Comparing Approaches to Value Owner-Occupied Housing Using U.S. Consumer Expenditure Survey Data

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Outline

• Introduction
  – Importance
  – Purpose of this study
  – Summary of findings

• Methods and procedures

• Results

• Conclusions
Introduction

• Prevalence of owner-occupied housing in U.S.
• Importance for economic well-being measurement
  – Consumption
  – Income
• Federal statistics
  – CPI
  – PCE and National Income Accounts
• Census Bureau, other agencies, and groups
  – Request for income statistics for poverty measurement
• International standard (ILO, SNA, EuroStat)
Purpose

• To explore how owner-occupied housing can be valued so that the flow of services from such housing can be captured in consumption expenditures and income
  – Hedonic regression models
    • Pooled sample of owners and renters (capitalization rate model)
    • Renter sample (renter hedonic model)
  – Reported rental equivalence (modeled)

To compare predicted owner implicit rents
To produce implicit net rental income

• To explore what might influence responses to the rental equivalence question in the CE
Caveats

• Preliminary results
  – *not to be quoted without permission*

• Statistical tests of differences across approaches not conducted

• Regression statistics do not reflect complex sample design of the CE although results are based on population weighting
Summary of Findings

- Implicit rents vary across geographic areas
- Implicit rents based on rental equivalence are higher than those based on
  - Hedonic regressions of renters’ rents
  - Implicit capitalization rates
- Net implicit rental income
  - Highest with rental equivalence for MSA areas
  - Usually higher with cap rate model versus renter hedonic model
- Rental equivalence model with additional variables
  - Positive and statistically significant relationship
    - Out-of-pocket shelter spending
    - Education
  - Not statistically significant
    - Mortgage status
    - Age of respondent
Contribution to the Literature

• Exploratory study comparing approaches to derive implicit rents for owner-occupied housing

• First to use implicit rents from the three approaches in the production of net implicit rents that could be added to income using CE data

(Earlier work by Garner, Short, and Kogan (2006) was first to produce implicit rents using the three approaches)
Valuing Owner-Occupied Housing Services

- Pooled-tenure hedonic model (renters and owners) - capitalization rate

\[ \ln(\text{price}) = BX + \gamma \text{Tenure} + \varepsilon \]

- Renter hedonic model of rents

\[ \ln(\text{rent}) = BX + \varepsilon \]

- Owner hedonic model of rental equivalence

\[ \text{renteq} = BX + \varepsilon \]
Pooled-Tenure Hedonic Model

\[ \ln(price) = BX + \gamma \text{Tenure} + \varepsilon \]

\[ \ln(propertyvalue) = BX + \gamma + \varepsilon \]

\[ \ln(rent) = BX + \varepsilon \]

\[ \ln(rent) - \ln(propertyvalue) = -\gamma \]

Rewritten as:

\[ \ln\left(\frac{rent}{propertyvalue}\right) = -\gamma \]

\[ \text{caprate} = \left(\frac{rent}{propertyvalue}\right) = e^{-\gamma} * 12 * 100 \]
CE Rental Equivalence

What would you say that your dwelling would rent for monthly unfurnished and without utilities?
Regressors

- Number of rooms not including baths
- Number of full baths
- Number of half baths
- Dwelling age
- *Dwelling age missing*
- Single detached home
- Mobile home
- Off-street parking
- Porch, balcony, patio
- Central AC
- Window AC
- Number of persons per room
- Median property value within PSU

- For pooled regression
  - Tenure
  - Energy utilities in rent
  - Water/trash utilities in rent

- For renter regression
  - Energy utilities in rent
  - Water/trash utilities in rent

- For rental equivalence
  - Value of property
  - Value of property squared
Net Implicit Rental Income

• Owner is a producer of housing services
• Defined as:

\[ R_n = (R_g - C) + \rho V \]

- **\( R_n \)** = After tax net implicit rental income
- **\( R_g \)** = Gross implicit rent
- **\( C \)** = Operating costs net of tax preferences
- **\( \rho \)** = Expected appreciation
- **\( V \)** = Current market value
Operating Costs

• Owner-Producer pays to maintain the property, cost of financing, and depreciation
  – Specifically
    • Maintenance and repairs
    • Property insurance
    • Property taxes (preferential treatment)
    • Mortgage interest (preferential treatment)
    • Depreciation
Simplified Definition of Net Implicit Rental Income

