growth in the remaining stock of unsubsidized rental units.

Following passage of the 1986 Tax Reform Act in the United States, which cut back tax privileges to rental housing, concerns about the supply of low-income rental housing led to the introduction (in 1987) of targeted tax credits. For an existing rental building that is 10 years old

⁴⁶ We are grateful to an anonymous referee for suggesting this microsimulation.

or older, an investor can claim a tax credit of 4 percent of the building structure's value in each year for 10 years.⁴⁷ Entitlement to the tax credit is conditional on the building being occupied by low-income tenants who receive rental subsidies (Case 1991; Smith 2000).

Microsimulation modeling of the effects of a low-income housing tax credit using our cross-section database permits scrutiny of this policy instrument's effectiveness. The microsimulations assume that tax credits on existing rental properties are offered at an annual rate of 4 percent of the building structure's value, as in the United States. However, we assume that these tax credits are not conditional on tenant or landlord incomes⁴⁸ and are not subject to a time limit. Targeting on low-income housing is achieved by making entitlements conditional on weekly rents being less than or equal to A\$100 at 1996 prices (see Yates and Wulff 2000).

Eligible landlords' user costs are now given by

$$\frac{R_m}{P_K} = \frac{(1-\beta)i}{1-\phi} + \frac{(1-\beta)(\gamma_s d - q)}{(1-t_y)(1-\phi)} + \frac{t_r + t_L(1-\gamma_s) + \mu}{1-\phi} - \frac{\rho\gamma_s}{e} [AMORT], \quad (5)$$

$$\text{where } AMORT = \frac{e - q + \gamma_s d}{(1-t_y)(1-\phi)}.$$

The last term represents the contribution of tax credits; ρ is the annual percentage credit (0.04), and e is the discount rate (required after-tax rate of return). The tax credit's contribution comprises two components. The first is the present value of the stream of tax credits with respect to a dollar of housing capital ($\rho\gamma_s / e$). The second ($AMORT$) converts this present value cash sum into an incremental rental rate in the first year so that, after subtraction of income tax and agency costs, full recovery of economic costs is ensured. It is important to recognize that the tax credit's impact on user cost is in part determined by the landlord's effective marginal tax rate. A top-bracket landlord can afford to reduce reservation rental rates by a greater margin than low-bracket landlords, because the former have larger tax savings as rents become a less important component of returns.

Table 6 compares the pre- and post-tax credit user costs of capital for landlords, which are grouped into deciles according to the pre-tax credit value of user cost. The sample mean falls from 8.2 percent to 8.0 percent, given baseline parameter values for i and q . This reduction in mean user cost would almost offset the increase in mean user cost that arises when the privileged tax treatment of passive losses is removed. It follows that the substitution of low-income housing tax credits for passive loss deductions would be an approximately revenue neutral change in the tax mix.

⁴⁷ In fact the percentage rate is effectively adjusted on a monthly basis so that its present value over 10 years will equal 30 percent of the building structure's value. Newly constructed rental buildings are entitled to a 9 percent tax credit that is adjusted so that on a present value basis it equals 70 percent of total construction costs. From 1990 the acquisition of an existing building became eligible only if it met a substantial rehabilitation qualification (Internal Revenue Service [IRS] 2000).

⁴⁸ Initially, entitlement to tax credits was restricted to investors with incomes less than US\$250,000, and each investor was limited to credits of US\$7,000. The latter restriction remains in place, but the cap on incomes has been removed (Case 1991).

*Table 6. User Cost and Low-Income Housing Tax Credits: All Properties**

Decile	Percentage of Properties Eligible (%)	Pre-Tax Credit User Cost (%)	Post-Tax Credit User Cost (%)
1	4.2	4.25	4.14
2	5.8	6.17	6.12
3	10.5	6.91	6.78
4	5.8	7.48	7.42
5	6.8	7.98	7.87
6	6.3	8.43	8.34
7	12.6	8.91	8.73
8	13.1	9.41	9.20
9	18.8	10.07	9.75
10	49.5	12.05	11.12
All	13.3	8.17	7.95

* Low-income housing tax credits are concentrated on high user cost suppliers who typically hold housing that low-income tenants can afford.

