Copenhagen Business School
HANDELSHØJSKOLEN

Department of Economics

Copenhagen Business School

Working paper 16-2004

CAPITAL GAINS TAXATION AND HOUSE PRICE FLUCTUATIONS

Clemens Fuest Bernd Huber Søren Bo Nielsen

Department of Economics - Solbjerg Plads 3, C5 - DK-2000 Frederiksberg

Capital gains taxation and house price fluctuations *

Clemens Fuest, University of Cologne

Bernd Huber, University of Munich

Søren Bo Nielsen, Copenhagen Business School

This version: November 2004

Abstract

Recent years have seen large swings in house prices in many countries. Motivated by housing price variations, proposals for taxing capital gains on housing have repeatedly been put forth. The idea seems to be that such taxes would curb the redistribution occurring between those owning houses and those trying to get into the market for owner-occupied housing. Our paper shows that at least in simple settings, a tax on real capital gains on housing will only lead to even bigger price swings and will not be able to redistribute between people appearing on either side of the housing market.

Keywords: capital gains tax, housing market, price fluctuations
JEL-Classification: H23, H24, R 31.

Addresses:

`Fuest`: University of Cologne, Department of Economics, Albertus Magnus Platz, D-50933 Koeln, Germany, Phone: ++49-221-4702302, Fax: ++49–221-4705060, mail: clemens.fuest@uni-koeln.de

`Huber`: University of Munich, Department of Economics, Ludwigstr. 28, 80539 Munich, Germany, Phone: ++49-89-21802874, Fax: ++49-89-21803128, e-mail: huber.office@lrz.uni-muenchen.de

`Nielsen`: Copenhagen Business School, Solbjerg Plads 3, DK-2000 Frederiksberg, Denmark, Phone: +45-3815-2596, Fax: +45-3815-2576, Email: sbn.eco@cbs.dk

*We would like to thank Alan Auerbach and participants of the 3rd German-Norwegian Seminar in Public Economics, the Norwegian Tax Forum and the IIPF Congress in Milan for stimulating comments on an earlier version of the paper. The usual disclaimer applies.

1 Introduction

House prices are known for displaying large swings in all industrialized countries. In recent years, where these countries have experienced moderate to high rates of growth, house prices have risen substantially.[1] Of course, such price hikes have led to large capital gains for existing house-owners while at the same time making it more difficult for potential new owners to enter the market.

Worried by this state of affairs, politicians and laymen in many countries have repeatedly called for the introduction of a tax on such capital gains from housing. Table 1 gives an overview of the current tax treatment of capital gains from investment in housing in the EU. Although there is taxation of capital gains from housing in most countries, there are many exemptions, in particular for owner-occupied housing; as a result, one can expect capital gains on owner occupied housing to go untaxed in most cases.

- Table 1 here -

Sometimes it has been unclear whether the proposals for taxation of capital gains meant taxation of nominal or real (i.e. corrected for inflation in the general price level) capital gains. In any case, many economists have been among the proponents of capital gains taxation on housing. All the same, other economists have regarded such taxation a bad idea. Arguments for or against have not always been clear, but proponents tend to argue that by taxing capital gains it becomes possible to redistribute from those experiencing the gains to those that have to enter the owner-occupied housing market at high price levels. Furthermore, some have even claimed that capital gains taxation might reduce the swings in prices in the housing market.

An example can be found in the 1999 OECD Economic Survey of Denmark, OECD (1999). OECD notes (on p. 96) that while the Danish tax system embodies a parallel

[1] For example, the house price index has in the period 1993-99 increased in real terms by about 50 per cent in Denmark and more than 20 per cent in the UK. As an exception, real house prices have in the same period fallen by around 15 per cent in Japan. See OECD (2000).

treatment of the two different components of capital income - interest, rents and dividends on one hand and (realized) capital gains on the other - this principle is in practice not applied to residential property, with capital gains and losses upon the sale of a house being tax-exempt. And later (on pp. 131-32) it says: "From the perspective of the cyclical evolution of the economy, the absence of a capital gains tax appears to have induced an important element of cyclicality into the market. ... Indeed, if housing investment were to be taxed on a par with financial investment, on a nominal and accrued basis, capital gains and losses would automatically be subject to taxation, potentially reducing price fluctuations in the housing market."

Those against a tax on capital gains on housing stock point out that at least when the tax falls on real capital gains it is not likely to bring much revenue in the medium to long run (as real price increases will be followed by real price drops, and vice versa). Further, it would be cumbersome to measure such capital gains, and as they would likely only be levied upon realization, the effective tax on capital gains would depend on the tenure period. Finally, and related to this, a capital gains tax would cause the usual lock-in effects normally associated with capital gains taxation.

Surprisingly, there is very little literature on the economic effects of capital gains taxation on housing. Some studies focus on the way capital gains taxes affect the risk associated with private homeownership. Rosen, Rosen and Holtz-Eakin (1984) analyze the impact of capital gains taxation on demand for owner occupied housing in a model with uncertainty about the user cost of housing. They argue that capital gains taxes may increase the attractiveness of owner occupied housing because the variance of the user cost declines. Of course, this comes at the cost of more risky tax revenue. Overall risk exposure can only be reduced if the government is able to diversify away part of the risk. Sheffrin and Turner (2001) focus on the ability of the government to diversify risk and point out that house price movements are typically not synchronized across regions. Therefore a capital gains tax with full loss offset may be used as a risk sharing device. In both papers, house price movements are taken as given[2] whereas the present paper takes into account that capital gains taxes will typically affect house prices.

