

# Chapter 6: Housing Demand and Tenure Choice (Brueckner's textbook)

Wen-Tai Hsu

National University of Singapore

For EC 3381 Urban Economics  
March, 2012

# Introduction

- Housing is probably the most important commodities that consumers purchase.
  - ▶ Consumption good: shelter, environment for most after-work activities, etc.....
  - ▶ Durable good, and hence an asset
- Tenure choice: for your own housing consumption choice, do you choose to own or rent?
- Do you try to own more than one housing units? (investment....)

# Introduction

- The housing part in the monocentric city model considers only one dimension of the housing demand, i.e., the floor space, and it ignores the fact that it is a durable good and assume everyone is a renter. (*Absentee landlord* rents land to developers who in turn rents their housing units to individual workers.)
- In this chapter, we consider
  - ▶ Demand on different attributes of housing units.
  - ▶ Tenure choice
  - ▶ Down payment, mortgage, default, and bubbles.

# Housing Demand: Traditional Approach

- Assume housing is a uni-dimensional good of which the demand function is given by

$$q = \alpha p^{\beta} y^{\theta},$$

where  $q$  is quantity,  $p$  is price per unit and  $y$  is income. Here, the object of concern can be rental price or housing price. (Note in Ch. 2 and 3 when we say housing price, we actually mean rental price)

- $\beta < 0$  is the price elasticity of demand, while  $\theta > 0$  is the income elasticity of demand. (Why?)

# Housing Demand: Traditional Approach

- So, the housing expenditure  $E$  is given by

$$E \equiv pq = \alpha p^{1+\beta} y^\theta,$$

which is equivalent to

$$\ln E = \ln \alpha + (1 + \beta) \ln p + \theta \ln y. \quad (1)$$

- In practice,  $q$  is difficult to measure (if one'd like to go beyond floor space), but regardless of the measure, (1) is easy to estimate.
- Empirical studies typically show  $\beta \in (-1, 0)$  and  $\theta \in (0, 1)$ . This indicates that housing is price inelastic and its demand or expenditure rises in income less than proportionately.

# Housing Demand: the Hedonic Approach

- Housing is a bundle of attributes, e.g., floor space, lot size, view, layout, etc. Say,  $m$  attributes.

$$u(c, a_1, \dots, a_m)$$

- To estimate housing demand: two step regression proposed by Rosen (1974).
- Grether and Mieszkowski (1974) estimate the following using data on house sales in New Haven, Connecticut, during 1962-1969.

House value

$$\begin{aligned} = & 36 + 5.2 \times \text{square footage} + 0.89 \times \text{lot size} \\ & + 800 \times \text{number of bathrooms} + 580 \times \text{family room} + 830 \times \text{fireplace} \\ & + 790 \times \text{one-car garage} + 1270 \times \text{two-car garage} \\ & - 5.2 \times \text{average room size} - 0.07 \times \text{age} \times \text{square footage} \\ & + \text{additional attribute effects} \end{aligned}$$

# Housing Demand: the Hedonic Approach

- The regression coefficients on attributes can be interpreted as implicit prices (or, willingness to pay) of the attributes.
- The demand for housing attributes can be recovered in a second step by regressing the implicit prices on the level of the corresponding attributes and on the characteristics of the household buying the house (income, family size, and so on).

# User Costs of Housing

- The point to establish the concepts of user costs of housing is to analyze tenure choice: the decision between own and rent. Back to view housing consumption as uni-dimensional.
- Lots of factors to consider when one is an owner-occupier, instead of a renter.
  - ▶  $i$  : annual mortgage interest rate
  - ▶  $h$  : annual property tax rate
  - ▶  $d$  : annual depreciation rate
  - ▶  $g$  : annual rate of capital gains
- Let  $V$  be the value of the house. Suppose 100 percent mortgage. The annual user cost of an owner-occupier is thus

$$(i + h + d - g) V.$$

- We ignore cost of maintenance and insurance...add them back if you want.



# User Costs of Housing: Tax treatment

- Let  $v$  be the purchase price per unit of housing, and so  $V = vq$ . The per unit user cost is

$$(i + h + d - g) v$$

- $v$  is the price of the housing market, while  $p$  is the price of the rental market and also the renters' per unit user costs.
- Some people are landlords who own the housing and rent out. So, need to consider landlords' profits, which determines  $p$ .
- Important difference of tax treatment between owner-occupiers and landlords. See the tables.

