Chapter 3

ESTIMATING DWELLING SERVICES IN THE CANDIDATE COUNTRIES: THEORETICAL AND PRACTICAL CONSIDERATIONS IN DEVELOPING METHODOLOGIES BASED ON A USER COST OF CAPITAL MEASURE

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1. Introduction

Within the European Union, the standard method for evaluating owner-occupied dwelling services in the national accounts has been the stratification variant of the rental equivalence approach. Unfortunately, this method could not be satisfactorily implemented by many of the candidate countries from Eastern Europe that were acceding to membership in the European Union in the late 1990s. Their implementation problems are rooted in the reality that some of these countries had, and still have, small private rental sectors that are not representative of the overall housing market. This paper discusses an alternative method for evaluating these dwelling services based on the user cost of capital measure that was developed by a Eurostat task force.

The paper is organized as follows. First, the background to the task force is given. Next, the theory behind the user cost method is described. Then, a short history of the method used by U.S. statistical agencies is given. Initial considerations and empirical recommendations for evaluating dwelling services are presented in sections 3-9. Section 10 offers lessons learned and modifications to the initial recommendations. In the concluding section of the paper, the author shares his views on the project taken up by the task force. A mathematical appendix is also provided that shows the formal derivation of the user cost measure.

2. Background

Because official measures of GDP and other aggregates are used in formulating economic policy and to determine transfers for member countries within the European Union (EU), the European Commission (EC) tries to ensure that the national accounts of Member States (MS) are

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estimated using comparable methodologies. To this end, in 1995, the EC issued a detailed statement on how dwelling services in all Member States are to be measured using the so-called "stratification method."[2] This method essentially involves dividing the stock of dwellings of a country into various strata, sampling the actual rents paid for dwellings currently being rented to estimate the average rent paid in each stratum per rented dwelling, and valuing the dwelling services of all units in a given stratum (including owner-occupied dwellings) by the product of the number of dwelling units in the stratum and its estimated average rent per unit. A similar methodology is used in the United States. There, rents are imputed to owner-occupied dwellings by dividing the stock of dwellings into strata based on dwelling value, determining the average rent to value ratio for comparable units (in the same value class) that are actually rented out and multiplying these ratios by the total value of the owner-occupied units in the stratum.

In 1998, there were thirteen countries that were candidates to join the European Union. These candidate countries (CCs) consisted of: Bulgaria, Cyprus, the Czeck Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, Slovenia, and Turkey. CCs are required to comply with all EU legislation including the Commission Decision on Dwelling Services (CD). Eurostat organized two projects to assist the CCs with their estimates. The first was the A8 Dwelling Services Project (A8 hereafter), which existed between October 1998 and May 2000. Its initial goal was to provide technical assistance to national statistical offices for implementing the stratification method. This goal was later abandoned because it became clear that there were a number of fundamental reasons why CCs are not able to comply. Having abandoned the goal of stratification, the project gave an overview of the estimation methods and data sources that are currently in use in the CCs, considered various methodological problems, and recommended improvements for some of the CCs.

The work that A8 started was carried forward by the Dwelling Services Task Force, which operated between June 2000 and September 2000. This task force sought to find alternative approaches to the stratification method.[3]

The first task was to determine when the stratification method would be inappropriate for a country. The recommendation was that: "In the case of privately rented dwellings constituting less than 10% of the total dwelling stock by number *and* where there is a large disparity between private and other paid rents (say, by a factor of three), as an alternative objective assessment, the user-cost method may be applied," (European Commission 2001, p. 68).

The task force examined the two recognized alternatives to the stratification method: self-assessment and user cost. Self-assessment was ruled out as too subjective. This left user cost as the only viable measure. Hence the task force put most of its effort into specifying a user cost measure that is consistent with the requirements of the CD.

[2] See the Commission Decision of 18 July 1995 specifying the principles for estimating dwelling services for the purpose of implementing Article 1 of Council Directive 89/130/EEC, Euratom on the harmonization of the compilation of gross national product at market prices (95/309/EC, Euratom), OJ No L 186, 5.8 1995, p. 59 (http://europa.eu.int/eur-lex/en/lif/dat/1995/en_395D0309.html).

[3] The Dwelling Services Task Force was an initiative of Eurostat Units B1 and B2 and reported to the National Accounts Working Party. Eurostat Unit B3 was also interested in the issue because dwelling services have been a problem for the work on the Harmonized Index of Consumer Prices and Purchasing Power Parities. Rather than set up its own separate task force, Eurostat B3 joined the one reporting to the National Accounts Working Party. Thus this Dwelling Service Task Force sought to provide solutions that would accommodate the combined needs of the interested Eurostat units that had been instrumental in its creation. For related technical issues, see Diewert (2002).