Hoyt and Rosenthal (1992) consider the changes in capital gains tax rates in the US due to the Tax Reform Act of 1986 in a setting with a nonlinear (kinked) budget constraint. The kink was caused by the fact that sellers in the housing market could avoid paying tax on the capital gain from the sale of their home, if they purchased a more expensive home when moving. Taking the kink into account Hoyt and Rosenthal establish that a reduction in the capital gains tax would reduce housing demand (and, presumably, the general level of house prices). Lundberg and Skedinger (1998) show, using a panel of Swedish home owners in 1984-90, that lock-in effects due to realization-based capital gains taxation only appear for households with income reductions. Further, the lock-in effects depend on the degree of mismatch in the current residence and whether households buy up or buy down in the market. Englund (1985) studies how accrual- vs. realization-based taxes on capital gains on owner-occupied homes affect the length of holding periods for homes. He allows for transactions costs and assumes a given development of house prices.

Of course, housing markets and house prices are shaped by other taxes than those on capital gains. Lundborg and Skedinger (1999) investigate the implications of transactions taxes. Seller taxes are found to raise house prices, while buyer taxes lower them, on account of the interaction of the taxes with lock-in effects. The failure in virtually all industrialized countries to tax imputed rent on housing at rates similar to capital income tax rates has triggered a number of theoretical and empirical contributions. Pines, Sadka and Sheshinski (1985) discuss at length the normative and positive aspects of taxation of imputed rent on owner-occupied housing. Berkovec and Fullerton (1992) consider a general equilibrium model of portfolio choice where owner occupied housing is one asset among others. They consider the efficiency gains which would result from the removal of tax advantages for owner occupied housing and find that there would be a gain of 382 US-Dollars for the average household. This gain results from the reallocation of

[2] Sheffrin and Turner (2001) assume that housing services are perfectly elastic in supply.

capital to sectors with higher before tax rates of return and from the diversification of risk provided by the tax system. Skinner (1996) computes sizeable dynamic efficiency costs of conceding preferential tax treatment to housing as compared to physical capital investment. Finally, Weiss (1978) examines the implications of various taxes, including differential capital gains taxation of owner-occupiers and landlords, on the choice between renting or owning.

At least since the important article by Poterba (1984) house prices have been perceived as asset prices. It is therefore natural to inquire whether there exist studies on the implications for share price variation of taxation of capital gains associated with ownership of shares. Specifically, do such studies find that an increase in capital gains taxation leads to greater stock price volatility? In his famous article on capital gains taxation Stiglitz (1983) shows that an increase in the capital gains tax rate will increase the volatility of the stock market. He derives this result from a model with two groups of investors and two states of nature. In one state, the price of the asset is high and in the other state, the price of the asset is low. If the state of nature changes, the asset is sold by one group of investors to the other. How does a capital gains tax affect price volatility in this framework? If the price of the asset is high, a capital gains tax with full loss offset reduces the capital loss of the investors who have bought at the high price if they sell the asset later at the low price. Accordingly, the investors who buy the asset if the price is low will sell the asset at some later date and earn a capital gain. Their valuation of the asset declines if capital gains taxes are introduced. As a result, capital gains taxes increase the price of an asset when the price is high and reduce it in states where the price is already low, i.e. prices become more volatile. The proposition that capital gains taxes increase price volatility in stock markets has been tested by, inter alia, Noronha and Ferris (1992) who find evidence of an increase in stock market volatility following an increase in the capital gains tax rate. (They seem to attribute their finding to the lock-in effect associated with realization, though.) Viard (2000) demonstrates that the level of asset prices is increased following the introduction of realization-based capital gains taxation. This is to compensate for the lock-in effect and its tendency to dampen the supply of assets.

The objective of this paper is to sort out some of the issues related to taxing capital gains on housing. In particular, we focus on the price and distributional effects of capital gains taxation. We wish to demonstrate that it is easy to imagine circumstances in which such a tax leads to no redistribution whatsoever and only causes bigger, not smaller, amplitudes in house price swings. Given that a real capital gains tax is likely to bring forth close to zero revenue, and that the construction sector likely would become even more volatile when faced with bigger price swings, it seems difficult to recommend such a capital gains tax.

We set up a simple overlapping generations model in section 2 and in the subsequent section 3 consider a clear-cut example with deterministic swings in income which drives home our main points. The revenue from a capital gains tax can be transferred back to the private sector in different ways, but this leads to only minor changes in our basic result. In section 4 we briefly allow for limited loss offset; more states; a stochastic income process; and income growth. Again we show that our basic point remains. Finally, section 5 offers some concluding remarks.

2 A simple model

In order to capture the fact that there is a definite generational as well as a time dimension to the debate over capital gains taxation on housing we have decided to apply an overlapping generations model. The model is deliberately kept as simple as possible; still, it should contain some of the essentials of any analysis of the effects of taxing real capital gains on housing.

Consider a small, open economy which is populated by overlapping generations of constant size N. Each generation lives for two periods; in the first period a (young) individual earns an income from production of some non-durable consumer good, while in the second period the (old) individual has retired and hence earns no labor income.

Imagine that young individuals live out in the open, while when old they occupy perfectly divisible houses, of which there altogether are N housing units. The number of housing units is constant through time.

At the end of their second period, the houses are sold by the old to the young, so that the latter can live in them in the subsequent period. The income earned by individuals in their first period is used for consumption in the same period, purchase of housing units, plus (net) financial saving. Individual have full access to an international financial market, where they can lend or borrow at the international interest rate. In the second period, individuals sell their houses, and together with the gross income from saving they finance their second-period consumption.

