

STEPS IN ESTIMATING HEDONIC EQUATIONS IN POLAND

A BRIEF "HOW-TO" MANUAL

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Next Steps for Development of Rent Schemes Using Hedonic Indices

I. Overview . This memorandum is companion to the paper, "The Use of Hedonic Indices in Rent Differentiation". The memo discusses in somewhat more detail the steps that would be necessary to introduce the hedonic technique into the current rent setting efforts being undertaken by the gminas. To introduce the topic, however, the final section of the paper cited above is reproduced here in order to summarize the context for the next steps.

(1) The hedonic rent setting strategy should be viewed as a long-run approach for Poland. The hedonic approach cannot yet be based on private market data for every gmina because the establishment of "free rents in a freely operating market" is still evolving and many gminas do not have sufficient privately traded units to estimate an equation. In the interim, the point schemes being set in place by gminas will be effective in introducing the concept of greater variation, as well as solving revenue and other policy goals.

(2) In the long-run, the hedonic and/or market based point system approaches could be used to modify the rent systems the gminas are now designing. Larger gminas, with adequate data on privately traded units, could begin the necessary data collection now. Smaller gminas, with similar types of housing stock, could pool both resources and information on private housing and develop a system jointly.

(3) Data collection for a sample of Units, Estimation of the Hedonic Equation, and Design of an Inspection Form for full Data Collection. Because much the rental housing stock in many gminas in Poland does not show an excessive amount of variation in size and layout, the information needs to estimate good hedonic equations estimated for the rental stock may not be too demanding. However, the major variations are likely to occur among particular types of characteristics. These are likely to include (1) special quality features of the unit, (2) the quality of the immediate neighborhood, and (3) the location of the building and access to public and private services.

At a minimum then, additional data would need to be collected for a sample of privately-traded units. The "sample" inspection would include more data than likely to be used on the main inspection form. A hedonic equation would then be estimated to determine which variables were significant and what the best specification was. This step, in turn, would assist in design of the inspection form used to collect the information on the communal units.

Finally these data would be used to "solve" the hedonic equation and obtain an estimated rent for each unit. The results would be analyzed by city officials and the final list of variables and weights selected.

II. Next Steps in Introduction of the Hedonic Technique.

(1) Determine the Approach to Sampling Privately Traded Dwelling Units that are as Similar as Possible to the Gmina's Communal Housing Stock.

As

noted above, larger gminas in Poland may now have a sufficient sample of privately traded units similar in design to the not-for-profit housing to develop their own hedonic equations. Smaller gminas could profit from these estimations. In addition, smaller gminas could pool resources with like communities elsewhere in Poland and jointly derive an hedonic equation.

A representative sampling plan would then be drawn up to collect data on these units and their locations. Where data are limited, the universe of traded units would be used.

How many units are needed for a satisfactory estimation? Different statisticians will answer this question differently. It is actually strongly suggested that gminas engage the assistance of consultant professors or statisticians before spending a lot of resources on design and data collection. In any event, an adequate and representative sampling plan must be developed. At the risk of offending proper statisticians, the author will offer a convenient "rule of thumb" for judging the number of units: the total sample should be at least 15 to 20 times the number of variables expected to be significant in the equation (i.e. in an equation with 20 variables, the sample should be at least 300 to 400 units. Note, however, that this "rule" is broken all the time!)

(2) Develop a Draft Inspection Form for Suitable for Hedonic Data Collection.

It should be noted, first of all, that the majority of inspection forms are used for purposes of estimating capital repair needs and assessment of health and safety conditions. The inspection forms to be used for the hedonic estimation clearly have a different purpose and thus a quite different design. There is, of course, bound to be overlap, especially in noting unit size, number of rooms, layout, and so forth. However, the capital needs inspection forms generally do not contain the requisite quality variables and are almost certainly do not have the important neighborhood quality feature included.

A good starting point would be quality-oriented inspection forms in use elsewhere for purposes off hedonic estimation. Examples of the types of variables needed are presented in tables 3.1 and 3.2. Many actual forms can be obtained from the U.S. and elsewhere.