The task force noted that the user cost approach reverses the normal accounting procedure and builds up output from its components. Thus, gross rentals equal the sum of intermediate consumption, consumption of fixed capital (CFC), compensation of employees (which is zero for owner occupiers), other (net) taxes on production, and the net operating surplus. The task force recommended that as many of the cost elements as possible should be valued by direct measurement. Where there are imputations rather than measurements, these should be based on standardized assumptions to ensure comparability of results. To better estimate CFC, as soon as possible, the CCs should establish perpetual inventory models (see footnote 9 of this chapter) for estimating CFC for dwellings and these should be partitioned into the owner-occupied and public and privately paid rental sectors. The net operating surplus should not be set to zero. Instead, the task force recommended that this should be:

> "… calculated as a rate of return applied to a market valuation of the owner-occupied dwelling stock based on the adjusted current replacement cost method. The rate of return should be based on as much empirical evidence as possible and ideally should represent an average rate typically obtained from the application of similar productive assets in the most similar activities,"
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> (European Commission 2001, p. 73).

The "Task force on estimation methods for dwelling services in the Candidate Countries," was also formed to define a user cost approach and to consider practical options for its implementation by the CCs. It functioned from November 2001 through July 2002. [4]

After an initial meeting of the experts, a questionnaire was sent to the central statistical offices of the participating CCs to determine what data they had available that could be used to implement a user cost measure. Taking account of the data realities, several methodologies were developed that could be used to estimate user cost measures of the rental value of owner-occupied housing. One of the major constraints on the task force's work was that it was necessary for every participating country to be able to implement at least one of the proposed methodologies. Draft templates for the proposed methodologies were developed that gave detailed step-by-step instructions for making the empirical calculations. The suitability of the draft templates was discussed and agreed to by the participating countries at the first meeting of the task force. The participating countries then produced experimental estimates for the period 1997-2000 using the templates. Estimates were also made using several different assumptions about the rate of return and the rate of depreciation of dwellings so that a sensitivity analysis could be conducted. These estimates were presented at the second meeting of the task force. At that meeting, some problems were identified (particularly with the estimation of the net operating surplus) and solutions were recommended. The templates were revised to reflect the solutions and participating countries used the revised templates to make new experimental calculations.

[4] It was an initiative of Eurostat Units B1 and B2 and reported to the National Accounts Working Party. The aim was to develop practical methods and have participating CCs carry out experimental calculations. The Czech Republic, Hungary, Poland, Slovak Republic and Slovenia were involved. The task force was led by Roger Akers. After its final meeting, he was replaced by Mojca Skrlec Sinkovec. Arnold J. Katz prepared the templates that formed the basis of the empirical work and served as the principal expert. Mr. Norbert Hartmann, Mr. Seppo Varjonen, Ms. Silke Stapel, and experts from the participating CCs also made important contributions. A final report, Eurostat B1 (2002), was presented at the Regional Coordinator's Workshop of the International Comparison Program 2003-2005 held in Luxembourg, March 24-28, as were the template and associated notes and a paper by Katz (2003a, 2003b) on the theory and application of the user cost measure. This paper draws on this material.

3. The User Cost Measure in Theory

The "user cost of capital" measure is based on the fundamental equation of capital theory. This equation, which applies equally to both financial and non-financial assets, has been known since at least the middle of the 19th century. It states that in equilibrium, the price of an asset will equal the present discounted value of the future net income that is expected to be derived from owning it. For non-financial assets, the relevant "net income" consists of the net rental income that would be obtained from renting out the durable. When durables are used by their owners rather than rented out, the value of their services represents costs that are implicitly incurred by their owner users, i.e., this value represents the opportunity costs of forgoing the receipt of the rental income. As shown in the appendix to this paper, the fundamental equation can be easily manipulated to obtain the traditional user cost of capital measure, which expresses the implicit rental value of a durable good as the sum of depreciation, a real net operating surplus, and various operating costs.

There are three relevant theoretical points that are the source of some controversy.

Point 1 arises because, as shown in the appendix, the traditional version of the user cost formula is derived by assuming that all of a durable's services are received on the last day of the income period (generally a year). Elsewhere I have argued that to make the user cost measure more consistent with the principles used in national economic accounting, one should assume that equal quantities of a durable's services are received in every fraction of the year. When this is done, the user cost measure is approximately equal to the traditional expression (given in equation (A4) of the appendix) divided by the square root of one plus the nominal rate of return, which is the value obtained by assuming that all services are received on the mid-day of the year. Thus, it yields estimates that are smaller than those obtained using equation (A4).

Although Diewert (2003) recently discussed some related questions, there does not appear to have been any further discussion on this point.[5] Thus, given that the expression in equation (A4) has become standard in the literature, the task force decided to avoid this controversy and carried out all practical work with the traditional version of the user cost measure that assumes that all of a durable's services are received at the end of the income period.