Suppressing notation for time and generation, an individual earning an income of y must thus decide how much to consume in the first period, c_1, how much to save, s, for the next period, and how many housing units, h, to purchase at the going house price p_1 (the subscript referring to the individual's first period). Non-durable consumption units, performing the role of numeraire, bear the price of one, so that p_1 denotes the relative, or real, price of housing units. Hence, the first-period budget constraint becomes

$$y - c_1 - p_1 h = s$$

In the second period, the individual sells his housing units for the going price of p_2 ('2' referring to his second period). The budget constraint for this period is therefore

$$c_2 = (1 + r)s + p_2 h$$

where r stands for the international rate of interest.

Substituting for saving, we can write the individual's intertemporal budget constraint as

$$c_2 = (1 + r)[y - c_1 - p_1 h] + p_2 h \tag{1}$$

Endowed with a utility function $u(c_1, c_2, h)$[3] and furnished with information about the

[3] In effect, we assume that one unit of housing stock produces one unit of housing services.

income process and the housing price process, the individual will select consumption in the two periods as well as the number of housing units so as to maximize utility.

For the case where the price of housing in the second period is *certain*, utility maximization implies

$$\frac{u_3}{u_1} = p_1[\frac{r}{1+r} - \frac{\Delta p}{p_1(1+r)}] \tag{2}$$

where $\Delta p \equiv p_2 - p_1$ denotes the increase in the real price of housing from the first to the second period. This first order condition equates the marginal rate of substitution between housing and first period consumption to the nominal user cost of housing.[4]

Now introduce taxation of capital gains at the rate t. This changes the second period budget constraint into

$$c_2 = (1+r)s + p_2 h - t\Delta p h$$

from which the intertemporal budget constraint becomes

$$c_2 = (1+r)[y - c_1] - h[p_1 r - \Delta p(1-t)] \tag{3}$$

We see that resources left for second period consumption diminish if the price of housing rises from the first to the second period, and the more so, the bigger is the capital gains tax rate t.

Provided the second period housing price p_2 is certain, the first order condition relating to the choice of housing relative to first period consumption can be stated as

$$\frac{u_3}{u_1} = p_1[\frac{r}{1+r} - \frac{\Delta p(1-t)}{p_1(1+r)}] \tag{4}$$

The capital gains term in the (certain) nominal user cost expression is now reduced in line with the size of the capital gains tax. This statement presumes, however, that housing prices are not altered by the capital gains tax. In fact, the aim of the following is to show that this is an untenable assumption – instead, both first and second period house prices and also the price difference between the two periods will be affected by the presence of capital gains taxation on housing. This will become clear in the following section.

[4] The presence of $1 + r$ in the denominator of the user cost expression derives from the fact that consumption of housing services takes place one period later than first period consumption.

3 Deterministic income swings

3.1 An example

In this example we presuppose that income of the young is deterministic and perpetually swings between a high level, y^u ('u' for up), and a low level, y^d ('d' for down). In other words, if a given generation experiences a high income level, it knows for sure that the subsequent generation will enjoy a low income level, just like the generation preceding it did. It is easily seen that the price of housing will fluctuate between two different values, too, since history will repeat itself every second period.[5] Denote the price of housing units in periods where the young generation experiences high (low) income by p^u (p^d).

To make for simple computations, assume that the utility function over first and second period consumption and housing services is logarithmic as in[6]

$$u(c_1, c_2, h) = log(c_1) + \beta[\alpha log(c_2) + (1-\alpha)log(h)] \tag{5}$$

in which β denotes the utility discount factor, while α stands for the budget share of non-durables consumption in total consumption in the second period.

The first order condition for the choice between c_1 and h can now be written

$$\frac{\beta(1-\alpha)c_1}{h} = p_1[\frac{r}{1+r} - \frac{\Delta p(1-t)}{p_1(1+r)}], \tag{6}$$

where if the income of the young $y_1 = y^u(y^d)$, then $p_1 = p^u(p^d)$, $p_2 = p^d(p^u)$, and $\Delta p = p^d - p^u(p^u - p^d)$. Solve this equation for housing stock demanded to get

$$h = \frac{\beta(1-\alpha)c_1}{p_1[\frac{r}{1+r} - \frac{\Delta p(1-t)}{p_1(1+r)}]}$$

The first order condition for c_1 in combination with the intertemporal budget constraint implies $c_1 = y_1/(1+\beta)$. The number of housing units per young individual is equal to one, so that all in all,

$$1 = \frac{\beta(1-\alpha)(1+r)}{[p_1 r - \Delta p(1-t)](1+\beta)} y_1$$

[5] Ruling out bubble paths in house prices.

[6] A similar formulation of preferences can be found in Skinner (1996)

Using how income and house prices gyrate between 'up' and 'down' levels, we can finally derive the following expressions for house prices in the two states,

$$p^u = \frac{k[(1+r-t)y^u + (1-t)y^d]}{(1+r-t)^2 - (1-t)^2}, \quad p^d = \frac{k[(1+r-t)y^d + (1-t)y^u]}{(1+r-t)^2 - (1-t)^2} \tag{7}$$

where the parameter k is given by $k \equiv \beta(1-\alpha)(1+r)/(1+\beta)$.

To get some feeling for these expressions, consider a set of values for the key parameters: $r = 0.5$, $\beta = 2/3$ (reflecting that a period in the model may span, say, twenty or thirty years), $y^u = 120, y^d = 90, \alpha = 2/3$. With these parameter values, $p^u = 43.2, p^d = 40.8$ in the absence of taxation, i.e. $t = 0$. With t at 50 pct., $t = 0.5$, $p^u = 44, p^d = 40$.

