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The dynamic efficiency cost of not taxing housing

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Abstract

Traditional welfare cost estimates of tax subsidies for owner-occupied housing are less than 0.5% of GNP in the United States and Canada. This paper argues that these static measures understate the true cost of the tax subsidy. Increasing the capital income tax makes untaxed housing more valuable, delivering a windfall bonus to existing homeowners at the expense of future generations. This intergenerational transfer has real efficiency effects in the presence of pre-existing tax distortions. When housing is in *fixed* supply, the dynamic efficiency cost of preferential tax treatment for housing is as much as 2.2% of GNP, or \$120 billion dollars in 1990.

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1. Introduction

A long tradition of economic studies has quantified the efficiency cost of preferential tax treatment toward owner-occupied housing. However, estimates of welfare cost from the tax subsidy to homeownership in the United States and Canada are generally quite modest, ranging from 0.1% of GNP (Laidler, 1969) to roughly 0.4% of GNP (Rosen, 1979; Hamilton and

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Whalley, 1985).¹ Poterba (1992) has calculated even smaller measures of excess burden in the United States, because of the recent decline both in statutory rates and the number of taxpayers who itemized. Among families with economic income of \$30,000, he estimated that excess burden (expressed in 1990 dollars) fell from \$137 per household in 1980 to only \$53 per household in 1990.

These studies have focused on the intra-asset distortion caused by over-investment, and over-consumption, of housing services at a point in time. In this paper, such intra-asset distortions are ignored by assuming a completely *fixed* housing stock. Hence, taxation does not affect the supply of housing, but it does affect the price of housing. The price of housing is affected by the return on non-housing assets that are typically subject to taxation. In a life cycle model, heavier taxation on non-housing capital makes housing a relatively more attractive asset and, ignoring risk considerations, its price rises until the net return on each asset is equalized (Poterba, 1984; Muellbauer and Murphy, 1989). The higher housing prices caused by the capital income tax delivers a windfall to current homeowners.² The windfall gain to current homeowners is equal in present-value terms to the loss by future generations who must buy the identical house for a higher price. In other words, taxing non-housing capital initiates an intergenerational transfer by affecting housing prices.

Why should a simple intergenerational transfer from future to current homeowners affect the welfare cost of taxation? As Atkinson and Stern (1974), Ballard and Fullerton (1992), and Hoff (1994) have stressed in a different context, lump-sum taxes or transfers can have real efficiency effects when there are pre-existing tax distortions. The capital gain to current homeowners raises little government revenue, because capital gains in housing are largely untaxed.³ However, the loss to future homeowners erodes the government tax base, because a larger fraction of their saving takes the form of the now more expensive non-taxable housing. The attenuation of future tax revenue implies that this (lump-sum) intergenerational transfer has real efficiency effects.

¹ More realistic models can imply a larger static efficiency cost. Berkovec and Fullerton (1992) and Hendershott and Won (1992) account for uncertainty in their estimates of efficiency cost; not taxing housing exposes the taxpayer to more risk from variable housing prices. Nguyen and Whalley (1990) emphasize the substantial transactions costs associated with purchasing the tax-favored owner-occupied housing. For a review, see Rosen (1985).

² See Miles (1994) for a comprehensive study of intertemporal issues in housing wealth and consumption.

³ In the United States, if a family sells the house after age 55, then they are entitled to a one-time \$125,000 exemption from capital gains. Furthermore, if the family bequeaths the house, then it benefits from the stepped-up basis at death.

Results from a two-period dynamic model with endogenous housing prices and plausible empirical parameters suggest that the capital income tax is far more costly than previously thought. The general equilibrium efficiency cost of exempting the housing stock from capital taxation is estimated to be as much as 2.2% of GNP, or \$110 billion annually. Furthermore, the marginal efficiency cost of raising revenue from capital income taxation is calculated to be between 30 and 40 cents per dollar larger than in conventional life cycle models.

The next section surveys the empirical evidence on housing prices, housing wealth, and overall household wealth holdings in the United States. The sharp appreciation in housing prices during the 1970s—a period of time during which real after-tax rates of return on non-housing capital were often negative—is certainly consistent with this asset-pricing view of housing (Poterba, 1984; Summers, 1981; Hendershott and Hu, 1983). The calculations below suggest that the appreciation in housing wealth during the 1970s was more than \$800 billion (in 1982 dollars). Furthermore, this wealth appreciation was concentrated almost entirely in owner-occupied land rather than in owner-occupied housing structures.

2. Aggregate changes in U.S. wealth composition

To describe the empirical patterns of housing and non-housing capital in the United States since 1955, I use the Balance Sheet and Flow of Funds data from the Federal Reserve System Board of Governors (Federal Reserve System, 1994a,b). Net wealth comprises financial assets, non-corporate equity, corporate equity, pension and life insurance assets, housing, and land, less total liabilities of the household sector. Net household wealth expressed as a fraction of national income has changed by less than 4% since 1955.⁴

There have been more dramatic changes in the *composition* of wealth during this period. I distinguish between owner-occupied land and housing structure wealth, denoted ‘housing wealth’, and the remainder, denoted ‘non-housing wealth’. Structures are valued at replacement cost, and the land value is calculated by the Federal Reserve based on Censuses of Government for real estate assessments and sale price adjustments.