The tax credit concentrates tax savings on marginal landlords of affordable housing in the highest user cost decile. The percentage of properties eligible for tax credits falls from 50 percent in the highest user cost decile to only 4 percent in the lowest user cost decile. There is a correspondingly large reduction in mean user cost in the highest decile, from 12.1 percent to 11.1 percent, as compared with the lowest decile in which there is a small reduction from 4.3 percent to 4.1 percent.

Summary and Conclusions

In this study we investigate the proposition that marginal suppliers of rental housing will belong to the top tax bracket. They have the lowest user costs and are therefore able to charge the lowest rents in competitive rental housing markets. We employ an Australian microdata set to calculate precise measures of landlords' user costs of capital for a sample of 1,907 properties. These measures of landlords' user costs are based on estimates of each landlord's effective marginal tax rate, which take into account non-housing deductions and tax credits, a Medicare levy, and transfer payments.

There are two particularly important findings. First, only 15 percent of the property sample is owned by landlords who belong to the top tax bracket. Thus, the typical landlord has a marginal tax rate lower than the top rate. Second, marginal suppliers generally belong to low tax brackets and are concentrated at the bottom end of the rental housing market. These results have implications for measuring the effects of tax reform. In competitive rental housing markets, tax shelter benefits will be passed on in the form of lower market rents that reflect the income tax bracket of marginal landlords. Past studies that based measures of the impact of tax reform on the assumption that marginal suppliers belong to the top bracket will have exaggerated the impact of tax reform.

The policy significance of our findings is explored further in two microsimulations. The first estimates the effect that preventing the deduction of passive losses from other sources of

income has on Australian landlords' user costs. The second examines a low-income housing tax credit, which is structured along lines similar to the tax credit program introduced by the U.S. federal government in 1987.

Our principal findings are that passive loss deductions concentrate tax shelter benefits on intramarginal suppliers of rental housing. The low-income housing tax credit concentrates tax savings on marginal landlords who supply affordable housing. This finding is particularly important for countries with steeply progressive income tax rates and an insufficient number of top-bracket landlords willing to supply the rental housing demanded at market rental rates. It suggests that tax credits, rather than tax allowances, will be more effective in promoting the supply of affordable housing for low-income tenants. This policy recommendation is likely to be of most relevance to governments with tax systems that offer an asymmetric tax treatment of rental income and capital gains. This asymmetric tax treatment can lead to clientele effects, a corollary of which is the concentration of high-tax-bracket landlords at the top end of the market and low-tax-bracket landlords at the bottom end. The introduction of low-income housing tax credits will act to neutralize such clientele effects.

References

- Anstie, Roslyn, Christopher Findlay, and Ian Harper. 1983. The Impact of Inflation and Taxation on Tenure Choice and the Redistribution Effects of Home-Mortgage Interest Rate Regulation. *Economic Record* 59(165):105–10.
- Australian Bureau of Statistics. 1994. *Investors in Rental Dwellings*. Catalogue No. 8711.0. Canberra: Australian Government Publishing Service.
- Australian Bureau of Statistics. 1995a. *Australian Economic Indicators: January 1995*. Catalogue No. 1350.0. Canberra: Australian Government Publishing Service.
- Australian Bureau of Statistics. 1995b. Information Paper. *July 1993 Rental Investors Survey Australia*. Canberra: Australian Government Publishing Service.
- Australian Bureau of Statistics. 1995c. *Year Book Australia: 1995*. Canberra: Australian Government Publishing Service.
- Australian Taxation Office. 1989. *Australian Tax Statistics 1987–88*. Canberra: Australian Government Publishing Service.
- Australian Taxation Office. 1994. *Australian Taxation Statistics 1992–93*. Canberra: Australian Government Publishing Service.
- Brueggeman, William B., Jeffrey D. Fisher, and Jerrold Stern. 1982. Rental Housing and the Economic Recovery Tax Act of 1981. *Public Finance Quarterly* 10(2):222–41.
- Case, Karl E. 1991. Investors, Developers and Supply-Side Subsidies: How Much Is Enough? *Housing Policy Debate* 2(2):341–56.
- Case, Karl E., and Robert J. Schiller. 1989. The Efficiency of the Market for Single-Family Homes. *American Economic Review* 79(1):125–37.
- Chinloy, Peter. 1980. The Effect of Maintenance Expenditures on the Measurement of Depreciation in Housing. *Journal of Urban Economics* 8(1):86–107.
- Chinloy, Peter. 1992. Returns to Holding Housing. *Journal of Housing Economics* 24(2):310–23.