As expected, house prices in the 'up' periods exceed those in the 'down' periods, although not by very much – especially not when compared with the example's huge variation in incomes between the two states. The reason for the comparatively modest variation in house prices is exactly that when an individual buys a house in an 'up' period he knows for certain that he will have to sell it in a 'down' period. The expectation of a capital loss raises the user cost of the house, ceteris paribus, thus limiting the price the individual is willing to offer for the house. Conversely in 'down' periods, where, despite low income, an individual is ready to offer rather much for a house, since he expects to harvest a capital gain when selling it at next period's higher price.

We can also see directly from (7) how taxation of capital gains will influence house prices. While some observers (viz. the reference to the OECD Economic survey of Denmark in the introduction) presume that taxing capital gains will limit variation in house prices, exactly the opposite is true in the present context. House prices will be even higher in the 'up' period and lower still in the 'down' period with capital gains taxation. The reason for this is the following mechanism:

When an individual in an 'up' period decides how much he is willing to pay for a house, he knows that he will have to purchase it dearly and sell it cheaply. However, with capital gains taxation he will be offered a tax rebate corresponding to the expected capital loss, so will be able to offer more for the house. The seller, knowing that he will be taxed on the capital gain that accrues to him (since he sells dearly and has purchased cheaply in the previous period), will demand a higher price. So the two parties will agree on a higher price in the 'up' period with capital gains taxation than without. Exactly the opposite holds for the 'down' period, where the buyer knows that he will be taxed on a capital gain later and therefore demands a lower price, while the seller can agree to this, because there is a tax rebate for his capital loss with capital gains taxation.

Now, the real surprise in this simple example is that capital gains taxation will have no influence whatsoever on the (discounted) user cost of housing. Into the formula for user cost, the right hand side of (4), we insert the two expressions in (7) for house prices to derive, respectively,

$$u^u = \frac{k}{1+r} y^u, \quad u^d = \frac{k}{1+r} y^d \tag{8}$$

(where u signifies user cost). The important thing to note here is that the user cost is completely independent of the reigning capital gains tax rate and simply varies proportionately with the income level of the young. The immediate tendency of capital gains taxation to lower or raise user cost is apparently entirely offset by the impact of capital gains taxation on house prices.

Using the figures above, we can calculate that the user cost in 'up' periods amounts to 16, and in 'down' periods it is equal to 12, regardless of the capital gains tax rate. The full variation in income levels is preserved in user cost, but not in house prices.

Admittedly, the present model with deterministic income swings is very simple. We do not see any reason, though, why the mechanisms governing house prices in the model should not be present in more complicated settings. In the remainder of this section we incorporate the use of the revenue from capital gains taxation, while in the subsequent section we consider several extensions of our basic model framework. Still, in all cases we derive similar effects of capital gains taxation on house prices as above.

3.2 Using the Tax Revenue

The analysis in the preceding section abstracts from the question of how the revenue from the capital gains tax is used or how the budget constraint of the public sector is balanced if capital gains tax revenue is negative. In this section, we consider the case where the revenue is transferred back to the private sector in a lump sum manner or a deficit is covered by lump sum taxes in each period. Since there is always an old and a young generation, there are different possible lump sum transfer schemes. In the following, we consider two cases. In the first case, we assume that the transfer paid (or the tax levied) is the same for all households in a given period. In the second and probably less realistic case, we assume that the transfer is paid only to (or the tax is paid only by) the old generation which also pays the capital gains tax in this period.

3.2.1 Equal per capita transfers

Denote the tax revenue in period j by T_j and normalize the number of households in each generation to unity, $N = 1$. Then, a household who is young in period j receives a transfer $T_j/2$ when young and a transfer $T_{j+1}/2$ when old. The second period budget constraint of the household can now be written as

$$c_2 = (1+r)[y_1 - c_1 + \frac{T_1}{2}] + \frac{T_2}{2} - h[p_1 r - \Delta p(1-t)]$$

Given the utility function in (5), housing demand is given by

$$h = m\frac{(1+r)(y_1 + \frac{T_1}{2}) + \frac{T_2}{2}}{rp_1 - (p_2 - p_1)(1-t)} \tag{9}$$

where $m \equiv \frac{\beta(1-\alpha)}{1+\beta}$. Assume again that income swings between an 'up' and a 'down' level as in section 3.1. In this case, the transfer from the government a household receives in a high income period is $\frac{T^u}{2} = \frac{t}{2}(p^u - p^d)$. In a low income period, the transfer is $\frac{T^d}{2} = -\frac{t}{2}(p^u - p^d)$. Substituting these expressions into (13) allows to derive the house prices in the two states:

$$p^u = m(1+r)\frac{(1+r-\phi t)y^u + (1-\phi t)y^d}{(1+r-\phi t)^2 - (1-\phi t)^2} \tag{10}$$

and

$$p^d = m(1+r)\frac{(1+r-\phi t)y^d + (1-\phi t)y^u}{(1+r-\phi t)^2 - (1-\phi t)^2} \tag{11}$$

where $\phi \equiv 1 + \frac{mr}{2}$.

With the parameter values used in section 3.1., we now find that the introduction of a capital gains tax rate of 50% increases the price of housing in 'up' period from $p^u = 43.2$ to $p^u \approx 44.05$ and reduces the price in 'down' periods from $p^d = 40.8$ to $p^d \approx 39.95$. We thus find that the capital gains tax again increases house price fluctuations. It is interesting to compare these results to the case studied in section 3.1., where we did not take into account the public sector budget constraint. Our additional assumption that the tax revenue is redistributed in a lump sum manner further increases house price fluctuations, though only by a small amount. Why does this happen? Effectively, the distribution of the tax revenue on an equal per capita basis in each period favours the high income households at the cost of low income households. This happens for the following reason. In high income periods, capital gains tax revenue is positive because prices have increased compared to the preceding period. This implies that the transfer is also positive. In low income periods, capital gains tax revenue is negative, so that all households have to pay a tax. As a result, each household faces a tax in one period of her life and a transfer in the other period. The difference between high and low income household is that high income households receive the transfer in the first period of their life and pay the tax in the second period, so that the present value of the transfers is positive, whereas it is negative for low income households.

