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# An Estimation of Elasticities of Consumption Demand and Investment Demand for Owner-Occupied Housing in Taiwan : A Two-Period Model

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Buying a house usually satisfies housing consumption demand and housing investment demand, simultaneously. In order to disentangle the above two types of demand, households, in this study, are separated into three subtenure groups i.e. renters, owners owning one house, and owners buying a second or more houses. Presumably, renting a house is for consumption only, while buying a second house is usually for investment purposes. Applying a two-period model and two data sets from DGBAS and from Land Bank of Taiwan, the estimated results are as follows: Firstly, the income elasticity of pure consumption demand for housing is very close to unity (1.0413). Secondly, the income elasticity for a pure investment demand is greater than one (1.2643). Finally, for a household owning only one house, the shares for consumption motive and for investment motive are 26% and 74%, respectively.

## Keywords

Consumption demand, investment demand, elasticity and housing, Taiwan.

## Introduction

A dwelling unit satisfies a basic demand of living and also serves as an investment good. Buying a house usually involves both consumption demand and investment demand.[1] It will be an interesting issue to disentangle the share for consumption demand and the share for investment demand. Moreover, it is also worthwhile to know the elasticities both for consumption demand and for investment demand.

Recently, some research has been published examining consumption demand and investment demand for housing. For example, Henderson and Ioannides (1983, 1986, 1987), Fu (1991), and Berkovec (1989) have discussed the factors influencing tenure choice. Lin (1990, 1994) considers that homebuyers decide tenure choice and housing demand simultaneously. Ioannides and Rosenthal (1994) separate consumers into four housing subtenures: families renting without owning properties, renting while owning property other than their home, own their home without owning other properties, and own their home in addition to other properties. Furthermore, they try to set apart consumption demand and investment demand for housing by applying an order probit model. All of those papers are interesting for their own purposes, but they did not provide good answers for the questions raised above.

There are two goals for this paper. Firstly, the elasticities of consumption demand for housing and investment demand for housing will be estimated separately, by applying two data sets from the housing market in Taiwan. Then, the consumption share and investment share will be calculated according to the Engel aggregation condition, as long as the above two types of elasticities are available.

For estimation purposes, the households are divided into three subtenures in this paper, according to Ioannides and Rosenthal (1994), that is, renters, households with only one house, and households with more than one house. Additionally, the data set for different subtenures are applied to estimate different elasticities. Presumably, there is no housing investment for renters. So it is possible to get a pure consumption elasticity from renters' behavior. On the other hand, it is a pure investment purpose for those households who buy their second or more dwelling units, since one person could not live in two places at the same time.[2] Finally, the data set for households with only

[1] See Ranney (1981), Schwab (1982), Henderson and Ioannides (1983), Poterba (1984), Wheaton (1985), Bosch, Morris, and Wyatt (1986), Berkovec (1989, 1997).

[2] It is possible that different members in a same family are staying at two different dwelling units. Here, for simplicity, we classify them as two households.

one house is used to calculate the share for consumption demand and the share for investment demand.

A basic two-period model is introduced in Section 2, where the estimation method employed in the paper is also discussed. In Section 3, income elasticities for different subtenures in Taiwan are estimated first. Then consumption share and investment share for households owning only one house are computed by using those estimated elasticities. Section 4 concludes this study.

## A Two-Period Model of Housing Demand

For simplicity, we assume that there are two periods for every household, i.e. t=1, 2. And households consume the same house during their life. Therefore, there are two goods in the world, housing service ($H$) and the other composite good ($X_t$), and their prices are $P_h$ and $P_t$, respectively. The object for a household is to maximize his utility under his budget constraint. For the household in question, his utility function is

$$U = U(H, X_1) + \frac{U(H, X_2)}{1+r},$$

where $U(H, X_t)$ is the utility function and $r$ is the rate of time preference.

Suppose initial saving is zero. Then the renters' budget constraint for two periods are as follows:

$$P_1 X_1 + S_1 + R_1 H = Y_1,$$

$$P_2 X_2 + R_2 H = Y_2 + (1+r_2)S_1,$$

where $R_t$ is the rent of housing service, $r_t$ is the interest rate of saving, $S_t$ and $Y_t$ represent household savings and income.