In 1955, the ratio of housing wealth to national income was 1.10, and the ratio of non-housing wealth to national income was 2.72. Fig. 1 shows the subsequent changes in housing wealth and non-housing wealth (both

⁴ I exclude consumer durables from the definition of net wealth because it includes not just automobiles, but also bicycles and CD players. The ratio of consumer durables to national income was 0.48 in 1955, and 0.46 in 1993.

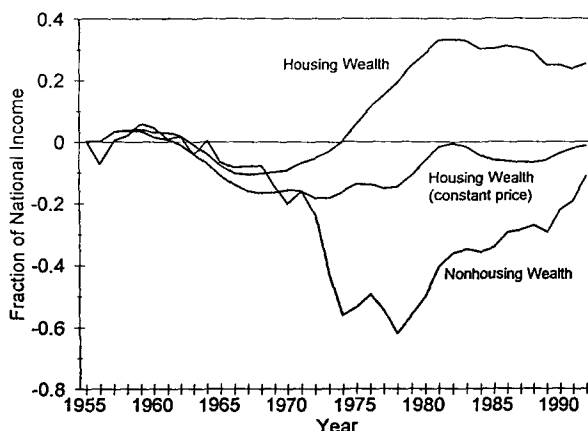


Fig. 1. Changes in housing and non-housing wealth in the United States, 1955–1993.

smoothed with a 3-year moving average), again expressed as a fraction of national income. Beginning in the 1955 base year, they travel in tandem until the early 1970s, when they sharply diverge. By 1982, housing wealth had risen 0.33 above its benchmark in 1955, while non-housing wealth had fallen by 0.36, with the overall change in the net wealth ratio of only -0.03 . Since that time, the two series have converged back to levels closer to the 1955 benchmark, but the share of housing wealth to total household wealth remains roughly one-fifth above its pre-1970 level.

The rise in housing wealth could have been the result of simply building more houses. To test for this, housing wealth was also calculated on a constant price basis as the accumulated sum of net investment less depreciation, adjusted by the implicit GNP deflator.⁵ The graph of this real construction cost housing wealth measure with a starting point of 1955 is also shown in Fig. 1. This measure lags behind national income during most of the period, suggesting that housing wealth appreciation explains the shift in household portfolios during this period.

The previous figure has focused on the revaluation of housing wealth. Was the revaluation caused primarily by housing structure revaluations, or by changes in the value of land? Alternatively, was there a general revaluation in all assets, such as corporate equity, that occurred during the same period? Both questions are addressed in Table 1. In columns (1) and (2), the real

⁵ An alternative deflator is the residential construction implicit price deflator. The difference in the two measures is small; while the GNP deflator grew at an annual rate of 5.7% between 1965 and 1987, the construction deflator grew at 6.3%.

Table 1
Real revaluations of land, housing structures, and corporate capital

Year	Land		Housing structure		House structure and land		Corporate capital	
	(1) (\$billions)	(2) (%)	(3) (\$billions)	(4) (%)	(5) (\$billions)	(6) (%)	(7) (\$billions)	(8) (%)
1955-59	24.1	4.82	-14.2	-1.65	9.9	0.72	92.9	9.29
1960-64	22.5	3.68	-12.4	-1.21	10.1	0.62	105.2	8.22
1965-69	9.0	1.28	10.1	0.84	19.2	1.00	-7.0	-0.34
1970-74	14.1	1.92	26.9	1.86	41.1	1.88	-182.2	-11.35
1975-79	102.8	11.31	25.7	1.34	128.5	4.55	58.8	6.34
1980-84	84.8	5.97	-80.0	-3.35	4.7	0.12	28.8	2.44
1985-89	74.8	4.06	-38.4	-1.60	36.4	0.86	187.5	14.12
1990-93	-53.0	-2.95	-26.3	-0.99	-79.4	-1.78	159.8	9.81
Average 1955-93	37.2	3.93	-13.2	-0.58	23.9	1.07	52.8	4.69

Notes: Federal Reserve System (1986, pp. 59-62; 1988, pp. 65-68; 1994, pp. 21-25, 63-67) and the Economic Report of the President (1994a). Real wealth changes are expressed in billions of 1982 dollars. Housing appreciation is the real change in owner-occupied housing wealth, less net household investment in housing (calculated as gross housing investment less housing depreciation). Land appreciation is the real increase in the value of owner-occupied land. Corporate wealth appreciation is the real revaluation in the market value.

annual dollar change (in billions of 1982 dollars), and the annual percentage change, of owner-occupied land are shown for 5-year intervals (except in 1989–93). The average annual real growth in land value during this period is 3.93 percentage points, with the strongest gain occurring during a period of high inflation, i.e. 1975–79, when real land values grew at an annual rate in excess of 11%.⁶ Land values continued to grow through the 1980s, although they declined in the 1990s.