Commonwealth Grants Commission. 1993. *Report on General Revenue Grant Relativities: 1993*. vol. 3. Canberra: Australian Government Publishing Service.

Commonwealth Grants Commission. 1995. *Report on General Revenue Grant Relativities: 1995 Update*. Canberra: Australian Government Publishing Service.

De Leeuw, Frank, and Larry Ozanne. 1981. Housing. In *How Taxes Affect Economic Behavior*, ed. Henry Aaron and James Pechman, 283–319. Washington, DC: The Brookings Institution.

Department of Treasury. 1992. *Tax Expenditure Statements: December 1992*. Canberra: Australian Government Publishing Service.

DiPasquale, Denise, and William C. Wheaton. 1992. The Cost of Capital, Tax Reform, and the Future of the Rental Housing Market. *Journal of Urban Economics* 31(3):337–59.

DiPasquale, Denise, and William C. Wheaton. 1996. *Urban Economics and Real Estate Economics*. Englewood Cliffs, NJ: Prentice-Hall.

Fisher, Jeffrey D., and George H. Lentz. 1986. Tax Reform and the Value of Real Estate Income Property. *Journal of the American Real Estate and Urban Economics Association* 14(2):287–315.

Follain, James R., Patric H. Hendershott, and David C. Ling. 1987. Understanding the Real Estate Provisions of Tax Reform: Motivation and Impact. *National Tax Journal* 3:363–72.

Follain, James R., and David C. Ling. 1988. Another Look at Tenure Choice, Inflation and Taxes. *Journal of the American Real Estate and Urban Economics Association* 16(3):207–29.

Frazer, Bernard W. 1993. Some Aspects of Monetary Policy. *Bulletin*. Sydney: Reserve Bank of Australia. April.

Gordon, Roger H., James R. Hines Jr., and Lawrence H. Summers. 1987. Notes on the Tax Treatment of Structures. In *The Effects of Taxation on Capital Accumulation*, ed. M. Feldstein, 223–54. Chicago: Chicago University Press.

Hendershott, Patric H. 1988. Home Ownership and Real House Prices: Sources of Change, 1965–1985. *Housing Finance Review* 7:1–18.

Hendershott, Patric H., James R. Follain, and David C. Ling. 1987. Effects on Real Estate. In *Tax Reform and the US Economy*, ed. James A. Pechman, 71–102. Washington, DC: The Brookings Institution.

Hendershott, Patric H., and David C. Ling. 1984. Prospective Changes in Tax Law and the Value of Depreciable Real Estate. *Journal of the American Real Estate and Urban Economics Association* 12(3):297–317.

Internal Revenue Service. 2000. *Market Segment Specialisation Program: Low-Income Housing Credit*. World Wide Web page <http://www.irs.treas.gov/prod/bus_info/mssp/lihc-5.html> (last modified August 19, 1999).

Leggett, David N. 1995. An Empirical Analysis of Efficient Real Property Liquidity Premiums. In *Alternative Ideas in Real Estate Investment*, ed. Arthur L. Schwartz Jr. and Steven D. Kapplin, 113–27. Boston: Kluwer.

Ling, David C. 1992. Real Estate Values, Federal Income Taxation and the Importance of Local Market Conditions. *Journal of the American Real Estate and Urban Economics Association* 20(1):122–39.

Litzenberger, Robert H., and Howard B. Sosin. 1978. Taxation and the Incidence of Homeownership across Income Groups. *Journal of Finance* 33(3):947–61.