On the other hand, the owners' budget constraints are as follows:

$$P_1 X_1 + S_1 + r_1^m M_1 + (1-b)P_h H = Y_1,$$

$$P_2 X_2 + r_2^m M_2 = Y_2 + (1+r_2)S_1,$$

where $b$ is the mortgage ratio, $M_1 = M_2 = bP_h H$ is the mortgage, $r_t^m$ is the interest rate of mortgage at time t. Finally, we assume the housing value at the end of period 2 is equal to the mortgage.[3]

Using the budget constraints of renters or owners, the objective function and budget constraint can be written as :

[3] Generally, housing price is variant but the mortgage is unchanged. For simplicity, we assume that the housing value at the end of period 2 is equal to the mortgage.

$$\max \quad U = U(H, X_1) + \frac{U(H, X_2)}{1+r},$$

$$\text{s.t.} \quad P_1 X_1 + \frac{P_2 X_2}{1+r_2} + \overline{P} H = Y, \qquad (1)$$

where $Y = Y_1 + \frac{Y_2}{1+r_2}$ is the household's total income of the previous period.

For renters, $\overline{P} = P^R = R_1 + \frac{R_2}{1+r_2}$; while for owners,

$$\overline{P} = P^O = \left[1 - b(1 - r_1^m + \frac{r_2^m}{1+r_2})\right] P_h .$$

Solving the first order condition, one can get the housing demand function which is a function of income, price of housing service, price of composite commodity in two periods, i.e. $H = H(Y, \overline{P}, P_1, P_2)$.

For estimation purposes, we assume that housing demand is a log-linear form, then the housing demand function can be shown as:

$$\log H = g + h \log Y + e \log \overline{P} + a \log P_1 + b \log P_2, \qquad (2)$$

restriction $h + e + a + b = 0$.[4]

where $\eta$ is the income elasticity, $\varepsilon$ is the price elasticity, $\alpha$ and $\beta$ are the cross elasticities.

Now, let $E_h$ be the total expenditure of housing services, $E_h = \overline{P} H$, then one can rewrite Equation (2) as

$$\log \frac{E_h}{P_1} = g + h \log \frac{Y}{P_1} + (1+e) \log \frac{\overline{P}}{P_1} + b \log \frac{P_2}{P_1}, \qquad (3)$$

where $\frac{P_2}{P_1}$ is inflation rate plus 1, that is a constant across household. Let

$g' = g + b \log \frac{P_2}{P_1}$, and we can rewrite Equation (3) as

$$\log \frac{E_h}{P_1} = g' + h \log \frac{Y}{P_1} + (1+e) \log \frac{\overline{P}}{P_1}.$$

In short,

$$LEH = g' + hLY + (1+e)LPH \ , \qquad (4)$$

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[4] Owing to the log-linear demand function assumption, $H = e^g Y^h \overline{P}^e P_1^a P_2^b$, the demand function is homogeneous of degree zero in $Y, \overline{P}, P_1,$ and $P_2$, if the consumers have no money illusion, in other words, $h + e + a + b = 0$.

where $LEH = \log\frac{E_h}{P_1}$, $LY = \log\frac{Y}{P_1}$, and $LPH = \log\frac{\overline{P}}{P_1}$. After that, we will use Equation(4) to estimate the income elasticity(η) and the price elasticity(ε). Furthermore, the estimated elasticities can be employed to calculate the shares for consumption demand and investment demand separately for households with only one house. Assuming that consumption demand and investment demand are divisible, i.e. $H = H^C + H^I$.[5] Now, by differentiating Equation (1), and let $d\overline{P} = dP_1 = dP_2 = dr_2 = 0$ and substitute it into the budget constraints, one gets

$$P_1 dX_1 + \frac{1}{1+r_2} P_2 dX_2 + \overline{P}(dH^C + dH^I) = dY \cdot \tag{5}$$