Point 2 also has to do with the proper measure of depreciation (or consumption of fixed capital as it is now termed in most of the literature on national economic accounting). The change in the market value of a durable from the beginning of the income period to the end of the period can be partitioned into depreciation and capital gains components. The depreciation component measures the difference in price between the given durable and an identical one that is one year older, both prices being measured at the same point in time.[6] Recently, Hill (1999) coined the term "cross section depreciation" to denote this measure of depreciation and the term "time series depreciation" to denote the entire change in the durable's market value over the course of the income period. Thus, the user cost measure in equation (A4) can be described as

[5] See Katz (1982, p. 47) and (1983, p. 408). See also Diewert and Nakamura (2009).

[6] Economists have differed over whether the prices of the durables should be measured as of the beginning of the income period, the end of the period, or at some other time, see Katz (1983, p. 418). Because the annual measure of depreciation that appears in the NIPAs is equal to the sum of the four quarterly estimates, it is effectively measured using prices as of the middle of the year.

being equal to the sum of the real net operating surplus (the nominal net operating surplus less the expected capital gain on the durable) plus cross section depreciation. Equivalently, it can also be described as consisting of the nominal net operating surplus plus time series depreciation. The question of whether economic depreciation should be measured by the time series or the cross section measure was debated extensively in the 1930s and 1940s. For the past 50 years, most national accountants have appeared to accept the cross section measure, which is essentially depreciation at current replacement cost, as the appropriate measure for national accounting. However, recently some have challenged that and advocated the use of the time series measure.[7]

While not really a source of controversy with respect to estimating dwelling costs, a third theoretical point needs to be stressed as well. User costs include such operating costs as expenditures on maintenance and repair. These expenditures have been part of mathematical models of user costs since at least the time of Hotelling (1925) and their interaction with other factors that affect depreciation is stressed by Faucett (1980). Their inclusion in estimates of dwelling costs is obvious to most national income accountants because, when dwellings are actually rented out, the residual entrepreneurial income is estimated after these expenditures are subtracted out. In short, maintenance and repair expenditures are often a substitute for purchases of new capital goods. Estimates of capital input and output should be largely independent of whether such expenditures are capitalized or not. However, it appears that these expenditures are often omitted from estimates of capital input and not treated as an input at all in various estimates of aggregate production functions.

The method for estimating constant-price values with the user cost measure is now standard in the literature. In a paper written for the U.S. Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce, Wykoff (1980) pointed out that the Jorgensonian user cost measure of capital services can be described as the product of a quantity of capital services and a (unit) price of capital services. The latter consists of the product of the price of the capital good and an expression equal to the nominal rate of return plus the rate of depreciation less the expected rate of capital gain in the durable's price. Thus, rates of return are treated like prices and the standard way to express the measure in constant prices is to use the service price in the base year and the quantities for each given year.

4. Historical Application of the User Cost Measure by U.S. Statistical Agencies

In conjunction with a number of collaborators, Jorgenson has shown how the user cost measure could be employed to develop a set of capital accounts for each vintage of asset. The most complete exposition of how such accounts could be integrated into a national accounting framework is found in Christensen and Jorgenson (1973). The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor adopted a variant of the user cost measure of capital services in its work on measuring multifactor productivity (see BLS 1983). Here capital services are measured in constant prices. This finesses the problem of having to develop a theoretically correct current-price measure of these services that does not suffer from excessive volatility.

[7] Diewert (2005a, 2005b) cites Hill (1999, 2000) on the use of times series depreciation for national accounting.

In the mid 1970's, the BLS attempted to develop a measure of dwelling services based on the user cost measure for use in its consumer price index. This attempt was unsuccessful. The large changes in the real own rate of return for dwellings in the 1970's undoubtedly played a major role in the inability to obtain a current-price measure that was not excessively volatile.[8]

5. Initial Considerations and Recommendations for Measuring Dwelling Services

When dwelling services are estimated with the user cost measure, exactly what costs should be counted? The answer to this basic question is straightforward. The user cost computation is actually the reverse of the usual imputation for dwelling services based on the "stratification" method. With that method, the value of dwelling services is measured by the rents charged for comparable dwellings that are actually rented out. Various associated dwelling costs are then subtracted from this rent to obtain a net operating surplus. With the user cost measure, this calculation is reversed. The net operating surplus is imputed using the opportunity cost principle; i.e., the net operating surplus is imputed on the basis of what owner occupiers could have earned on alternative investments. Then, the dwelling costs that are subtracted in the stratification method are added to the imputed net operating surplus to obtain the imputed rent. These costs include: consumption of fixed capital (CFC) for dwellings, expenditures on ordinary maintenance and repair of dwellings, net premiums on insurance for dwellings, and taxes paid less subsidies received on dwellings and their associated land.