- MacNevin, Alex S. 1997a. Marginal Effective Tax Rates on Canadian Rental Housing Investments: An Asset Pricing Model Approach. *Public Finance Review* 25(3):306–26.
- MacNevin, Alex S. 1997b. Tax Effects on Rental Housing in Halifax, Nova Scotia. *Canadian Tax Journal* 45(1):87–113.
- Malpezzi, Stephen, and Richard K. Green. 1996. What Has Happened to the Bottom of the U.S. Housing Market? *Urban Studies* 33(10):1807–20.
- Malpezzi, Stephen, and Stephen K. Mayo. 1997. Getting Housing Incentives Right: A Case Study of the Effects of Regulation, Taxes and Subsidies on Housing Supply in Malaysia. *Land Economics* 73(3):372–91.
- Narwold, Andrew. 1992. The Distribution of the Benefits of Tax Arbitrage in the Housing Market. *Journal of Urban Economics* 32(3):367–76.
- Nordvik, Viggo. 2000. Tenure Flexibility and the Supply of Private Rental Housing. *Regional Science and Urban Economics* 30(1):59–76.
- Poterba, James M. 1990. Taxation and Housing Markets: Preliminary Evidence on the Effect of Recent Reforms. In *Do Taxes Matter? The Impact of the Tax Reform Act of 1986*, ed. Joel L. Slemrod, 141–65. Cambridge, MA: MIT Press.
- Prices Surveillance Authority. 1992. *Inquiry into Real Estate Agent Fees Relating to Residential Transactions*. Report No. 43. Prices Surveillance Authority, Australia.
- Risstrom, Eric, and Peter McDonald. 1993. *The Taxpayer's Guide 1993–94*. Victoria: Wright Books.
- Sanger, Gary C., Clemon F. Sirmans, and Geoffrey Turnbull. 1990. The Effects of Tax Reform on Real Estate: Some Empirical Results. *Land Economics* 66(4):409–24.
- Smith, Eric A. 2000. Low-income Housing Tax Credits Basics. *Journal of Financial Planning* 13(5): 114–19.
- Sunley, Emil M. 1987. Comment on Gordon, Roger H., James R. Hines Jr., and Lawrence H. Summers. In *The Effects of Taxation on Capital Accumulation*, ed. Martin Feldstein, 254–7. Chicago: Chicago University Press.
- Tanzer, Ellen P. 1987. Housing Quality and the Structure Tax: Evidence from Microdata. *Journal of the American Real Estate and Urban Economics Association* 15(2):32–45.
- Wood, Gavin A. 1996. The Contribution of Selling Costs and Local and State Government Taxes to Home Buyers' User Cost of Capital. *Australian Economic Papers* 35(66):60–73.
- Wood, Gavin A. 2000a. Tax Arbitrage, Agency Costs and the Relative Cost of Renting versus Ownership. Working Paper No. 177. Murdoch University, School of Economics. Also available at <<http://www.tlc1.murdoch.edu.au/teach/econs/wps/wpslist.html#online>>.
- Wood, Gavin A. 2000b. Effective Capital Gains Tax Burdens Under Alternative Tax Rules: Microsimulation Results for Real Estate Investments. Working Paper No. 178. Murdoch University, School of Economics. Also available at <<http://www.tlc1.murdoch.edu.au/teach/econs/wps/wpslist.html#online>>.
- Wood, Gavin A., and Richard Watson. 1999. The User Cost of Capital, Taxation and the Marginal Supply of Private Rental Housing: Evidence from Microdata. Working Paper No. 176. Murdoch University, School of Economics. Also available at <<http://www.tlc1.murdoch.edu.au/teach/econs/wps/wpslist.html#online>>.
- Yates, Judy, and Gavin A. Wood. 1997. Rental Yields as Indicators of Market Inefficiency. Working Paper No. 97-02. University of Sydney.

Yates, Judy, and Maryann Wulff. 2000. Whither Low Cost Private Rental Housing? *Urban Policy and Research* 18(1):45–64.