Divided by $dY$ on both sides of Equation (5), we obtain

$$\frac{P_1 X_1}{Y}\cdot\frac{Y}{X_1}\cdot\frac{dX_1}{dY} + \frac{1}{1+r_2}\cdot\frac{P_2 X_2}{Y}\cdot\frac{Y}{X_2}\cdot\frac{dX_2}{dY} + \frac{P_1 H^C}{Y}\cdot\frac{Y}{H^C}\cdot\frac{dH^C}{dY} + \frac{P_1 H^I}{Y}\cdot\frac{Y}{H^I{}_1}\cdot\frac{dH^I}{dY} = 1 \cdot$$

In fact, this equation is the Engel aggregation condition, i.e.

$$a_x^1 h_x^1 + \frac{1}{1+r_2}\cdot a_x^2 h_x^2 + a_h^C h_h^C + a_h^I h_h^I = 1, \tag{6}$$

and

$$a_h h_h = a_h^C h_h^C + a_h^I h_h^I \cdot \tag{7}$$

In Equation (6) and (7), $h_h$ and $h_x$ are the income elasticities of housing service and composite commodity, and $h_h^C$ and $h_h^I$ are the income elasticities of consumption demand and investment demand for housing. Meanwhile, $a_h$ and $a_x$ are the shares of housing expenditure and composite commodity expenditure to total expenditure, while $a_h^C$ and $a_h^I$ are the shares of consumption expenditure and investment expenditure to total expenditure. In other words,

$$a_h = \frac{\overline{P}(H^C + H^I)}{Y},\ a_x = \frac{P_1 X_1 + P_2 X_2/(1+r_2)}{Y},\ a_h^C = \frac{\overline{P}H^C}{Y},\ a_h^I = \frac{\overline{P}H^I}{Y}, \text{ and}$$

$$a_h + a_x = 1, \tag{8}$$

$$a_h^C + a_h^I = a_h \cdot \tag{9}$$

Substitute Equation (9) into Equation (7), one obtains

$$a_h h_h = a_h^C h_h^C + (a_h - a_h^C) h_h^I = a_h^C (h_h^C - h_h^I) + a_h h_h^I \cdot \tag{10}$$

Finally,

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[5] See Henderson and Ioannide (1983), Ioannides and Rosenthal (1994). Virtually, $H^C$ and $H^I$ influence each other, which makes this study much more complicated. Since it is not the main purpose of this paper, we neglect this problem.

$$\frac{a_h^C}{a_h} = \frac{H^C}{H} = \frac{h_h - h_h^I}{h_h^C - h_h^I}, \tag{11}$$

and

$$\frac{a_h^I}{a_h} = \frac{H^I}{H} = \frac{h_h - h_h^C}{h_h^I - h_h^C}, \tag{12}$$

where $\frac{a_h^C}{a_h}$ and $\frac{a_h^I}{a_h}$ are the shares of consumption demand and investment demand in housing for households owning their own houses.

## Empirical Analysis

To get information for three subtenure groups, two data sets have been employed in this paper. In the "Annual Housing Survey" data set from Directorate-General of Budget, Accounting and Statistics (DGBAS), households in Taiwan could be separated into renters and owners.[6] By pooling those annual data sets from 1988 to 1993, there are 2,770 and 1,610 sample points for renters and owners, respectively.

In order to separate owner-occupied households into two groups, i.e. households with only one house and households with more than one house, the "Personal House Loan" data set from the Land Bank of Taiwan from 1988 to 1992 is applied here.[7] By examining the data set from 1988 to 1992, there are 202 sample points suitable for our purpose to separate owner-occupied households into the above two groups. Among those 202 households, 134 of them are households owning only one house, the rest 68 are households buying their second house or more.

The definitions of variables in this study are as follows:

$E_h$: Housing expenditure. For owners, total housing expenditure includes imputed rent and other expenditure. For renters, housing expenditure is the yearly rent plus other expenditure, such as utility payments.

$P_h$: Price of housing units. For owners, $P_h$ is the purchase price per unit adjusted at the base of investigation year.[8]

$R_t$ : Yearly rent for renters.

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[6] In the data set, owners include both households with one house and households with more than one house. For details of the data set, see S.J. Lin (1993).

[7] For details of the data set, see Chang and Lin (1993).

[8] For details on the adjustment year, see Chang and Lu (1992).