6. Consumption of Fixed Capital

CFC is one of the most important components of the user cost measure. Because it is extremely desirable for the user cost estimates to be consistent with the rest of the national accounts, the task force recommended that if a CC already had an estimate of CFC for owner-occupied dwellings for another part of the accounts, that estimate should be used here. It was recommended that if estimates of CFC on dwellings are not already available, then they should be estimated using the perpetual inventory method (PIM).[9] There are two basic reasons for using

[8] BEA also explored the possibility of employing a user cost measure in evaluating the services of consumer durables. Katz (1983) examined the theoretical and empirical issues involved in developing an appropriate measure. Katz (1982) examined how sensitive user cost estimates of the services of consumer durables were to alternative assumptions about expected rates of inflation and patterns of depreciation. Earlier, BEA published a de facto satellite account for the services of consumer durables in Katz and Peskin (1980) that used a crude version of the user cost measure termed an "opportunity cost measure." A similar opportunity cost measure was used at BEA by Martin, Landefeld, and Peskin (1984) in their de facto satellite account for the services of government capital.

[9] For those unfamiliar with the PIM, it can be summarized as follows. Constant-price CFC is estimated by taking the product of the beginning-of-year net stock at constant prices and the depreciation rate and summing it with one-half of the product of constant-price investment in dwellings (of a constant quality) and the depreciation rate. The end-of-year net stock at constant prices is estimated by taking its beginning-of-year value, adding constant-price investment in dwellings, and subtracting constant-price CFC on dwellings. Thus, both CFC and the net stock are essentially weighted averages of past investment. Current-price CFC is estimated by multiplying the constant-price value of CFC by the average value of the appropriate price index for the given year. Current-price net stocks are similarly estimated by multiplying the constant-price value of the net stocks by the end-of-year price index.

the PIM. First, variants on it can be easily constructed so that all CCs can implement it. Second, the nations of Western Europe generally estimate CFC using the PIM and it is desirable to use similar methodologies. Schedules of straight-line declines in prices (equal values of constant-price CFC in each year of an asset's life) were recommended as the preferred variant of the PIM because that appears to be the most prevalent method in Western European countries.

In moving from estimating CFC for a single dwelling to that for the entire stock of dwellings, it is also necessary to take account of three complicating factors. One is that dwellings that enter the stock during the year due to new investment undergo some depreciation during this year. A second is that some goods that are in the stock at the beginning of the year undergo depreciation and are discarded from the stock before the end of the year. And a third is that depreciation takes place continuously during the year rather than on one specific date. It is because of attempts to deal with these factors that CFC in U.S. national accounting is calculated by assuming that new investment depreciates by only half the amount that it would if it had taken place entirely on the first day of the year and CFC is calculated using year-average prices (i.e., average prices during the year).[10] It was recommended that this half-year convention be integrated into the CCs' estimates.

Yet another complicating factor is that the straight-line method is not the easiest method to implement because depreciation rates are different for assets of different ages and all assets are eventually fully depreciated and, consequently, discarded. The straight-line method requires keeping track of accumulated depreciation for each vintage of assets. However, there is little reason for requiring its use given that a simpler alternative exists that can produce results that closely approximate those obtained using it. Specifically, simulations were conducted that showed that total estimates of user costs produced using straight-line depreciation and an approximately normal distribution of service lives around the mean life could be closely approximated by geometric depreciation with a declining-balance rate of 1.6. With this method, the rate of depreciation is held constant over the asset's life; in the first year of an asset's life, it is 1.6 times what it would have been with the straight-line method. Because depreciation rates are made independent of an asset's age, depreciation does not have to be estimated separately for each vintage of assets, which substantially simplifies the calculations.

As noted above, because the data requirements for a PIM using geometric depreciation are so meager and the equations so simple, it was anticipated that all of the CCs would be able to implement the method. All that is required is an initial value of the (net) capital stock in constant prices and series of fixed capital formation for subsequent years in both current and constant prices. The latter series are required to estimate GDP; hence all nations that produce GDP estimates have these. There is still the problem, however, of obtaining the estimate of the initial value of the capital stock.

Because of the general lack of available price data in the CCs, it was necessary to provide specific guidance regarding the proper price indexes for the CFC calculations. In the final instructions, Katz (2003b) pointed out that the appropriate price index is the deflator for gross fixed capital formation (GFCF) for owner-occupied dwellings, i.e., the one used to convert current-price estimates of GFCF to constant-price ones. If this index does not exist, a similar one is to be substituted. The instructions recommend that, in order of their usefulness, possible

[10] See OECD (2002, p.96).

alternatives include the deflator for GFCF for all dwellings, the deflator for GFCF for all structures, and an index of relevant construction costs. (For these deflators, the appropriate value is the average annual value.) Note that in the United States, all of the deflators for investment in structures are derived from at most a half dozen unique indexes of construction costs.