More formally, the second period value of lifetime government transfers for a high income household is

$$\frac{1}{2}\left(T^u(1+r) + T^d\right) = \frac{1}{2}\frac{tr^2 m(1+r)(y^u - y^d)}{[(1+r-\phi t)^2 - (1-\phi t)^2]}$$

For low income households, we have

$$\frac{1}{2}\left(T^d(1+r) + T^u\right) = -\frac{1}{2}\frac{tr^2 m(1+r)(y^u - y^d)}{[(1+r-\phi t)^2 - (1-\phi t)^2]}$$

Does this also imply that the capital gains tax makes high income households better off, at the expense of low income households? To answer this question, we have to take into account the possible effects of the tax on the user cost of housing. Substituting (14) and (15) into the user cost term on the right hand side of (4) yields

$$u^u = my^u + t\frac{r^2m^2(y^u - y^d)}{(1+r-\phi t)^2 - (1-\phi t)^2} \tag{12}$$

and

$$u^d = my^d - t\frac{r^2m^2(y^u - y^d)}{(1+r-\phi t)^2 - (1-\phi t)^2} \tag{13}$$

In contrast to our results in the preceding sections, it now turns out that the capital gains tax does influence the user cost of housing. The user cost of housing is reduced in low income periods and increased in high income periods. In our numerical example, the introduction of a capital gains tax with a rate of 50% increases the user cost of housing in the high income state slightly from $u^u = 16$ to $u^u = 16.05$. In the low income state, the user cost of housing falls from $u^d = 12$ to $u^d = 11.95$.

What does this imply for the overall distributive effects of the capital gains tax? The indirect utility function of high income households can be written as $V = V(Y, u)$, with $V_1(Y, u) = \lambda$ and $V_2(Y, u) = -\lambda h(1+r)$, where λ is the marginal utility of second period income and Y is the second period value of the household's lifetime income (incl. transfers). For a high income household we have

$$Y = Y^u = y^u(1+r) + \frac{1}{2}\left(T^u(1+r) + T^d\right)$$

and for a low income household

$$Y = Y^d = y^d(1+r) + \frac{1}{2}\left(T^d(1+r) + T^u\right)$$

The effect of introducing a capital gains tax, departing from an equilibrium without taxes is

$$\frac{dV(Y^u, u^u)}{dt} = \lambda^u \frac{(1-m)m(1+r)r^2(y^u - y^d)}{(1+r-\phi t)^2 - (1-\phi t)^2} > 0 \tag{14}$$

for the high income households and

$$\frac{dV(Y^d, u^d)}{dt} = \lambda^d \frac{(1-m)m(1+r)r^2(y^d - y^u)}{(1+r-\phi t)^2 - (1-\phi t)^2} < 0 \tag{15}$$

for the low income households. It thus turns out that, paradoxically, the high income households benefit from the introduction of a capital gains tax on housing, at the expense of the low income households.

3.2.2 Transfer to the old generation only

A key factor explaining the adverse distributional effects of the capital gains tax in the above example is the assumption that the government balances the budget using lump sum transfers or taxes which are the same for the old and the young generation. As has been explained above, this policy redistributes from low to high income households. We now consider the case where the government distributes the capital gains tax revenue in each period to the generation which pays the tax, i.e. the old generation. In the example where income swings deterministically between y^d and y^u, we can derive the following house prices:

$$p^u = m(1+r)\frac{(1+r-\eta t)y^u + (1-\eta t)y^d}{(1+r-\eta t)^2 - (1-\eta t)^2} \tag{16}$$

and

$$p^d = m(1+r)\frac{(1+r-\eta t)y^d + (1-\eta t)y^u}{(1+r-\eta t)^2 - (1-\eta t)^2} \tag{17}$$

where $\eta \equiv 1 + m$. Using the same approach as in the preceding sections, we can derive the user cost of housing as

$$u^u = my^u + t\frac{rm^2(y^u - y^d)}{(1+r-\eta t)^2 - (1-\eta t)^2} \tag{18}$$

and

$$u^d = my^d - t\frac{rm^2(y^u - y^d)}{(1+r-\eta t)^2 - (1-\eta t)^2} \tag{19}$$

As in the case of equal per capita transfers, the capital gains tax increases the user cost of housing in 'up' periods and reduces the user cost of housing in 'down' periods. Given that the transfer policy of the government does not redistribute between generations, the user cost effects suggest that the capital gains tax should now have less adverse redistributive effects. Indeed, it turns out that the introduction of a capital gains tax now reduces the utility of high income households, to the benefit of low income households:

$$\frac{dV(Y^u, u^u)}{dt} = -\lambda^u \frac{(1+m)m^2(1+r)r(y^u - y^d)}{(1+r-\eta t)^2 - (1-\eta t)^2} < 0$$

for the high income households and

$$\frac{dV(Y^d, u^d)}{dt} = \lambda^d \frac{(1-m)m(1+r)r^2(y^d - y^u)}{(1+r-\eta t)^2 - (1-\eta t)^2} > 0$$

for the low income households.

4 Extensions

In this section, we consider three extensions of our basic model. Firstly, we give up the assumption that there is full loss offset. We do so because limited loss offset is an important feature of many real world tax systems. Secondly, we consider a situation with three states, where income fluctuates between a low, a medium and a high level. This extension has the purpose to investigate whether or main result, the finding that capital gains taxes increase house price volatility, also holds in a more complex house price cycle, where households expect further house price increases in booms and vice versa. Thirdly, we will allow for a simple stochastic income process because uncertainty about future housing demand may have an impact on house price volatility and tax effects. Finally, we put forth a few remarks on the implications of income growth.