$P_t$: Price of composite commodity. $P_t$ is computed from consumer price index and consumer price index-housing. See Table A.1 in the appendix for details.

$Y_t$: Households' yearly income

Basic statistics for the above variables of DGBAS and Land Bank are shown in Table 1 and Table 2. In Table 1, one may see that renters' housing expenditure and the floor space are much lower than that of owners' (79,953 vs. 109,279; 79.24 vs. 131.70), which is consistent to our expectation. On the other hand, renters' income is also lower than owners' (461,617 vs. 494,151). In Table 2, the average income, the housing expenditure, and the floor space for owners with one house only are lower than owners with more than one house (774,141 vs. 1,020,146; 84,038 vs. 110,418; 125.16 vs. 138.98).

**Table 1. Basic Statistics: DGBAS** Unit: NT dollar

| | Renters | Total Owners |
|---|---|---|
| Housing Expenditure | 79,953 | 109,279 |
| Household Income | 461,617 | 494,151 |
| Rent / Housing Price | 49,914 | 3,033,397 |
| Floor Space ($m^2$) | 79.24 | 131.70 |
| Number of Observations | 2,770 | 1,610 |

*Sources: "Annual Housing Survey" from DGBAS of Taiwan.*

**Table 2. Basic Statistics: Land Bank** Unit: NT dollar

| | Total Owners | Owners with One House Only | Owners with Second or More Housing |
|---|---|---|---|
| Housing Expenditure | 92,372 | 84,038 | 110,418 |
| Household Income | 852,735 | 774,141 | 1,020,146 |
| Housing Price | 4,506,547 | 4,208,502 | 5,143,829 |
| Floor Space ($m^2$) | 129.62 | 125.16 | 138.98 |
| Number of Observations | 202 | 134 | 68 |

*Sources: "Personal House Loan" from the Land Bank of Taiwan.*

Comparing the two data sets, we find that the average income for owners of DGBAS is lower than that of Land Bank (494,151 vs. 852,753). The housing value has a similar situation for renters and owners. The basic statistics have

confirmed our expectation that renters have lower income and live in less-expensive housing units, while owners live in better places.[9]

Applying the ordinary least-squares method (OLS) in Equation (4), the housing expenditure functions for renters and owners are estimated. The estimation results are shown in Table 3. Almost all the estimated coefficients in Table 3 are significant with right signs for both equations. Additionally, both $\overline{R}^2$ s are also satisfied in the two equations.

**Table 3. The Expenditure Function of Rental Housing and Owner-Occupied Housing**

| | Renters | Owners |
|---|---|---|
| Intercept | -2.3042** | -5.0133** |
| | (30.56) | (43.27) |
| LY | 1.0413** | 1.2551** |
| | (164.29) | (134.27) |
| LPH | 0.0006 | 0.0131** |
| | (0.36) | (5.07) |
| $\overline{R}^2$ | 0.9318 | 0.9294 |
| F-value | 18930.050** | 10590.331** |
| Number of Observations | 2770 | 1610 |

Notes: (1) Dependent variable is LEH, i.e. log of real housing expenditure.
(2) LY and LPH represent log of real income and log of real housing price, respectively.
(3) ** indicates that the coefficient is significantly under 95% significance level and the absolute t-value is in the parenthesis.

One interesting result in Table 3 is that renters' income elasticity is almost equal one ($h_h^C$=1.0413), while it is greater than unit ($h_h^A$=1.2551) for all owners. The result shows that housing is a normal good for a pure consumption demand, since renters' demand could represent a pure consumption demand. On the other hand, housing is a luxury good for home owners. Since there are both consumption and investment motives for owning a house, it is easy to

[9]A problem one may see in Table 1 and Table 2 is that the average income for renters and for total owners are lower than that for owners with one house only and owners with more than one house. The average housing price has similar problem. This problem is caused by different data set. In "Annual Housing Survey" data set, because of restrictions the data is pooled from 1988 to 1993. On the other hand, the observation period in "Personal Housing Loan" is from 1988 to 1992. What is interesting is that housing price/income ratio is similar for both data sets, they are 6.14, 5.28, 5.44, and 5.04 for total owners of DGBAS data set, total owners of Land Bank data set, owners with one house only, and owners with more than one house, respectively.

show that the income elasticity of investment demand for housing should be greater than one.