## Table 6.1 Tax treatment of housing costs

<b>Cost element</b>	<b>Tax deductible for owner-occupier ?</b>	<b>Tax deductible for landlord ?</b>
Mortgage interest	Yes	Yes
Property taxes	Yes	Yes
Depreciation	No	Yes

## Table 6.2 Tax treatment of housing benefits

Benefit	Taxable for	
	owner-occupier ?	Taxable for landlord ?
Rental income or imputed rent	No	Yes
Capital gains	No for most taxpayers	Yes

# The Effect of Tax Treatment

- Let an owner-occupier's income tax rate be denoted as  $\tau \in (0, 1)$ .  
Deductibility means that, e.g., for mortgage interest rate, for every dollar of mortgage interest payment that the owner-occupier pays, she can reduce her income taxes by  $\tau$  dollar via the deduction.
- This is not exactly how tax deductions work in reality, but just to capture the idea.
- Here, the larger the  $\tau$ , the larger the deduction works. So, the new (per unit) user's cost for an owner-occupier with  $\tau$  is thus

$$[(1 - \tau)(i + h) + d - g] v. \quad (2)$$

# The Effect of Tax Treatment

- Let's now turn to the rental market.
- Landlord purchase housing by with price  $v$ . Suppose 100 percent mortgage. Let  $\lambda$  be the landlords' income tax rate. A landlord's profit is given by

$$\pi = (1 - \lambda) p - [(1 - \lambda)(i + h + d) - (1 - \lambda)g] v.$$

- Competition drives  $\pi$  to zero. So,

$$p = (i + h + d - g) v,$$

which is larger than the owner-occupier's user cost given in (2).

- Everybody would like to be an owner-occupier. But, this is at odds with reality. In the US, there is a third of households who are renters.

# The Effect of Tax Treatment

- Another consideration: The US tax code assumes buildings wear out (that is, fully depreciated) after 27.5 years of use. Actual economic depreciation, in contrast, would lead to a life span of 75-100 years.
- Let the depreciation rate allowed for tax purposes be  $d + e$ , where  $e$  is the rate of excess depreciation over and above  $d$ . So, now, revise the profit equation

$$\begin{aligned}\pi &= (1 - \lambda) p - [(1 - \lambda) (i + h + d) v - \lambda e v - (1 - \lambda) g v] \\ &= (1 - \lambda) [p - (i + h + d - g) v] + \lambda e v.\end{aligned}$$

- $\pi = 0$  implies that

$$p = (i + h + d - g) v - \frac{\lambda e v}{(1 - \lambda)}.$$

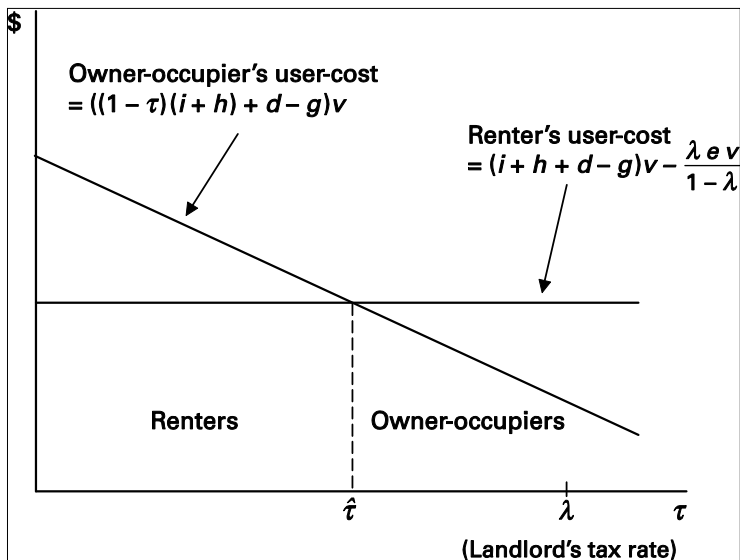
- An individual would like to be an owner-occupier if and only if

$$[(1 - \tau) (i + h) + d - g] v < (i + h + d - g) v - \frac{\lambda e v}{(1 - \lambda)}. \quad (3)$$

# The Effect of Tax Treatment

- Pull in one assumption: the higher the income, the larger the  $\tau$ . (progressive tax rate....question: are tax deductions due to property tax and mortgage also progressive?)
- The right-hand side of (3) is invariant to  $\tau$ .
- High income individuals want to be owner-occupier, while low income would be renters.
- Intuition: owner-occupiers enjoy the tax deduction benefit from mortgage and property tax, while renters' user cost may be cheaper because landlords are compensated due to excess depreciation (as operating cost).
- Assuming that tax deduction rate is also progressive, then the result holds.

# Figure 6.1 Housing tenure choice





# Does it make sense?

- It captures part of the reality that how user's cost differ between owner-occupiers and renters due to differential tax treatment between home owners and landlords.
- There is even an empirical evidence.
- Imagine there is no tax deduction on anything related to housing and rental markets. Would this tenure choice problem disappear?