Changes in the value of housing structures net of land are constructed as the change in the real value of structures minus real net investments in the reproducible housing stock, and are shown in columns (3) and (4). The trend in housing structure wealth changes is slightly negative for the entire period 1955–93 (–0.58%), with a modest gain of 1.34% annually in the period 1975–79, and pronounced losses of roughly 2% annually during the 1980s. Most of the overall gain in housing wealth of \$848 billion during the 1970s (columns (5) and (6) of Table 1) occurred because of the appreciation of land values.

Changes in corporate wealth are measured by the revaluation of corporate stock equity held by households, again in annual real changes (column (7)) or in annual percentage changes (column (8)). While there is substantial variation in returns, even when averaged over 5 years, there is little evidence that years in which land values rise are also years in which stock values rise; if anything, there is a modest negative correlation between the two series. In sum, these empirical data suggest that the 1970s, a period marked by rapid inflation and a high real tax burden on many non-housing capital goods, was also characterized by very rapid appreciation in land prices for owner-occupied housing with no comparable gain in non-housing taxable corporate wealth. The next section seeks to explain these empirical regularities using a life cycle model with housing assets.

3. A model of housing, consumption and saving

A number of dynamic models have analyzed the role of a fixed asset, typically land, in international trade (Eaton, 1987; Engel and Kletzer, 1990), fiscal policy and taxation (Feldstein, 1977; Chamley and Wright, 1987), and in development (Drazen and Eckstein, 1988). While the model discussed below will follow the basic structure of these two-period models, there is

⁶ Some of the increase in land value is likely to have occurred when farm land, for example, was switched into residential use. Unfortunately, the Federal Reserve data do not have this information. However, it is unlikely that such shifts in land use could explain the dramatic jump in land prices during the inflationary period of the late 1970s.

one major difference: the long-lived asset in this model serves as both a consumption durable and a productive input.⁷

Goulder (1989) has examined the impact of taxation on housing asset prices in a general equilibrium simulation model. He finds that tax changes cause housing prices to shift, but by much smaller magnitudes than those calculated below. The reason is that homeowners in Goulder's model live forever, so there are no life cycle wealth effects. Brueckner and Pereira (1993) develop an overlapping generations model of homeownership, and show that income shocks can lead to 'overshooting', because their impact is magnified through housing asset price changes. Their result is similar to the one below, in the sense that changes in taxation are magnified by housing asset price fluctuations.⁸

Feldstein (1977) showed that, by taxing land in a life cycle model, the current generation suffers a capital loss, and future generations gain from cheaper land prices and increased capital accumulation. Chamley and Wright (1987) generalized the Feldstein model and emphasized the parallel in life cycle models between government debt and land taxation. In the case of tax-subsidized housing, the current owner enjoys the full capitalized value of the unexpected subsidy, but future generations must pay for the subsidies through higher housing prices. A tax on non-residential saving that causes housing prices to rise implicitly gives a 'bond' to current homeowners with a corresponding 'interest payment', the higher housing price, paid by future homeowners.

How does this lump-sum intergenerational transfer affect the evaluation of dynamic efficiency cost? As Atkinson and Stern (1974) noted, lump-sum transfers can have efficiency effects in the presence of existing tax distortions. For example, let us suppose an individual is subject to a one-dollar lump-sum tax in the presence of a distorting wage tax. The marginal cost of funds (MCF) for this one-dollar tax is actually *less* than one dollar; the government need only impose, say, an 85-cent lump-sum tax to raise \$1.00; the remainder will be collected from the payroll tax through increased work hours assuming that leisure is normal (see Fullerton, 1991; Ballard and Fullerton, 1992).⁹

In the case of housing, the existing tax distortion *worsens* the social cost of transferring one dollar from future generations. The intergenerational

⁷ For examples of models that focus on the joint consumption–investment housing decision, see Berkovec and Fullerton (1992), Henderson and Ioannides (1983), and Hendershott and Won (1992).

⁸ The model presented below also builds on the original insights by Harberger (1962) and Mieszkowski (1972) of the importance of the *untaxed* sector in determining the overall efficiency cost of taxation.

⁹ In a recent paper, Hoff (1994) has argued more generally that redistributions of wealth can have important efficiency consequences along a number of dimensions.

transfer awards an essentially tax-free benefit to the current generation at the expense of future generations. These future generations shift the composition of saving from taxable to non-taxable housing assets. Thus, a tax policy that raises housing and land prices can substantially reduce the future tax base, through income and asset-shifting effects.¹⁰

In the model below, revenue is generally returned lump-sum to the generation that paid it. Hence, fiscal policy does not explicitly redistribute across generations with the use of the tax system. The excess burden measure below will reflect both the traditional welfare cost caused by distortions of relative prices, and the welfare effects of changes in housing and land prices, benefiting some groups at the expense of others. The government makes no attempt to 'undo' these intergenerational transfers. The excess burden, or social cost, of the tax is the present-value of the money-equivalent utility changes across all generations—an intertemporal version of the aggregate 'money-metric' measure of deadweight loss in King (1983).¹¹

An analytical solution for consumption, saving and housing prices is provided below for a log-utility function. While the log-utility function may be somewhat restrictive, it allows for a closed-form solution to the dynamic system. The equilibrium solutions may be solved analytically for a partial equilibrium (fixed interest rate and wage) model, but must be simulated for a general equilibrium model. Both solutions are provided in calculations presented in the next section.