4.1 Limited loss offset

In this section, we change the model considered in section 3.1. by assuming that household which experience a loss when selling their houses are denied any loss offset. It is straightforward to show that it can only be the rich generations (those experiencing high income when young) that will experience a capital loss on their houses over their life time, and that, conversely, the poor generations will experience a capital gain.[7] Then the second-period consumption of high income households will be given by

$$c_2 = (1+r)s + p_2h \tag{20}$$

Even though they experience a housing capital loss, and a capital gains tax is in place, they will receive no tax rebate. The poor generation's second period consumption will be

$$c_2 = (1+r)s + p_2h - t\Delta ph \tag{21}$$

since they will be taxed on their capital gains on housing.

Exploiting the log (Cobb-Douglas) utility function, we may derive two equations for the price of houses in 'up' and 'down' periods:

$$p^u(1+r) - p^d = ky^u$$

$$p^d(1+r-t) - p^d(1-t) = ky^d$$

with $k \equiv \beta(1-\alpha)(1+r)/(1+\beta)$.

The two equations can be solved to yield

$$p^u = \frac{k}{r(2+r-t)}[(1+r-t)y^u + y^d] \tag{22}$$

$$p^d = \frac{k}{r(2+r-t)}[(1-t)y^u + (1+r)y^d] \tag{23}$$

First note that if $t = 0$, i.e. there is no capital gains taxation, the expressions for house prices are the same as in the benchmark model without taxes. Second, substituting the usual numbers of $y^u = 120, y^d = 90, \alpha = \beta = 2/3, r = 0.5$, a 50 per cent capital gains tax rate will lead to house prices of $p^d = 39$ and $p^u = 42$.

In a situation without capital gains taxation, the house prices in the 'up' and 'down' periods were, respectively, 40.8 and 43.2, with a span of 2.4 between them. Capital gains

[7]Entertaining the opposite assumption will quickly lead to a contradiction.

taxation without any loss offset leads to a widening of this span to 3.0. The increase in the span is a little less than one half of the full span of 4.0 between 'down' and 'up' prices with full loss offset, where the two price levels were 40 and 44.

Also note that the average level of house prices has gone down from previously 42 to now 40.5. The reason for this, of course, is that the government collects revenues, but no longer provides any tax rebates. The average level of house prices (and the span between the 'down' and 'up' levels) would increase, if the government were to hand back the capital gains tax revenue in the form of transfers to the young and old in those periods where positve capital gains are measured and subjected to tax.

The bottom line of the investigation of limited (in fact, no) loss offset in capital gains taxation on housing is that the mechanism working in the direction of increasing house price volatility is still in action, although it has lost about half of the full effect under full loss offset. Taking into account the realistic feature that when (and if) capital gains on housing are taxed, there will not be comparable rebates for capital losses, thus does not destroy our point: Taxing capital gains on housing will increase the variability of house prices.

4.2 More states

We now assume that there are three income levels: $y^d < y^m < y^u$, in the three states 'down', 'medium', 'up'. A deterministic business cycle would now be a movement from 'medium' to 'down' to 'medium' to 'up' to 'medium' and so forth. While the two 'medium' positions will have the same income level, they will *not* have the same house price level, since they will be followed by bust and boom, respectively. But both medium levels will have the property that the recent development in house prices will (be expected to) continue in the future as well. In the upswing from the bust state, the house price will increase towards the medium state and further on to the boom state, while in the downswing the decline in the house price will occur from boom to medium and also from medium to bust.

To distinguish between the two medium states let us call the medium state following a bust and preceding a boom $m+$ and the medium state following a boom and preceding a bust $m-$. Full loss offset in capital gains taxation is assumed, and the use of the tax revenue is ignored for the moment.

Using the properties of the logarithmic utility function, the house prices in the 'down' state will be given by

$$p^d(1+r-t) - p^{m+}(1-t) = ky^d$$

and similar equations will connect p^{m+} to p^u, p^u to p^{m-}, and p^{m-} to p^d. The corresponding four equations with the four unknown house prices can now be solved to yield

$$p^d = [(1+r-t)^4 - (1-t)^4]^{-1}k[(1+r-t)^3y^d$$

$$+(1+r-t)^2(1-t)y^m + (1+r-t)(1-t)^2y^u + (1-t)^3y^m],$$

with a similar solution to the other three prices:

$$\begin{aligned}
p^{m+} &= \zeta[(1+r-t)^3y^m + (1+r-t)^2(1-t)y^u + (1+r-t)(1-t)^2y^m + (1-t)^3y^d], \\
p^u &= \zeta[(1+r-t)^3y^u + (1+r-t)^2(1-t)y^m + (1+r-t)(1-t)^2y^d + (1-t)^3y^m], \\
p^{m-} &= \zeta[(1+r-t)^3y^m + (1+r-t)^2(1-t)y^d + (1+r-t)(1-t)^2y^m + (1-t)^3y^u],
\end{aligned}$$

where $\zeta = [(1+r-t)^4 - (1-t)^4]^{-1}k$. Now use the same parameter values as above, and let y^m attain the value 105. Then, the four house prices can be calculated to $p^d = 39.6, p^{m+} = 43.2, p^u = 44.4, p^{m-} = 40.8$ with a capital gains tax rate of t=0.5, as opposed to $p^d = 40.6, p^{m+} = 42.9, p^u = 43.4, p^{m-} = 41.1$ without taxation. Again, we see that the span between house prices in the 'down' and 'up' periods, while at 2.8 in the absence of taxes, increases to 4.8 with capital gains taxation.