It was left up to the individual countries to determine the appropriate average service life for dwellings, which when divided into the assumed rate of declining-balance (1.6) yields the depreciation rate. It was pointed out that some Western European countries use a life of 50 years, which would yield a depreciation rate of 3.2 percent. In contrast, the United States uses a 0.91-declining balance rate for residential structures, which corresponds to a geometric depreciation rate of 1.14 percent for 1-4-unit (new) dwellings and a rate of 1.4 percent for 5-or-more-unit dwellings. The United States uses rates that are more than double these geometric depreciation rates for major replacements and for additions and alterations to dwellings. Perhaps analyses of past censuses would give some indication of what service life assumptions are reasonable.[11]

7. Net Stock of Dwellings and Associated Land

To estimate the user cost of capital measure, it is necessary to have an estimate of the value of the net stock of owner-occupied dwellings at constant prices for the beginning of the period in which the user cost estimates are to be made. Because it appeared that many of the CCs did not have such estimates and some CCs lacked the data required for the preferred method for estimating net stocks, several alternative methods for obtaining these estimates were recommended. First, if a long time series on fixed capital formation for dwellings in constant prices is available, the stock estimate can be obtained using the PIM and geometric depreciation. This method incorporates the effects of improvements to existing dwellings because these are included in fixed capital formation. It also has the advantage of being consistent with the PIM that is used to estimate CFC, which would ordinarily make this the preferred method. However, the method has disadvantages. In order to be useful in estimating the net stock, the time series on CFC must be very long, i.e., it must cover at least forty years. (Note that the shorter the time series, the more important are errors caused by inaccurate estimates of the initial or seed value of the capital stock.) Given significant war damage or sales or transfers of dwellings between sectors, the series on CFC must be adjusted for these factors. Such adjustments are not easy.

The initial value of the stock of dwellings can also be estimated using the physical inventory method. This method requires physical data on dwellings usually obtained in a census. Fortunately, most CCs appear to have this data. Basically, the method involves placing a value on all dwellings reported in a recent census. The number of existing dwelling units is converted into the number of equivalent new units by adjusting existing units for their age (depreciation) and differences in quality. All units are valued at current prices using a price index for fixed capital formation in dwellings, or if this is unavailable, an index of relevant construction costs.

[11] For example, based on the U.S. experience, if one examined census data, one would ordinarily not expect to see significant rates of discard from the cohort of dwellings constructed in a given year until those dwellings had reached about 70 to 80 percent of the appropriate average service life.

The chief difficulty in implementing the physical inventory method is in making proper adjustments for the effects of depreciation. To make such adjustments, two variants of the basic physical inventory method were recommended.

Variant 1 requires data from only the single recent census. However, it also requires that the data on dwelling units be stratified by their year of construction (or age). The requirement will be met if, for example, separate data are available on all dwelling units in the stock that are 0-10 years old, 11-20 years old, etc.

Variant 2 does not require age-stratified data. However, it does require data from a second census conducted at least several decades before the recent one. By assuming constant growth rates for some of the major determinants of the stock, such as the quality and number of units, it is possible to convert the number of units in the recent census from the actual (physical) numbers of units into equivalent numbers of new units. Because this method essentially substitutes assumptions for the actual data used in the first variant, it is less preferred than that method. Both of these variants of the physical inventory method do not have the same problems of dealing with war damage as the PIM estimates do. However, as noted earlier, the stock estimates derived from the PIM reflect the effects of improvements to dwellings while, when the variants of the physical inventory method discussed above are used, these effects would have to be allowed for by explicit quality adjustments to the data.

For both variants of the physical inventory method, it was recommended that adjustments for the effects of age on the value of the stock be made using the same 1.6-declining-balance rate of depreciation that is recommended when the PIM is used. By using the same depreciation rate to value the stock and CFC, the two estimates are made more consistent and estimates of total user costs are less sensitive to alternative assumptions about the service life of dwellings.

It was recommended that wherever possible, the estimates of fixed capital formation that are used in the PIM or the estimates of equivalent numbers of new units that are estimated with the physical inventory method should be adjusted for quality change.

In addition to valuing the stock of dwellings, it is also necessary to value their associated land, i.e., the land that the dwellings sit on and which would be included in their selling price, if they were being sold. (Land can be thought of as a fixed capital good that differs from other fixed capital goods in that it does not suffer any depreciation.) Valuing land, however, is extremely problematical. Even in Western Europe, prices per unit of land in a central city can easily exceed those in rural areas by more than a thousand fold. Where land is taxed, it may be possible to infer the assessed value of the land. Otherwise, rough rules of thumb may have to be used such as assuming that land is a fixed percentage of the value of the dwelling located on it.