Let us assume that utility can be expressed as

$$U_t = \ln(C_{it}) + \frac{\ln(C_{2t+1})}{1 + \delta} + \frac{\alpha \ln(h_{t+1})}{1 + \delta}, \quad (1)$$

where C_{it} is consumption at age i in period t , δ is the time preference rate, and α is a parameter that indicates tastes for housing. Housing service units, h_{t+1} , are assumed in fixed supply for this section, allowing the time subscript to be dropped.

¹⁰ A similar result was derived by Engel and Kletzer (1990) in a model of tariff policy and fixed land.

¹¹ In King (1983), individual-specific welfare cost measures are summed across individuals at a point in time. By contrast, the intertemporal measure above sums across generations, discounted using the net rate of return (see Judd, 1987, p. 688). Another approach is to compensate explicitly each generation through lump-sum transfers, and then assess how much money is collected (or paid out) by the government after such transfers. One can then spread the surplus or deficit across a predetermined group of generations (see, for example, Gravelle and Kotlikoff, 1989). The problem with this second approach is that it must, by necessity, 'undo' all the intergenerational transfers which, I argue below, have real effects that are detrimental to tax revenue.

Per capita earnings in year t , Y_t , are assumed not subject to choice. It is easiest to see how housing enters the budget constraint, by expressing second-period consumption as

$$C_{2t+1} = (Y_t - C_{1t} - V_t h)(1 + r_{t+1}) - \varepsilon h + (V_{t+1} + G_{t+1})h + R_{t+1}, \quad (2)$$

where R_{t+1} is the lump-sum tax rebate, ε is the implicit (specific) tax or subsidy per unit of housing and r_{t+1} is the net return, equal to $r_{t+1}^*(1 - \tau)$, where r_{t+1}^* is the gross return and τ the tax rate. The purchase price of housing is V_t , while the sale price is $V_{t+1}^* = V_{t+1} + G_{t+1}$, where V_{t+1} is the anticipated housing price at time t and G_{t+1} is the unexpected capital gain or loss. In general, G_{t+1} is zero except just following a tax change. The timing of the model is that individuals work while young, and consume only the composite consumption good C_{1t} . At the end of period t , they divide the proceeds of their saving $Y_t - C_{1t}$ between traditional non-housing capital $Y_t - C_{1t} - V_t h$ and housing $V_t h$, with housing sold at the end of period $t + 1$ for $(V_{t+1} + G_{t+1})h$.

Eq. (2) can be rearranged to express the present value of consumption and housing services as equal to earnings plus rebates:

$$C_{1t} + \frac{C_{2t+1} + \rho_{t+1}^e h}{1 + r_{t+1}} = Y_t + \frac{R_{t+1} + G_{t+1}}{1 + r_{t+1}}, \quad (3)$$

where the ex ante implicit price of housing, ρ_{t+1}^e is defined by

$$\rho_{t+1}^e \equiv V_t(1 + r_{t+1}) + \varepsilon - V_{t+1}. \quad (4)$$

By contrast, the ex post implicit price of housing, $\rho_{t+1} = \rho_{t+1}^e - G_{t+1}$. In this model, the unanticipated gains or losses in housing wealth, G_{t+1} , are realized only by the transition generation in their second period following a tax law change, at which point there are no more surprises on the new steady-state path. I assume that these one-time windfalls or losses are not included in taxable income.

Eq. (4) can be rearranged to invoke the arbitrage assumption,

$$\rho_{t+1}^e + (V_{t+1} - V_t) = V_t r_{t+1}^*(1 + \theta - \tau), \quad (4')$$

where $\theta \equiv \varepsilon(r_{t+1}^* V_t)^{-1}$ is the tax or subsidy on housing services per dollar of the gross return on non-residential saving; when $\theta = \tau$ the two assets are taxed equally. In this equation, the gross expected return from investing V_t in housing services (the LHS) is equal to the return from non-housing capital (the RHS), adjusted by the relative tax differential between the two sectors, $\theta - \tau$. Revenue is defined to be

$$R_{t+1} = \tau(Y_t - C_{1t})r_{t+1}^* + (\theta - \tau)r_{t+1}^* V_t h. \quad (5)$$

Holding aggregate saving constant, it is clear that the partial impact of an increase in V_t , for whatever reason, reduces revenue when $\theta - \tau < 0$. For example, let us suppose that aggregate saving $Y_t - C_{1t}$ is unaffected by the net after-tax rate of return. Then any housing price appreciation crowds out long-term taxable capital and, hence, revenue in the long run.