# Other Factors Affecting Tenure Choice

- Expected mobility
- Pride of ownership
- Risk:
  - ▶ Locking in housing costs by purchasing a home with fixed-rate mortgage or by 100 percent cash insulates the risk of year-to-year rent changes under the renting option.
  - ▶ Homeownership imposes a risk with mortgage because of potential "negative equity." When housing prices fall, .....
  - ▶ The risk is larger if wage income and housing prices are positively correlated, such as in company towns. E.g., in Detroit, bad times in the auto industry translate into both downward pressure on wage incomes and capital losses on real estate.

# Down Payments and Tenure Choice

- The existence of down payment poses a hurdle to home ownership
- One needs to save enough to pass the hurdle.
- Those who are patient (in the sense that they value future consumption more than those impatient people) would like to save more and more likely to pass the hurdle.

# Mortgage Default

- Default: stop making mortgage interest payment, leading to foreclosure, under which the lender evicts the resident, takes possessions of the house, and sells it to a new buyer.
- Down payment reduces the likelihood of default.
- Suppose a consumer buys a house at the beginning of a period for an amount  $V$ , and then lives in it until the end of the period. To make the purchase, the consumer borrows  $M$  from a mortgage lender and makes a down payment  $D$  using her own funds. So,

$$M + D = V.$$

# Mortgage Default

- Let the end-of-period price be  $V^*$ . If  $V^* > V$ , there is no problem with default. So, consider  $V^* \leq V$ .
- She resells the house and pay back mortgage and is left with  $V^* - M$ . If  $V^* - M < 0$  and then she has a negative equity. If she defaults, then she is left with 0 and she would rather default.
- Pull in default costs. Let such costs be denoted as  $C$ , which captures the cost of an impaired credit rating, the costs associated with moving out of the house, and the psychic cost (guilt) that defaulting might bring. In this case, default would occur if

$$V^* - M < -C.$$

# Mortgage Default

- A down payment makes default less likely because it reduces the mortgage, because the default condition is in fact

$$V^* - M = V^* - V + D < -C.$$

- The larger the  $D$ , the less likely the above would hold. If  $V^* = V$ , then there would be no default for any small amount of down payment.
- If the society expects bad times ahead, then the down payment requirement would tend to be high.

# Property Abuse and Tenure Choice

- To focus on the issue of property abuse, it is useful to suppress many of the previous features.
- Owner-occupier purchases a house at the beginning of the period for an amount  $V$ .
- While living in the house, the owner-occupier incur an operating cost,  $O$ , which includes property tax.
- Potential property abuse, which leads to a damage  $D$ .
- If exercising care, then  $D$  could be avoided, but need to pay a cost  $C$ .

# Property Abuse and Tenure Choice

- The resale value of the house at the end of the period depends on whether care is exercised. If yes, then the value is  $V$  (assume no depreciation), if no, then the value is  $V - D$ .
- So, when care is exercised, then the cost of owner-occupancy is  $V + O + C - V = O + C$ . (note the typo in Table 6.3)
- If care isn't exercised, then the cost of owner-occupancy is  $V + O - (V - D) = O + D$ .
- Suppose that  $C < D$ . Hence, home owners will exercise care.



# Property Abuse and Tenure Choice

- Now, consider renters. Let  $P$  be the rent. If renters exercise care, the cost is  $P + C$ , and if not, then the cost is simply  $P$ . Of course, renters won't exercise care.
- For a landlord, she acquire the house for an amount  $V$ , earn  $P$ , pay operation cost  $O$ , and resell at  $V - D$ . So, her profit is  $P + V - D - O - V = P - D - O$ . Zero profit implies that  $P = O + D$ . So, property abuse in fact is incorporated in the rent!
- Now, consider tenure choice. Since an owner-occupier's cost  $O + C$  is less than renter's cost  $P = O + D$ . Then, everybody chooses to own.
- If damage deposit is required for renters, then renters would also exercise care and in this case,  $P = O + C$ . (can you show this?)

## Table 6.3 Tenure choice with property abuse

Owner costs as a function		
of care	Choice of care	Owner-occupier's cost
-O + C with care	Exercise care, since $C < D$	-O + C
O + D without care		
Renter costs as a function of care		
	Choice of care	Renter's cost
P + C with care	Do not exercise care, since $C > 0$	P, equal to O + D with zero profit
P without care		
Tenure choice		
Own, since $O + C < O + D$		

# Inflation and Housing Bubbles

- A housing bubble arises when widespread expectations of high housing capital gains are self-fulfilling.
- Inflation has an effect of fueling housing bubble. Get back to the tax treatment section, recall that owner-occupier's per unit user cost is

$$[(1 - \tau)(i + h) + d - g]v.$$

- Suppose that the rate of overall inflation rises by 1 percent, i.e., 0.01. Then, both  $g$  and  $i$  goes up by 0.01. The change in user cost is

$$[(1 - \tau)\Delta i - \Delta g]v = [(1 - \tau) \times 0.01 - 0.01]v = -0.01\tau v.$$

So, a reduction in cost!