• Property insurance \((0.5 \times \text{owners’})\)

• No adjustment for preferential treatment of
  – Property taxes
  – Mortgage interest

• No accounting for
  – Depreciation
  – Appreciation
CE Interview Data

• Collected using personal interviews *(and telephone)*
• Nationally representative of non-institutionalized consumer units (CUs)
• Sampling frame: 1990 Census with augmentation
• Collected on continuing basis since autumn 1979 with panel rotation (CUs in and out in 5 consecutive quarters)

• Introduction of CAPI 2003Q2
• Study variables - *caveat*
  – *Property value of owned home and dwelling unit characteristics*: asked in first interview only for “today”
  – *Rental equivalence*: asked each quarter for “today”
  – *Rents paid (not adjusted for business expenses)*: asked each quarter for last three months
CE Interview Data: Study Sample

• 2003Q2-2004Q1 (~30,000 interviews)
• Sample restrictions
  – Last interview
  – Not in student housing, government or subsidized housing
  – Renters
    • Positive rents
    • Did not receive rent as pay
  – Owners
    • Positive rental equivalence and positive property values
    • Lived in same owned property in last three months (issue for shelter expenses)
  – No imputations for dependent variables
    • Rents: 96% of unrestricted sample
    • Owners‘ rental equivalence: 75% of unrestricted sample
    • Owners’ property value: 83% of unrestricted sample
    • Owners with both restrictions: 66% of unrestricted sample
Final Sample

n=\sim 10,300\ consumer\ units

70\%\ of\ unrestricted\ sample

- 42\%\ renters\ (31\%)
- 58\%\ owners\ (69\%)
Results

• Analysis conducted at region-MSA status level
  – Pooled regression for capitalization rate hedonic

• Analysis conducted at region level with results shown at region-MSA status level
  – Renter hedonic
  – Reported rental equivalence hedonic

• All results are population weighted

• Present results for regional central cities
  – Derived capitalization rates
  – Predicted implicit rents
  – Net implicit rental incomes
Capitalization Rates for Central City 2003: CE and AHS

The bar chart shows the capitalization rates for Central City 2003, broken down by region (National, Northeast, Midwest, South, West) and category (CE Restricted, CE Unrestricted, AHS). The rates are presented as percentages, with values ranging from 0.0 to 9.0 percent.
Median Monthly Owners’ Implicit Rents and Expenditures: 2003

- Rent: $0, $200, $400, $600, $800, $1,000, $1,200, $1,400
- Market: Northeast, Midwest, South, West
- Analysis: renter hedonic, cap rate, predicted REQ, shelter exp with prin, shelter exp w/o prin
Average Operating Costs as Shares of Owners’ Implicit Rents: 2003
Median Monthly Owners’ Net Implicit Rent: 2003

![Bar chart showing median monthly owners’ net implicit rent by region in 2003. The regions are Northeast, Midwest, South, and West. The chart includes data for renter hedonic, cap rate, and predicted REQ.](chart.png)
Rental Equivalence: Additional Information

- Log linear model with demographics and other variables fits the data better
- Positive and statistically significant coefficients
  - Quarterly spending on shelter
  - Higher education
- Did not add to the explanatory power of the model
  - Age of respondent
  - Whether the CU had a mortgage or not
Conclusions

• Location, location, location
  – Owner imputed rents are different across geographic areas
  – Importance of housing unit characteristics varies across areas

• Rental equivalence results in highest implicit rents

• Net implicit rental income can be derived from CE but more work is needed to produce a more complete measure

• Data issue: using imputed versus not imputed rents, rental equivalence, and property values from the CE has an impact on the results
• Further research is needed to identify reasons why rental equivalence is always higher than imputed rents based on the other two approaches
  • Housing unit quality and neighborhood quality
  • Role of the presence of renters in a geographic area (i.e., renter intensity)

• **Caution** should be followed before one approach is selected over another to produce measures of consumption and income that account for the value of owner-occupied housing in the U.S.

• Much more work needs to be done … *we have only just begun*
Shelter Expenditures

• Associated with producing housing services – operating costs
  – Mortgage interest
  – Property taxes
  – Property insurance
  – Maintenance and repairs

• All owner shelter expenditures (including mortgage repayments, equity loans and lines of credit)