From the first-order conditions, we have

$$C_{1t} = \frac{Y_t + R_{t+1}[1 + r_{t+1}]^{-1}}{D}, \quad (6)$$

where $D = [1 + (1 + \alpha)(1 + \delta)^{-1}]$. Substituting (6) into (5) and solving for government revenue yields

$$R_{t+1} = \frac{\tau Y_t [D - 1] r_{t+1}^* + V_t [\theta - \tau] r_{t+1}^* D h}{D + \tau r_{t+1}^* (1 + r_{t+1})^{-1}}, \quad (7)$$

while substituting (7) into (6) provides an expression for C_{1t} :

$$C_{1t} = \frac{Y_t [1 + r_{t+1}^*] + V_t [\theta - \tau] r_{t+1}^* h}{D [1 + r_{t+1}] + \tau r_{t+1}^*}. \quad (8)$$

The aggregate capital stock per old person is $K_t = Y_t - C_{1t}$, and steady-state saving (also per old person) is $n(Y_t - C_{1t})$, where n is the growth rate of the population. The total capital stock K_t is divided between housing and non-housing capital.

The aggregate supply of housing and land is assumed to be exogenously determined. This assumption is maintained for two reasons. First, it allows an analytic solution of the two-period model. Secondly, assuming a fixed supply of housing rules out the traditional static distortion caused by the overconsumption of housing services. Hence, any impact of housing on the excess burden of the capital income tax occurs only through dynamic effects.

The shadow price of housing services, ρ_{t+1}^e , is the price that makes demand for housing equal to the fixed supply, $h\rho_{t+1}^e = \alpha[(1 + r_{t+1})/(1 + \delta)]C_{1t}$:

$$\rho_{t+1}^e = \alpha \left[\frac{1 + r_{t+1}}{1 + \delta} \right] \frac{Y_t + R_{t+1}[1 + r_{t+1}]^{-1}}{D h}. \quad (9)$$

Substituting (9) into the arbitrage condition (4'), and rearranging, yields

$$V_{t+1} = V_t \left[1 + r_{t+1}^* \left([1 + \theta - \tau] - \frac{\alpha}{1 + \delta} [\theta - \tau] \Delta_{t+1}^{-1} \right) \right] - \frac{\alpha [1 + r_{t+1}] Y_t}{[(1 + \delta) \Delta_{t+1}] h}, \quad (10)$$

where $\Delta_{t+1} = D + (1 + r_{t+1})^{-1}r_{t+1}^*\tau$. When the coefficient on V_t in Eq. (10) exceeds one, the stable solution to the linear difference equation is

$$V_t = \left[\frac{\alpha[1 + r_{t+1}^*]Y_t}{(1 + \delta)\Delta_{t+1}h} \right] \sum_{j=1}^{\infty} \left\{ 1 + r_{t+j}^* \left[(1 + \theta - \tau) - \frac{\alpha(\theta - \tau)}{(1 + \delta)\Delta_{t+j}} \right] \right\}^{-j}. \quad (11)$$

The stable steady-state solution is given by

$$V = \frac{\alpha Y(1 + r)}{hr^*[\Delta(1 + \theta - \tau)(1 + \delta) - \alpha(\theta - \tau)]}. \quad (12)$$

The model can be solved analytically in partial equilibrium, where r^* and Y are assumed constant over time. Alternatively, a general equilibrium model can be specified in which the production function for non-housing output is written $Q = \bar{L}^{1-b}K_n^b$, where \bar{L} is exogenously determined labor supply and K_n is non-housing capital. It should be noted that Q measures total output net of the implicit return on housing.

The impact on saving of a tax change can be characterized by noting that $dS/d\tau = -dC_1/d\tau$ holding r^* and Y constant. From Eq. (8), the partial equilibrium change in long-term saving is

$$\frac{dS}{d\tau} = \frac{-r^*(1 + r^*)}{\Omega(1 + r)} \left[(Y - C_1 - V_1h) + (\theta - \tau) \frac{hdV}{d\tau} \right] \quad (13)$$

and $\Omega = D(1 + r) + r^*\tau$. The first term in the square brackets in Eq. (13) captures the traditional (negative) effect on saving of a compensated tax change. The second term shows that, when housing is tax-preferred (so that $\theta < \tau$), $\partial S/\partial V > 0$; individuals must forego consumption while young (and consumption while old) to afford the more expensive housing. Hence, one cannot sign $dS/d\tau$, despite the fact that all taxes are returned in a lump-sum fashion; saving may either rise or fall in response to the increase in the compensated capital income tax.¹²

The theoretical structure above posits that the government can rebate taxes in a manner that is neutral across generations. Perhaps a more realistic budget constraint facing governments is that they are restricted to a *balanced budget* change in tax policy during a particular period. For example, let us suppose that an increase in θ_t allows the government to increase after-tax (inelastic) earnings Y_t . The government's budget is balanced in year t . However, the higher tax on the older generation who

¹² Feldstein (1978) argued that the interest elasticity of saving is indeterminate for a different reason. He showed that a compensated increase in capital income taxation may increase or decrease *private* saving. However, even in Feldstein's model, aggregate capital accumulation K must fall in response to an increase in capital income taxation (Sandmo, 1981).

owns the housing stock benefit the younger generation earning Y_t in that same year.¹³ Below, illustrative numerical calculations of the efficiency gains from a uniform tax treatment of housing are presented, both for the generation-neutral approach, and also for this balanced budget approach.