We also note the very interesting property that the medium income state will display two different levels for the price of houses, depending on whether the state is a stepping stone in an upswing period, or conversely a stepping stone in a period of downturn. So while only three income levels are introduced, one must distinguish four different types of generations in accounting for welfare levels of such different generations, with or without capital gains taxation.

It is also interesting to consider the case where the medium income level is closer to one of the two extreme income levels. Assume, for instance, that $y^m = 114$, with all other parameter values as above. Without capital gains taxes, the housing price cycle reaches its peak already in the $m+$ period: we get $p^d = 42.1, p^{m+} = 45.1, p^u = 44.8, p^{m-} = 43.2$. The result $p^{m+} > p^u$ is due to the fact that households who buy in m+ expect further house price increases whereas households buying in 'up' periods expect a decline in prices. These price change expectations overcompensate the income difference. What is the effect of capital gains taxation. With t=0.5, we get $p^d = 40.8, p^{m+} = 45.6, p^u = 45.6, p^{m-} = 43.2$. Again, the capital gains tax increases the span between the highest and lowest prices, from a value of 3 without taxes to 3.8 with taxes.

To summarize, the analysis of this section reflects that house prices are very much forward-looking. As a result, the house price development accellerates in the early phase of an upswing and decellerates in the latter phase. Conversely, in the downturn, house prices drop dramatically in the first phase of the downturn while subsequently decellerating. The taxation of capital gains seemingly reinforces this accelleration-decelleration pattern.

4.3 The Role of Uncertainty: An example with credit constrained households

So far, we have assumed that income fluctuations are deterministic so that individuals face no risks when making their consumption and saving decisions. We now consider the case where each generation faces uncertainty about the income of future generations, which implies that the price at which the housing stock can be sold to the next generation is also uncertain. We use a simple model of stochastic house price fluctuations. As in the previous section, we assume that each generation lives for two periods. The utility function of the representative household is assumed to have the form

$$c_2 + v(h)$$

with $v' > 0$ and $v'' < 0$. Thus, the individual only consumes in the second period of life and is risk neutral with respect to second period consumption. We again assume that households earn an income y_1 in the first period. In each period, this income takes a high value denoted by y^u with probability π or a low value denoted by y^d with probability $1-\pi$. These assumptions considerably simplify the analysis. In the first period, the household earns a random income y_1. Income may be used for savings or purchases of housing units. The budget constraint of the household is given by

$$y_1 = s + p_1 h$$

Furthermore, we assume that the household faces a credit constraint such that savings must be non-negative ($s \geq 0$). In the second period, the household sells the housing unit for the random price p_2, liquidates savings and possibly pays capital gain taxes, so that second-period consumption is

$$c_2 = (1+r)s + p_2 h - t(p_2 - p_1)h$$

Expected utility maximization implies the following first order condition:

$$E[p_2] - t(E[p_2] - p_1) + v'(h) \geq (1+r)p_1 \tag{24}$$

where $E[]$ is an expectations operator. The first order condition holds as an equality if the household's first period income $y_1$is sufficiently high. In this case, the household invests in both housing and financial assets. Since the supply of housing is given, equation (22) determines the equilibrium price of housing in period 1 for a given expected house price in period 2, $E[p_2]$. For low values of y_1, equation (22) holds as an inequality. The household spends the entire income on housing. Intuitively, equation (1) then indicates that the household would like to borrow in order to purchase additional housing in period

1. However, borrowing is ruled out because of the credit constraint. Assume the credit constraint is binding if and only if $y_1 = y^d$. The equilibrium prices are then given by the equations

$$p^d = y^d \tag{25}$$

and

$$-(1 + r - t)p^u + (1 - t)E[p_2] + v'(1) = 0 \tag{26}$$

Using our assumption that $E[p_2] = \pi p^d + (1 - \pi)p^u$, we can now derive the effect of a marginal change in the capital gains tax rate t on housing prices:

$$\frac{dp^d}{dt} = 0$$

and

$$\frac{dp^u}{dt} = \frac{\pi(p^u - y^d)}{\pi(1 - t) + r} > 0.$$

It turns out that capital gains taxes raise house prices in high income states and do not affect house prices in low income states. Our example with uncertainty and credit rationing thus confirms out earlier finding that capital gains taxes increase house price fluctuations.

4.4 Income growth

We close this section with some remarks on the implications of income growth in our model. Imagine that the underlying rate of growth in the economy amounts to g, so that the process of incomes over time could be, for example, $..., y^d, y^u(1+g), y^d(1+g)^2, y^u(1+g)^3, ...$ What would such an income process entail for the effects of capital gains taxation? First, without secular growth in income the government will essentially collect zero revenue from a (symmetric) tax on capital gains on housing; neglecting discounting, what is collected in one period is paid out in the subsequent period. With growth, on the contrary, capital gains tend to more than offset capital losses, if any, enabling the government to collect positive revenue over time. Whether the government simply keeps the revenue or pays it back to the private sector in one form or another will therefore influence the general level of house prices. Regardless of these considerations it is nevertheless possible to demonstrate that the above tendency for capital gains taxation to increase house price fluctuations, suitably interpreted, will persist.