8. Other Operating Expenses

All expenses incurred on dwellings should be reflected in the user cost measure of dwelling services. Expenses that are capitalized and included in gross fixed capital formation, such as expenditures on improvements, will be reflected in the estimates of the value of the stock of dwellings and, therefore, in the estimates of the net operating surplus. They will also be reflected in the estimates of CFC. All expenses that are not capitalized need to be treated as other operating expenses and explicitly added to the other components of the user cost measure. These

expenses include expenditures on intermediate goods, such as those for ordinary maintenance and repair, net insurance premiums, and taxes less subsidies. Note that if the expenditures on maintenance and repair are of the kind that a tenant would make, they should not be included in the housing imputation but should be measured elsewhere in the accounts together with other expenditures that are not for dwellings. The task force anticipated that there would be little trouble in obtaining data on other operating expenses because this information is generally required to estimate the various accounts according to SNA93 and its European version, ESA95.

Net insurance premiums on dwellings are an important operating expense. This expense does not include insurance on the contents of the dwelling; such insurance is of a kind that a tenant would have and is measured elsewhere in the accounts. Insurance premiums are measured net of any payments received for incurred losses. Strictly speaking, the losses should be measured when they are incurred rather than when they are paid and premiums are measured when they are earned; the losses reflect the relevant insurance company's views about the liability it has incurred as a result of the loss (not the views of the insured about the magnitude of the loss). According to SNA93, the measure should also include premium supplements, which are the expected investment income on technical reserves other than on own assets (of the insurance company); this income should exclude capital gains.[12] Initial indications were that the data required to refine the estimates of insurance may be lacking in the CCs.

The final component of other operating expenses is taxes less subsidies paid. Many countries levy taxes on the value of dwellings and the land they are situated on. These are often referred to as property taxes. Because such taxes are costs that would not be borne by an investor in a financial asset, they represent opportunity costs that need to be included in the user cost measure. Some countries levy taxes on housing services. These taxes would also be added here. Conversely, any subsidies that owner occupiers receive need to be subtracted.

9. Net Operating Surplus

The most important and problematic component of the user cost of capital measure is the imputed real net operating surplus.[13] This surplus is estimated as the difference between the nominal net surplus received from an investment in an alternative asset and the expected capital gains on the durable itself. It is clear from the derivation of the user cost measure itself that the latter gains are those arising from changes in the price of the durable (when new) and not those from general inflation.

Computationally, the nominal net operating surplus is estimated as the product of an assumed nominal rate of return and the value of the net stock of dwellings and their land. It was recommended that the stock's value be measured as the average of the beginning- and end-of-

[12] This measure was introduced in SNA93 (Commission of the European Communities et al. 1993, p. 575).

[13] For those who are unfamiliar with the concept of an operating surplus, an explanation is in order. In the United States, it has been customary to measure the rental income of persons as a profit-type residual income after the subtraction from space (gross) rent of all associated dwelling costs including the payment of mortgage interest. In the SNA, the operating surplus is the residual income accruing to capital before payments are made to debt (e.g. dividends and interest). Thus the operating surplus includes the return to both the debt and equity portions of capital.

year values of the net stock. This incorporates the effects on the stock's value of gross investment during the year, depreciation, and changes in the price level for (new) dwellings.

The determination of the appropriate real rate of return is contentious. In theory, on the basis of the opportunity cost principle, the nominal rate of return is measured as the rate on the best alternative investment. In practice, different rates have been used in empirical work. The rates are almost always those obtained from investment in financial assets, including rates paid on loans as well as those earned on bonds and other assets. The most important practical problem in empirically implementing the user cost measure is the year-to-year volatility of the real own rate of return. This is only a problem for current-price measures. Constant-price measures utilize prices, rates of inflation, and rates of return of the base (reference) year. Therefore, the real own rate of return for a given type of asset is a constant and there is no volatility.

The different rates of return used in practice reflect differences in analyst thoughts with respect to some basic questions. These questions include: whether a before- or after-tax rate should be used, whether the same rate should be applied to the debt and equity portions of the stock, whether a borrowing or lending rate should be used, and whether the rate should reflect differences in risk.[14] In the present context, a definitive answer can be given to the first question. The objective is to approximate the rental value for dwellings obtained with the stratification method and this value is measured before taxes. Thus, we can definitely state that a before-tax rate should be used in the imputation. The last question reflects the concern that the risk on the alternative financial asset should be comparable to that of the durable in question. In the present context, this means that because investments in dwellings and land are generally made on a long term basis and may be less risky than investments in other types of goods, there is a case for using returns on long-term assets that are less risky, such as long-term government bonds.