Now, the "Personal House Loan" data set is applied here specifically to estimate the income elasticity of investment demand for housing. The data set is also divided into two subtenure groups, households with only one house and households with a second house or more. Again, by applying OLS method the estimation results are shown in Table 4. All coefficients in Table 4 are significant at 95% significance level with right signs for both subtenture groups. Additionally, $\overline{R}^2$s are also quite high.

**Table 4. The Expenditure Function of Owning One House and Owning a Second or More Houses**

| | All Owners | Owners with One House Only | OwnersBuying Second or More Houses |
|---|---|---|---|
| Intercept | -0.0716 | 0.7189 | -0.7949 |
| | (0.11) | (0.81) | (0.34) |
| LY | 0.9310** | 0.8945** | 0.9379** |
| | (21.88) | (15.03) | (15.60) |
| LPH | -0.1150** | -0.1448** | -0.0534 |
| | (2.82) | (2.93) | (0.74) |
| $\overline{R}^2$ | 0.7050 | 0.6273 | 0.7934 |
| F-value | 242.426** | 112.915** | 131.552** |
| Number of Observations | 202 | 133 | 68 |

Notes: (1) Dependent variable is LEH, i.e. log of real housing expenditure.
(2) LY and LPH represent log of real income and log of real housing price, respectively.
(3) ** indicates that the coefficient is significantly under 95% significance level and the absolute t-value is in the parenthesis.

When a household buys a second or more houses, his buying behavior could be classified as a pure investment motive since he does not enjoy any housing consumption there.[10] On the other hand, when a household owns only one house, he enjoys both consumption demand and investment

[10] In fact, owning a second house may not be a pure investment motive. For example, some families own their second houses for recreation purposes. For this case, we may get an over estimation of investment motivation. However, generally speaking, the demand for second houses as recreation purposes is quite low in Taiwan. Therefore, we believe that the situation of upward bias for estimating investment motive in Taiwan is not as serious as in other countries.

demand. Therefore, the income elasticity for a household who buys his second or more houses $(h_h^2)$ should be higher than that for a household owning one house only $(h_h^1)$, since the former represents a pure investment demand which intuitively contains a higher income elasticity. In Table 4, the empirical results confirm this statement, since $h_h^2$ (0.9379) is larger than $h_h^1$ (0.8945).

However, comparing Table 4 with Table 3, one may find that the income elasticity for all owners in Table 4 is much smaller than that of Table 3 (0.9310 vs. 1.2551). In order to compare three subtenure groups at a same base, i.e. renters, owners with only one house, and owners with more than one house, the income elasticities for the latter two are adjusted according to the income elasticity in Table 3.[11] After the adjustment, the income elasticity for owners with more than one house $(h_h^2)$ is 1.2643, while it is 1.2057 for owners with one house only $(h_h^1)$[12].

The income elasticities for three subtenure groups are summarized in Table 5. Housing is an necessity when it serves as pure consumption good, since renters' income elasticity $(h_h^C)$ is almost equal one (1.0413). On the other hand, it is a luxury good when a dwelling unit serves as an investment good, since households' income elasticity for pure investment purpose $(h_h^2)$ is greater than unit (1.2643). Furthermore, the order of income elasticities for different subtenure groups in Table 4 is $h_h^C < h_h^1 < h_h^A < h_h^2$.[13]

We chart the estimated results in Figure 1. $H^C$ has a flat slope comparing to $H^I$ since consumption demand should have a smaller income elasticity. In the meantime, $H^C$ has a positive intercept (a) showing that a minimum amount of housing consumption is necessary even for a household with zero income.

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[11] There is one reason to explain why the estimated coefficients in Table 4 are underestimated. One has to note that the data set employed in Table 4 comes from Land Bank of Taiwan. When people file their income data to apply for an equity loan, they tend to inflate their income so that they may have a higher chance of getting their application approved. So the estimated income elasticity could be underestimated since income has been inflated there.

[12] The adjustment for $h_h^2$ is: 1.2551/0.9310=$h_h^2$/0.9379, so the adjusted $h_h^2$=1.2643. For $h_h^1$, 1.2551/0.9310=$h_h^1$/0.8945, so $h_h^1$=1.2057.