As an example, consider an economy with the same features as in subsection 3.1, except that disregarding the business cycle income grows over time. In period zero, income is at a level of y^d; in period 1, it is $y^u(1+g)$, and so forth. Any revenue from capital gains taxation is kept with the government and not transferred back. Utilizing the method in subsection 3.1 one can compute general expressions for house prices in boom and bust periods (this we leave to the reader). Now use the same values for key parameters as in 3.1. The rate of growth is $g = 1/3$ (again reflecting a twenty-thirty year period length), and the interest rate is $r = 1$ (now reflecting growth on top of pure time preference). Without taxation, house prices will in periods 1 to 3 lie at 40.8, 57.6, and 72.5, respectively. With a 50 percent capital gains tax, house prices in these three periods will instead be 31.8, 47.3, and 56.5. We see that, as expected, the general level of house prices is lower with taxation. But we also notice that from a bust period to the subsequent boom period, house prices will increase by 41 percent without taxes, whereas with capital gains taxation the increase will amount to 49 percent. In this sense, house price fluctuations will continue to be more dramatic under capital gains taxation.

5 Conclusions

This paper uses a simple OLG model to analyse the effects of capital gains taxes on house price fluctuations and the user cost of housing. Capital gains taxes are widely thought to dampen house price fluctuations and to redistribute income from rich to poor households. The results derived in this paper suggest that this view may be highly misleading. In our model, it turns out that capital gains taxes increase house price fluctuations and redistribute income from the poor to the rich unless extreme assumptions on the use of the revenue from the capital gains tax are made. The reason is that households who buy their real estate in boom phases will typically benefit from the boom as far as their overall income is concerned but they also buy their real estate at high prices. As a result, they are likely to suffer a capital loss when selling their houses later. Households who buy their real estate in times of economic crisis, in contrast, have lower general income but are likely to make a capital gain on their real estate investment. Introducing a capital gains tax reduces the losses of the high income earners and reduces the capital gains of low income earners. As a consequence, high (low) income earners will be able to pay more (less), so that prices increase even further in booms and fall deeper in recessions.

Of course, these findings emerge from a stylized model of the housing market which abstracts from several complications which are potentially important. Firstly, we assume that the supply of housing is fixed. Although we think that our results would also hold in a model with an upward sloping supply curve for housing services, the validity of our results for the more general case of upward sloping supply curves remains to be explored. Moreover, our analysis includes only a highly restrictive analysis of the case with uncertainty about future income streams. Finally, there is no room in our model to deal with the problem of accrual versus realisation based capital gains taxation. To the extent that realization based capital gains taxes lead to lock in effects, it is likely, though, that price volatility increases further as the volume of trade declines.

References

Berkovec, J. and D. Fullerton, 1992, A General Equilibrium Model of Housing Taxes and Portfolio Choice, Journal of Political Economy 100, 390-429.

Englund, P., 1985, Taxation of capital gains on owner-occupied homes. Accrual vs realization, European Economic Review 27, 311-334

Englund, P., 1986, Transaction costs, capital gains taxes and housing demand, Journal of Urban Economics 20, 274-290

Hoyt, W. H. and S. S. Rosenthal, 1992, Owner-occupied housing, capital gains, and the tax reform act of 1986, Journal of Urban Economics 32, 119-139

Lundborg, P. and P. Skedinger, 1998, Capital gains taxation and residential mobility in Sweden, Journal of Public Economics 67, 399-419

Lundborg, P. and P. Skedinger, 1999, Transactions taxes in a search model of the housing market, Journal of Urban Economics 45, 385-399

OECD, 1999, Economic Survey of Denmark, Paris

OECD, 2000, House prices and economic activity, ch. VI in OECD Economic Outlook 68, Paris

Noronha, G. and S. P. Ferris, 1992, Capital gains tax policy and the behavior of common stock returns, Economics Letters 40 (1992) 113-117

Pines, D., E. Sadka and E. Sheshinski, 1985, The normative and positive aspects of the taxation of imputed rent on owner-occupied housing, Journal of Public Economics 27, 1-23

Poterba, J., 1984, Tax subsidies to owner-occupied housing: An asset-market approach, Quarterly Journal of Economics 99, 729-752

Rosen, H. S., K. T. Rosen and D. Holtz-Eakin, 1984, Housing Tenure, Uncertainty and Taxation, Review of Economics and Statistics 66, 405-416.

Sheffrin, S. M. and T. M. Turner, 2001, Taxation and house-price uncertainty: Some empirical estimates, International Tax and Public Finance 8, 621-636

Skinner, J., 1996, The dynamic efficiency cost of not taxing housing, Journal of Public Economics 59, 397-417

Stiglitz, J., 1983, Some aspects of the taxation of capital gains, Journal of Public Economics 21, 257-293

Viard, A. D., 2000, Dynamic asset pricing effects and incidence of realization-based capital gains taxes, Journal of Monetary Economics 46, 465-488

Weiss, Y., 1978, Capital gains, discriminatory taxes, and the choice between renting and owning a house, Journal of Public Economics 10, 45-55.

Table 1: Capital gains taxes on housing in EU countries (2001)

Belgium	Y (turnover <5 years, exemption for owner-occupiers)
Denmark	Y (tax exemptions for owner-occupiers)
Germany	Y (turnover <10 years, tax exemptions for owner-occupiers)
Greece	N
Spain	Y (tax exemptions for principal dwellings when reinvested)
France	Y (no tax for main residence)
Ireland	Y (tax exemptions for principal dwellings)
Italy	Y (50% tax reduction for pood), tax was abolished as from 2002)
Luxemburg	Y (tax exemptions for principal dwellings)
Austria	Y(turnover <10 years)
Netherlands	N
Portugal	Y (exemptions if proceeds are reinvested in another residence within 2 years)
Finland	Y (exceptions for pood after 2 years)
Sweden	Y(25%)
UK	Y(tax exemption for pood)

Y: Yes

N: No

pood: pricipal owner-occupied dwelling

Source: European Central Bank (2003), Structural Factors in the EU Housing Market