(3) Collect the Data through an Inspection of the Sample Units and Estimate an Hedonic Equation

The next step follows the general prescription set forth in the companion paper. Again, however, each situation in unique and there are indeed statistical issues that need to be carefully addressed in this step. Thus, there are statistical decisions as well as practical ones that help dictate the functional form of the equation, the variables to include, and the validity and interpretation of the estimated weights. Here again, we suggest the use of assistance from local professors and statisticians.

(4) Refine the Hedonic Equation from step (3).

For the statistical reasons cited above, the specifications are generally carefully reviewed and modifications made. There may also be policy reasons why some variables are more relevant than others or why proxies for information thought to be missing from the equation might have to be developed and entered into the equation. This step is called forth separately to reinforce the point that while there is a lot of "science" in the approach, when it comes to the practical applications, such as devising rent schemes, the "political art" also has to enter the equation.

(5) Refine the Draft Inspection Form.

Based on steps (3) and (4), the inspection form is redesigned and streamlined to include only the information felt to be important for the rent setting process. As discussed in the companion paper, for statistical reasons, fewer variables are likely to enter (be significant in) hedonic equation than would be thought to be important in describing quality. This occurs because many of the variables describing the housing stock will be correlated: that is, the wall quality of the living room will, on average, probably be related to the wall quality of the remaining rooms. Since this type of multicollinearity makes the weights unstable (and sometimes look like nonsense), only selected variables can be used to describe the unit. Thus, the inspection form can possibly be reduced in scope to collect only those most relevant.

(6) Collect Data on the Units for which the Rent scheme is being Introduced.

The inspection form described in step (5) is then used to collect data on all the units affected by the rent setting scheme.

(7) Solve the Hedonic Equation for each Dwelling Unit.

The hedonic equation is then "solved" for each unit. The estimated rents for each unit must then be carefully reviewed for both statistical and policy purposes as described in the next three steps.

(8) Review the Results and Make Modifications to the Hedonic Results as Necessary.

The resulting rents are immediately reviewed for specification error, data entry mistakes, and the existence of "outlier" (results which don't seem to make sense). The final results are then entered into both the computer system and the gminas's rent management database.

(9) Revise or Modify the Hedonic Approach to Reflect Gmina Goals for the Rent Differentiation Strategy.

Many options are open to the gmina at this point, including the following:

- the modified hedonic equation can be used to solve for rent as is, and the new rents are reviewed and set in place;

- the hedonic equation can be used to devise a point system;
- the hedonic equation can be used to develop a stratification scheme, or a combined stratification/hedonic scheme.

The rent scheme which results from solving the hedonic equation, once reviewed and modified, can be used exactly as is. However, as has been discussed in section 4.0 of the companion paper cited above, it can be modified into a combined stratification/hedonic scheme as described in the example given for the city in the United States. Equally, the results can be used to develop a point system, such as those widely used in Europe and the United Kingdom.

In any of these options, two key principles are being addressed:

(1) Market-based transactions have been used to help define both the characteristics of the dwelling units to be used in the rent setting scheme and their relative weights.

(2) A system has been developed which treats each unit (and household) on a clear and equitable basis. City officials are provided with defensible, acceptable decision-making tools.

(10) Integrate the Final Pricing Strategy into other Gmina Policies for the Housing Stock Regarding the Base Level of Rent, Unit Allocation and Exchange, Affordability, and so forth.

Finally, as discussed in section 2.0 of the companion paper, gmina officials are clearly trying to balance many objectives in their communal housing policies. As long as the process is clear, deviation from the "market-based" estimated rents is plausible to solve other goals regarding total revenues, affordability, cross-subsidization among units and households, and numerous other policies. The goal is to make the adjustments as transparent and clear cut as the original derivation of the market rents.

III. Sample Hedonic Equation and Variable List

Tables 3.2 and 3.4 from the companion paper are reproduced here for the reader's convenience. They describe the types of variables available from the nation-wide American Housing Survey (AHS) and their use in estimating a hedonic equation. As noted, the AHS, designed to serve numerous policy and research purposes and yet be conducted on a cost-effective basis, does not contain as many of the types of unit quality or locational variables as would be desired for development of an hedonic index. However, it is available to all researchers in the U.S. for only a small fee, and this is used for numerous studies. The equation presented in table 3.4 can be modified to demonstrate the impact of alternative functional form, alternative variable specifications, and alternative samples.