4. Calculations of excess burden in a two-period model

There are two ways to measure the welfare cost of tax preferences towards owner-occupied housing. The first is the standard Harberger calculation that measures the dollar-equivalent overall welfare cost from departing from a specified norm, in this case the equivalent tax treatment of housing and non-housing capital income. This measure provides a standard of comparison against previous studies of housing distortions, but provides little information about the social cost of raising revenue at the margin. The second is to calculate the marginal excess burden (MEB) to society per dollar of revenue raised from the capital income tax. Both average and marginal measures of welfare cost are evaluated below.

To convert annual parameters into a two-period model, assume that each 'period' lasts for 20 years. The initial spot price of housing, p_t , is normalized to 1.0, and per capita earnings are assumed to be \$30,000 per year. The net real return, and the time preference rate, are both fixed initially at an annual rate of 3%, accumulated over 20 years. The preference parameter for housing, α , is assumed to be 0.29 (the share of housing expenditures in total consumption; *Statistical Abstract*, 1987, p. 430), while the capital share in the (non-housing) production function, b , is set to 0.25.

Effective tax rates were calculated by Fullerton (1987) to reflect the lower statutory rates following the 1986 Tax Reform Act. The average effective tax rate in the corporate plus non-corporate sectors (excluding housing) is 36%, while the effective tax rate in the owner-occupied housing sector is 19%. These tax estimates include property taxation, which in a Tiebout (1956) model is simply a user cost for services rather than a distortion. An alternative approach is to exclude property taxes altogether on the grounds that they are 'user fees' for the services provided by local or state governments. Under this latter assumption, Fullerton (1987) calculated the average effective rate to be 25% in the corporate and non-corporate sectors, but – 5% in housing. In the benchmark calculations reported below, I

¹³ In other words, lifetime resources for a young person in period t become simply $Y_t + R_t$, where R_t is revenue paid by the older generation in period t .

compromise with an annual non-housing capital income tax rate of 25% and, for simplicity, a zero tax on housing.¹⁴ (Sensitivity analysis is reported below.) Finally, the gross annual rate of return in the non-housing sector, 4%, is implied by the assumed 3% net return and the tax rate of 25%.

Table 2 reports the social cost of taxation as well as the percentage change in housing prices for baseline and alternative parameter values. Welfare cost estimates are calculated by first iteratively determining the dollar-equivalent change in utility using Eqs. (1) and (6) evaluated at initial prices for *each* generation. The overall welfare cost (or social cost) of the combined tax system is defined to be the present value of the ‘money-metric’ change in

Table 2
The welfare cost of preferential tax treatment of housing

Parameters	Change in housing price (%)		Welfare cost	
	PE	GE	PE	GE
A: Baseline	–24.89	–11.39	1.80	3.36
B: $r_a = 0.045$	–27.58	–17.90	3.28	1.03
C: $r_a = 0.02$	–23.08	–3.03	1.15	5.82
D: $\delta_a = -0.01$	–24.94	–11.60	2.88	2.24
E: $\alpha = 0.15$	–27.98	–20.73	1.16	1.54
F: Include property taxes ^a	–15.91	–8.72	1.72	1.90
G: Exclude property taxes ^b	–30.52	–12.92	2.25	4.60
H: <i>Balanced budget</i> tax change (same parameters as Case A)	–24.03	–9.49	4.45	5.52

Notes: The subscript ‘a’ denotes annual values; in actual calculations all variables are converted to 20-year equivalents. The variable PE denotes partial equilibrium, GE general equilibrium.

^a Annual nonhousing tax rate is 36%, annual housing tax rate is 19%. Annual gross return is 4.6%.

^b Annual nonhousing tax rate is 25%, annual housing tax rate is –5%.

¹⁴ The annual tax rates are converted into 20-year rates according to

$$\tau = -\{[1 + r_a^*(1 - \tau_a)]^{20} - 1\} / [(1 + r_a^*)^{20} - 1]$$

where the subscript ‘a’ denotes annual rates. When $\tau_a = 0.25$ and $r_a^* = 0.04$, $\tau = 0.323$.

utility of each generation, discounted using the initial net rate of return. In the counterfactual case in which housing and non-housing capital are subject to a uniform tax, the new tax rate is revenue neutral in present-value terms, again discounting using the initial net rate of return (Judd, 1987).

The benchmark calculations (Case A) are shown in the first row of Table 2. In response to an equalization of housing and non-housing capital income taxes, housing prices drop in partial equilibrium by 25 percentage points, but by only 11 percentage points in general equilibrium. Housing prices fall because housing is no longer tax-preferred. The price decline is cushioned in general equilibrium both because the extra saving engendered by the tax change lowers the gross return and because the rise in labor income stimulates demand for housing.

The welfare effects are substantial. The partial equilibrium impact of removing the preferential tax treatment of housing is to increase the present value of welfare by 1.8% of labor income. The general equilibrium welfare cost is estimated to be 3.36% of labor income, or \$120 billion annually. Equivalently (assuming labor income is two-thirds of GNP), the excess burden is 2.2% of GNP, or more than five times the magnitude of previous welfare cost estimates.