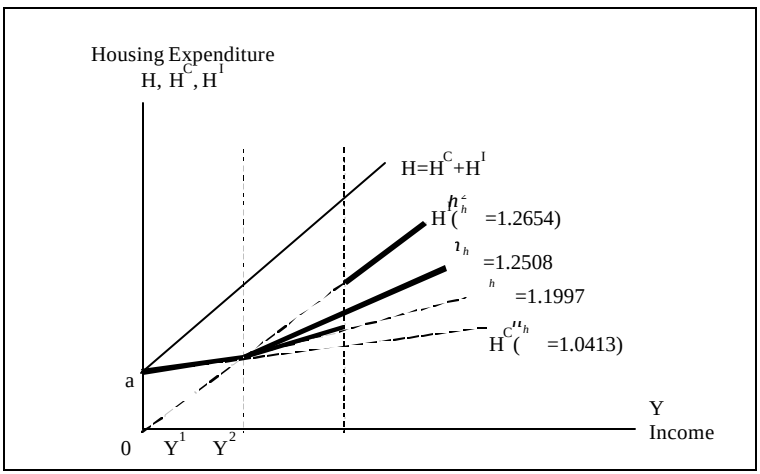
[13] One has to note that $h_h^A$ should have a larger elasticity than $h_h^1$, since the former contains total owners while the latter is for owners with one house only.

Moreover, it is intuitive to assume that both types of demand are normal and so that they are positive correlated with income (Y). For simplicity, we assume that households with income less than $Y^1$ will rent their houses,

**Table 5. Income Elasticities of Housing Demand for Different Subtenure Groups**

| Subtenure Groups | Income Elasticity |
|---|---|
| Renters (pure consumption demand) | $h_h^C$ =1.0413 |
| Owners with one house only (both for consumption and investment) | $h_h^1$ =1.2057 |
| Owners buying second or more houses (pure investment demand) | $h_h^2$ =1.2643 |
| Total Owners(both for consumption and investment) | $h_h^A$ =1.2551 |

**Figure 1. Income Elasticities of Housing Expenditure**




Notes: 1. Assume households with income less than $Y^1$ are renters; households with only one house have income between $Y^1$ and $Y^2$ ; and households having income greater than $Y^2$ are those who own more than one house.

2. $h_h^C$: income elasticity for renters (pure consumption motive), $h_h^1$: income elasticity for owners with only one house, $h_h^A$: income elasticity for total owners, $h_h^2$: income elasticity for owners buying second or more houses (pure investment motive).

while a household with an income between $Y^1$ and $Y^2$ will own only one house. For households with income higher than $Y^2$, they will own more than one house.

In conclusion, the estimation procedure is shown in Figure 1. Firstly, a data set with renters only is applied to estimate income elasticity ($h_h^C$) standing for

pure housing consumption demand, that is, for households with income less than $Y^1$. Secondly, a data set with only households who buy their second house, that is for those households with income higher than $Y^2$, is employed to estimate the income elasticity ($h_h^2$) for pure investment demand. Thirdly, a data set with households who own only one house, i.e. for those income between $Y^1$ and $Y^2$, is used to estimate their gross income elasticity ($h_h^1$).[14] Finally, a data set with households having one or more than one house (i.e. total owners) will also be applied here to estimate their gross income elasticity ($h_h^A$).[15]

After getting the estimated income elasticities, it is not difficult to compute the shares of consumption demand and of investment demand for households with only one house. According to Equation (11) and (12), the shares of consumption demand and investment demand for housing are computed as follow,

$$\frac{a_h^C}{a_h} = \frac{H^C}{H} = \frac{h_h - h_h^I}{h_h^C - h_h^I} = \frac{1.2057 - 1.2643}{1.0413 - 1.2643} = 0.2628,$$

and

$$\frac{a_h^I}{a_h} = \frac{H^I}{H} = \frac{h_h - h_h^C}{h_h^I - h_h^C} = 1 - \frac{a_h^C}{a_h} = 1 - 0.2628 = 0.7372.$$

That is, for households owning one house, the share of consumption demand for housing is about 26.28%, and the share of investment demand for housing is about 73.72%.[16] In other words, most of homebuyers in Taiwan consider investment factors more important than consumption factors when they purchase their houses.