The solutions to the remaining questions center around three possible methods: (1) applying a lending rate to both the debt and equity portions of the stock, (2) applying a borrowing rate to both the debt and equity portions of the stock, and (3) applying a lending rate to the equity portion of the stock and a borrowing rate to the debt portion. In general, the rates at which money is borrowed (on loans) are higher than those at which it is lent (by consumers to financial institutions in the form of saving accounts, bonds, or similar financial instruments). The opportunity cost principle of using the highest rate points to using a borrowing rate. Also, it can be argued that when owner occupants have taken out loans on dwellings, the expected benefits must be greater than the expected costs including any interest paid. In many instances, borrowers have the option to pay off some or all of their loans early and thereby "earn" the interest rates charged on the loans. The foregoing arguments point to using the rate actually paid on mortgage loans on at least the debt portion of the stock. Consequently, if data are available on the amount of the stock financed by debt, the return on the debt portion of the stock should be estimated by the amount of interest actually paid on the debt.

This leaves the question of what rate of return should be applied to the equity portion of the stock if data to support the calculation of method 3 are available or what rate should be applied to the entire stock if these data are not available. The principle of using the highest rate suggests the use of a borrowing rate. However, it can be argued that the relatively high rates "earned" by borrowers do not represent true alternatives to owner occupiers who have no debt.

[14] For a discussion of these issues, see Katz (1983).

Thus, the theoretical arguments are inconclusive and either borrowing or lending rates are permissible.

Another theoretical point is whether the real rates of return in effect when a durable is purchased should be used to estimate the durable's services throughout its lifetime, or whether the rate to be used to value services in any given year should be the real rate in effect for comparable purchases of a new durable in the given year. Some economists have favored the former "vintage" approach to measuring rates of return.[15] However, most economists have favored the latter approach of using a single rate for all durables. In particular, some have argued that the vintage approach seems to deny that old durables can be perfect substitutes for newer durables that are identical, except for their ages. Such a denial would appear to erode the theoretical foundations on which the entire user cost of capital derivation is based. One of the implications of this approach is that if a borrowing rate is used to make the estimates, the rate should be the one on newly issued loans rather than the average rate on all loans outstanding.

Having decided on the general parameters of how, in theory, the real rate of return should be measured, we turn to the thorny question of how it should be estimated in practice. Initially, the task force decided against assuming what the rate of return was and attempted to see if reasonable estimates of it could be made from data available in the CCs. While it was recognized that estimated rates could be very volatile, there were some strong reasons for seeking to estimate them. Specifically, it was felt that real rates of return to housing could vary significantly over time in any single county (they varied tremendously in the United States between 1979 and 1984), real rates of return might vary significantly among countries, and rates of inflation in housing and land prices might differ significantly from each other.

These considerations led to a recommendation that real rates of return be initially estimated by taking an appropriate nominal interest rate on long-term loans and subtracting from it an estimate of the rate of inflation. Different rates of inflation would be used for the rates applicable to land and those to the dwellings themselves. Specifically, the rate of inflation in dwelling prices should be based on the same price index that is used to estimate consumption of fixed capital, i.e., the deflator for fixed capital formation in owner-occupied dwellings, or when that is unavailable, an index of relevant construction costs. Theoretically, the rate for land prices should be based on actual selling prices for land. Such price indexes are not available in many countries. When that is the case, a measure of general price inflation should be used instead. The rates of change of the consumer price index and the implicit deflator for GDP are two measures of price inflation that were recommended as appropriate.

Regardless of how the real rate of return was estimated for a given year, it was recommended that the rate be smoothed by taking a moving average of past rates. There are several reasons for such smoothing. In the past, the volatility of interest rate series has been the biggest obstacle to employing the user cost measure. Smoothing should mitigate this problem. Moreover, the theoretically relevant rate is an expected rate and many have argued that the best method of estimating an expected rate is by making it a function of actual past rates.

[15] For example, see Mohr (1984).

10. Lessons Learned and Modifications to the Initial Recommendations

Sample calculations made by representatives of statistical offices of some of the CCs exhibited many of the problems that have turned up in past attempts to implement user cost measures. As expected, most of these centered on attempts to estimate appropriate real rates of return on dwellings. In the estimates made by some countries, there was extreme year-to-year volatility. Attempts to smooth these by taking weighted averages of past rates did little to mitigate the problem. The variation in estimated rates among countries was unreasonably large, and some countries had rates of return that were unacceptably high. They produced imputed values for housing services that were a much higher percentage of GDP than in other European countries. Other countries had estimates of real rates of return that were unreasonably low. Some even had negative rates for several years in a row. The task force felt that such results could not be theoretically justified and had little worth for practical work.

The failure to obtain reasonable estimates of real rates of return appears to be largely due to the lack of fully developed markets for financial funds. Many of the CCs appeared to lack large scale markets for mortgage loans. In some countries, the only statistics on long-term debt were for government bonds. These were often closely administered by government authorities and set at rates that were lower than the rate of increase in the consumer price index, which resulted in estimated negative real rates of return.