These results are sensitive to the assumed parameter values. In Case B, the net return is assumed to be 4.5%, increasing the gross return to 6%. Under this assumption, the partial equilibrium efficiency cost is 3.28% of labor income, but the general equilibrium effect falls to only 1.03%. By contrast, Case C with a lower net return of 2% annually implies a general equilibrium excess burden of nearly 6% of labor income.¹⁵

Case D lowers the time-preference rate to -1% , generating a larger stock of capital. With the greater importance of saving, the general equilibrium welfare cost is 2.24%. Alternatively, reducing the housing share α to only 0.15, as in Case E, reduces the importance of housing in the consumption bundle, but still yields a welfare cost of 1.54 percentage points.

Cases F and G consider the two polar cases for property taxes—either property taxes are included or excluded entirely from the tax wedge. Including the property tax implies an excess burden measure of 1.90% of labor income (Case F), while excluding property taxes increases the estimated welfare cost of tax preferred housing rises to 4.60 (Case G). Finally, Case H considers welfare cost estimates under the *balanced budget* scenario in which the government balances its budget in a given period by

¹⁵ Despite the range in present-value excess burden estimates, the undiscounted steady-state gains range are reasonably close; 1.96% for case (A), 1.77% for Case (B), and 2.41% for case (C). The present-value welfare cost estimates differ because of the change in the discounting factor. A higher net interest rate, for example, discounts future generations' gains more heavily against the current generation's loss.

appropriate adjustment of after-tax earnings by the young, Y_t . In this latter case, efficiency gains from taxing housing in both partial and general equilibrium, 4.45% and 5.52% of labor income, are larger than the benchmark case (Case A).¹⁶

A different way to view the welfare cost of taxation is a marginal approach—what is the efficiency cost of raising an extra dollar of revenue from capital income taxation? To address this question, the present value of the change in utility (measured as above) is calculated for a small change in the tax rate, starting from an initial marginal tax rate of 25%. This utility gain or loss is then divided by the (minus) change in the present value of revenue to determine the marginal efficiency cost. It should be noted that the marginal dollar is returned in a lump-sum fashion but that different generations may be better or worse off, depending on how housing prices change.

To provide a basis for comparison, Table 3 first calculates numerical derivatives for the traditional model that ignores housing capital ($\alpha \approx 0$). The first and second rows describe the long-term revenue elasticity and the marginal excess burden. At the margin, revenue is relatively responsive to changes in tax rates, with an elasticity measure of 0.85 in the partial

Table 3
The marginal excess burden of capital income taxation

Parameters	Non-housing sector $\theta = 0$ $\alpha = 0.0001$		Tax-preferred housing sector $\theta = 0$ $\alpha = 0.29$		Equally taxed housing sector $\theta = \tau$ $\alpha = 0.29$	
	PE	GE	PE	GE	PE	GE
The long run revenue elasticity ($\tau dR/R d\tau$)	0.85	0.95	0.53	0.89	0.87	0.93
The marginal excess burden of taxation (PV)	0.08	0.07	0.35	0.47	0.05	0.07

Notes: All calculations assume that the annual gross return is 0.04, the annual tax rate $\tau_a = 0.25$, the annual time preference rate $\delta_a = 0.03$, and the share of capital $b = 0.25$. The initial (accumulated) tax rate τ is 0.323.

¹⁶ The reason why the balanced budget case yields higher welfare costs is because the housing price losses suffered by the transition generation are partially offset by their receiving more in tax rebates from the previous steady-state generation than they paid in taxes during their lifetime. (Cohort-specific tax revenue is lower in the transition and higher in the steady state; in present-value terms the tax change is still revenue neutral.)

equilibrium case. The present-value calculation of the marginal excess burden is between 7 and 8 cents per dollar of revenue collected. This measure is low relative to other studies (see, for example, Ballard et al., 1985), largely because of the lump-sum nature of the tax on existing capital.

In a model with preferential tax treatment of housing ($\alpha = 0.29$), the long-run revenue elasticity declines to only 0.53 in partial equilibrium (Panel 2). This dramatic erosion of revenue is not replicated in general equilibrium, for two reasons. First, the decline in housing values in general equilibrium is only half of the decline in partial equilibrium (see Table 2), so crowding out of revenue eases. Furthermore, the higher gross rate of return increases the ad valorem level of taxation. None the less, measures of marginal excess burden in this second case are large in either partial or general equilibrium. The marginal efficiency cost of raising taxes on non-housing capital is 35 cents per dollar of revenue in the first case, and 47 cents in the second. Compared with the model without housing, these measures suggest that the marginal excess burden is 30–40 cents per dollar higher than conventional measures suggest.

Finally, marginal efficiency cost is considered in the final panel of Table 3, where it is assumed that income from housing as well as non-housing capital is fully taxed at 25%. Despite the much larger share of revenue collected than in the previous case, the marginal excess burden is minimal, with values less than 10 cents per dollar of revenue raised. On the basis of both average and marginal welfare cost measures, excluding housing from the tax base may be more costly than previously estimated.