## Conclusion

[14] Since $h_h^1$ is a linear combination of $h_h^C$ and $h_h^2$, according to Equation (6) and (7), $h_h^1$ should be somewhere between $h_h^C$ and $h_h^2$.

[15] $h_h^A$ should be greater than $h_h^1$ intuitively, since it also contains households who own more than one house.

[16] One may argue that the estimated proportion for investment demand for housing is higher than one's intuition. There are two reasons to explain our results: Firstly, some households may own their second houses for recreation purposes, not for investment purposes. Therefore, when we assume that investment is the only purpose for owning a second house, we may get an upward biased result. Secondly, there may exist a lock-in effect for buying a house mainly because the moving cost is very high. Therefore, when a household buys a house he/she may consider buying a house larger than his/her optional size because he/she may need a larger space in the future (for his/her children to use, for example). We appreciated a referee's comment on this viewpoint.

Buying a house is usually to satisfy housing consumption demand and housing investment demand simultaneously. In order to disentangle the above two types of demand, households are separated into three subtenure groups in this study, i.e. renters, owners owning one house, and owners buying a second or more houses. Presumably, renting a house is for consumption only, while buying a second house could represent a pure investment demand since it serves almost no consumption purposes. For households owning only one of the house could be purchase for both consumption and investment purposes.

Applying two data sets from Land Bank of Taiwan and DGBAS, the estimated results are as follows: Firstly, housing is a necessity in Taiwan for a pure consumption motive with a income elasticity near one (1.0413). Secondly, the income elasticity for a pure investment demand is greater than one (1.2643), which shows that a dwelling unit is a luxury good when it serves as an investment good. Finally, for a household owning one house only, the shares for consumption motive and for investment motive are 26% and 74%, respectively.

# Appendix

**Table A.1. The Price of Composite Commodity ( $P_t$ )**

| Year | CPI [(a)] | CPI-HOUS [(b)] | Weight $(w_h)$ [(c)] | $P_t$ [(d)] |
|---|---|---|---|---|
| 1979 | 60.04 | 58.70 | 286.88* | 60.58 |
| 1980 | 71.45 | 70.37 | 284.78* | 71.88 |
| 1981 | 83.12 | 79.89 | 284.78* | 84.41 |
| 1982 | 85.58 | 82.04 | 284.78* | 86.99 |
| 1983 | 86.75 | 83.64 | 266.88 | 87.88 |
| 1984 | 86.72 | 84.38 | 266.88 | 87.57 |
| 1985 | 86.58 | 84.70 | 266.88 | 87.26 |
| 1986 | 87.19 | 84.58 | 266.88 | 88.14 |
| 1987 | 87.64 | 85.01 | 266.88 | 88.60 |
| 1988 | 88.77 | 85.60 | 275.58 | 89.98 |
| 1989 | 92.68 | 89.40 | 275.58 | 93.93 |
| 1990 | 96.51 | 94.54 | 275.58 | 97.26 |
| 1991 | 100.00 | 100.00 | 275.58 | 100.00 |
| 1992 | 104.46 | 105.15 | 296.64 | 104.17 |

Source : Indices of Consumer Price in Commodity-Price Statistics Monthly in Taiwan Area of the Republic of China, ed. by Directorate-General of Budget, Accounting and Statistics, Executive Yuan.

Notes : (a) Consumer Price Index---General Index.

(b) Consumer Price Index---Housing, including rents; maintenance and repairs which contain materials, maintenance and repair services; household appliances and equipment which contain fabric decoration, furniture, electric appliances and kitchen utensils; household keeping services, water supply, electricity and gas which contain gas, water, electricity and public services.

(c) The thousandth share of the housing expenditure in total expenditure. * is substituted by the indices of Urban Consumer Price in Taiwan Area for lack of the Indices of Consumer Price in Taiwan Area.

(d) $P_t = \dfrac{(a)-(b)*w_h}{1-w_h}$, which is computed by the authors.

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