- Money neutrality, or money illusions?

# Inflation and Housing Bubbles

- Bubbles are the cases where illusions sustain themselves for a period of time. There are various sources of illusions. The above is just one example. Why self-fulfilling?
  - ▶ Expect capital gains
  - ▶ Demand rises
  - ▶ Indeed, there exists capital gains, at least for a period of time.
  - ▶ So, if such a self-fulfilling expectation forms an equilibrium, why bubbles burst?
- Housing market is an asset whose value is based on net present value of rental incomes over the periods.....

# More on Money and Housing

- One important aspect that this chapter (or book) doesn't capture is that housing unit as a durable good asset, is a value-keeper compared to high liquidity securities, or simply money!
- Money supply increases induce inflation. Also, at times of fast money expansion, the interest rate (which is the price of money) is low.
- The facts that money depreciates at a fast rate and that cost of borrowing money is low create demand for *housing as an asset* (the rental market might be unaffected if there is not much real economic changes except for money expansion).
  - ① Choice between cash and asset.
  - ② Mortgage interest rate is low.

# More on Money and Housing

- Is this a bubble? Not quite. This may be just a leading inflation, which means the prices of other goods and services, including housing rental, will follow up.
- But, there may be a distributional effects due to credit constraints.
- 2000-2006 housing price surge in the US...is that a bubble?
- Hard to disentangle the effects of a bad shock and bubble burst. In some angles, that looks a bubble.
- In any case, any bubble involves imperfect foresight. But, maybe the imperfect foresight is on other aspects of the economy, and housing price surge just accompanies as a side effect.

# Political Economy of Land Supply

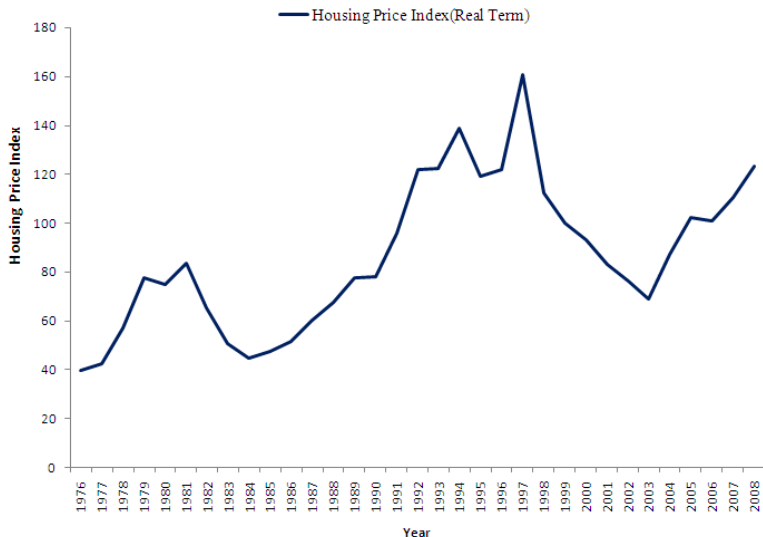
- A lesson of Hong Kong's housing surge during 1984-1997 and then the crash thereafter.
- In 1985, sino-british joint declaration limits land sales to 50 acres per year.
- Housing price skyrocketed. Who gains and who loses?

# Political Economy of Land Supply

- In 1997, after the handover, the governor Dong announced a new housing policy: to supply 85,000 units per year. (was under 10,000 per year at that time)
- What happened after that was ugly....
- A practical lesson: credit constraint matters and try not to be the greatest fool!



# Political Economy of Land Supply



# Urban Renewal

- Old and ugly houses hurt a city's image (tourism, self-esteem, etc).
- More importantly, they hurt values of real estate properties. (Rossi-Hansberg, Sarte, and Owens, 2010)
- Hong Kong: famous for its laissez-faire economy
  - ▶ Really?
  - ▶ The laws are such that lots of business are oligopolized
  - ▶ The majority of land is owned by the government
  - ▶ The right to develop lands into housing is given to a few large developers (scale economies maybe)
  - ▶ no sales tax, not much intervention in other aspects

# Urban Renewal

- Urban renewal: replace old buildings with new buildings
- 100% consensus before 1999. (Holdout problem)
- In 1999, 90% consensus of landlords (in terms of floor space). The developer who has acquire 90% of the property can file for a compulsory public auction of the rest 10%. The developer usually gets the 10%.
- Thresholds even lowered to 80%, was an issue.
- What's the difference between 90% and 100%?
- Then, between 80% and 90%?

# Urban Renewal

- Positive side of this: when ownership in a building is very fragmented, negotiation to reconstruct the building can take very long, especially in the case of 100%. A developer can internalize all these benefits and costs and settle in prices.
- Distributional effects as discussed.
- People are different and the dynamics matter.