5. Housing demographics and the bequest motive

The model presented above restricts its attention to taxation as the cause of higher housing prices. Mankiw and Weil (1989) suggest that housing prices rose during the 1970s because the baby boom had reached the age at which housing became a larger fraction of their consumption budget. Demand increased, and given a relatively inelastic supply of housing, prices jumped (but see Hendershott, 1991; Hoynes and McFadden, 1994). While Mankiw and Weil are primarily concerned with temporary shifts in housing demand, the exogenous shift in housing demand caused by population growth can be modeled in the simple two-period framework by a change in n , population growth, holding g , housing (or land) growth, constant. This means that the effective supply of housing is growing (or shrinking) annually at the rate

$g - n$. The partial equilibrium impact of a change in population growth (evaluated at $n = g$) on revenue is¹⁷

$$\frac{dR}{dn} = \left[\frac{(\theta - \tau)r^*\tau Dh}{D + (1 + r)^{-1}r^*\tau} \right] \frac{V_t(1 + a)}{a(1 + n)}, \quad (14)$$

where

$$a = r^* \left[1 + \theta - \tau - \frac{\alpha(\theta - \tau)}{(1 + \delta)\Delta} \right].$$

It is straightforward to show that $dV/dn > 0$, so that housing prices jump after the population growth rate rises; at that point the perfectly anticipated price of housing will grow at a constant rate each year. While the population growth rate is not (usually) a policy parameter, one can also show that the policy of favoring housing over other assets ($\theta < \tau$) has a strong impact on revenue. In the transition year, the partial equilibrium $dR/dn = -4.91$ when housing is untaxed, while $dR/dn = 0$ when housing is taxed. To the extent that demographic shifts increase housing prices, subsidizing housing ownership leads to substantial losses in revenue to the government.

Finally, the existence or non-existence of a bequest function is crucial to the life cycle analysis of tax policy in the presence of a fixed factor such as land or housing (Calvo et al., 1979). If homeowners care about their children, then they will save the proceeds from their housing gains, and pass them along to the children struggling with higher housing prices. In this case, the bequest motive would effectively ‘undo’ the intergenerational transfer.

There is mixed evidence on the marginal propensity to consume out of housing wealth.¹⁸ Some evidence that homeowners’ wealth gains are not reaching their children is from survey data on first-time home buyers (Chicago Title and Trust, 1991). Despite an increase in the real median purchase price of housing of 22% between 1976 and 1990, the share of the down-payment provided by relatives actually declined from 10.8% to 10.2%. While a strong bequest function in housing would certainly reduce the magnitude of the welfare cost estimates, there is currently little conclusive evidence in its favor.

¹⁷ Derivations are available from the author.

¹⁸ See Hendershott and Peek (1987), Bhatia (1987), Manchester and Poterba (1989), Muellbauer and Murphy (1989), Skinner (1989, 1993), Miles (1992, 1994), and Hoynes and McFadden (1994); for a review of the literature, see also Skinner (1994).

6. Conclusions

This paper suggests that the welfare cost of preferential tax treatment of housing is nearly five times that measured by earlier studies. This estimate is derived even when housing and land are assumed to be in perfectly fixed supply. The welfare cost occurs because changes in tax policy towards non-housing capital affect the price of housing. A higher capital income taxation confers a lump-sum gain to current generations at the expense of future generations. As Atkinson and Stern (1974) and Ballard and Fullerton (1992) have demonstrated in a different context, a lump-sum transfer in the presence of an existing distortion can generate welfare costs by attenuating tax revenue.

There are two implications of this asset-pricing model. The first is that the housing subsidy is far more inefficient than previously thought. Secondly, the marginal efficiency cost of increasing the capital income tax—in the presence of a housing sector—is substantially larger than when there is no untaxed housing sector.

How relevant is this asset-pricing model of housing to the post-war empirical record? Certainly, the long-term prediction of the model—that an increase in the effective tax on non-housing capital should stimulate land prices at the expense of non-housing capital (with little effect on overall capital accumulation)—appears consistent with the empirical record in the United States during the 1970s. However, not all empirical evidence fits the pattern implied by the model. In Japan, land is a large fraction of national wealth, and land prices appreciated rapidly during the mid-1980s. According to the housing model, saving in Japan should have been very low during this period. Furthermore, the asset model has not been particularly successful in predicting stock market shifts in response to tax changes (Cutler, 1988; Downs and Tehranian, 1988).

Traditional models of taxation and saving have stressed the effect of taxation on the overall level of aggregate saving. However, support for the view that the after-tax return affects saving is sparse.¹⁹ This paper suggests that taxation in the United States may affect capital accumulation through a more subtle route. By stimulating the price of tax-preferred owner-occupied housing, the capital income tax causes the now more valuable housing stock to soak up a larger fraction of total saving, leaving less for investment in (non-housing) physical capital. In sum, capital income taxation may have a larger impact on national output through its effect on the *composition* rather than on the overall level of saving and wealth accumulation.

¹⁹ Except for Boskin (1978), most empirical estimates of the saving elasticity with respect to the after-tax return have been zero or negative (e.g. Hall, 1988; Skinner and Feenberg, 1990).

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