Many of the past practical studies employing user cost measures have resolved problems in estimating real rates of return by assuming that it is a constant over time. This was essentially the approach taken by the task force. The members of the task force agreed that the best way to resolve the practical problems was to determine a real rate of return for dwellings and associated land that would be used by all countries. This rate would be used in all estimates made during the next five years. The rate would then be reviewed to determine if it should be modified.

The remaining question was what value of the real rate of return is appropriate? Evidence was presented to the task force that suggested that, at least in Western European countries, the appropriate real rate of return for owner-occupied dwellings was lower than that for other durables, perhaps in the 2.5 to 3.0 percent range.[16] It was the consensus of the task force that given the actual situation in the CCs, real rates of return on both dwellings and land should be assumed to be 2.5 percent. In the subsequent sample calculations performed by the participating CCs, this rate resulted in estimates of dwelling services that ranged between 7 and 9 percent of each country's GDP. This was judged as being reasonable because dwelling services generally averaged about 8 percent of GDP in the countries of Western Europe.

Obtaining estimates of land values turned out to be extremely problematical. There appeared to be very little data, if any, on what values of land were implied in any tax assessments. This left us with only the hope that there might be some agreement as to what might be a reasonable rule of thumb. It was pointed out that in the United States, when there is new construction, the value of land generally accounts for about a quarter of the total sales price.

[16] This included calculations by Hartmann (2003) using data from the German national accounts, which showed that if land associated with dwellings were included in the net stock of dwellings, a real rate of return of 2.5 percent would be realistic based on rents obtained from the German stratification model.

Some of the experts on the task force noted that the value of land was relatively higher in Western Europe; it was generally more than one third and sometimes more than one half of the total sales price. However, some experts from the CCs insisted that the value of land in their countries was worth less than five percent of the value of the dwellings that were built on it. This appeared to be contradicted by the fact that in some CCs even newly constructed high value dwellings outside of central cities are built on relatively small plots. If land were so cheap, one would expect the plots for such dwellings to be larger. The task force concluded that the valuation of land is largely based on variables that are specific to a given locality and that rules of thumb that work in one country cannot be assumed to apply to other countries. Consequently, there seemed to be no alternative to allowing countries to estimate the value of their land independently of each other without imposing any specific guidelines.

It appeared that a number of the CCs would not have the data required to estimate the premium supplements that are part of net insurance premiums. To promote comparability in the estimates, the task force recommended that all CCs forgo estimating such supplements. Similarly, few countries had separate data on insurance losses for dwellings and their contents. It was recommended that such losses be split in proportion to the relative values of the stock of dwellings and their estimated contents.

Table 1 presents estimates from the final report of the project (see Eurostat B1, 2002). The estimates show how the various components of the output of owner-occupied dwellings differed between the participating CCs and some member states when estimates for the former were derived by the user cost method with an assumed real rate of return of 2.5 percent. U.S. data have been added to this table. These data are based on estimates that were recently published in the U.S. national income and product accounts. The estimates for the CCs and the member states are very similar. There are, however, major differences between the estimates for these two sets of countries and those for the United States. Consumption of fixed capital and expenditures on maintenance and repair account for much smaller shares of the output of dwellings in the United States while taxes on production account for a much larger share. Some of these differences may be due to differences between the statistical methodologies used in the United States and Europe. Major replacements to dwellings, such as the replacement of roofs and water heaters, are treated as capital formation in the United States but as current maintenance and repair in Europe. Conversely, costs of acquisition are included in capital formation in Europe but a large part of it is treated as current intermediate expenditure in the United States. The rate of depreciation for dwellings used in the United States is much lower than comparable rates used in Europe. How much this impacts the relative estimates of consumption of fixed capital is not clear. Nevertheless, the difference in taxes is a real one and it does not seem likely that statistical differences account for most of the other differences.

The percentage of the output of owner-occupied dwellings accounted for by the net operating surplus is relatively large in the United States. Assuming that the value of residential land is equal to one third of the value of the net stock of dwellings, the real rate of return on dwellings and land in the United States was about 3.7 percent in 1998, which is much higher than it is in Europe. To put this another way, the value of residential land would have to be about equal to the value of dwellings in order for the real rate of return on dwellings and associated land to be 2.5 percent. Moreover, the composition of the operating surplus is clearly different in the United States and Europe. In the United States it is largely a return on debt (i.e., it is largely used to pay mortgage interest) while in much of Europe it is largely a return on equity.

Table 1. Components of Output of Owner-Occupied Dwellings in Participating Candidate Countries, Some Member States, and the U.S., in percent, 1998.

	Czech Rep.	Hungary	Poland	Slovak Rep.	Slovenia	Germany	Nether-lands	Finland	U.S.
Output of owner-occupied dwellings	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Intermediate consumption	25.1	16.2	17.9	11.5	19.5	12.1	20.0	22.9	17.3
Current maintenance and repairs	25.2	15.2	17.6	11.4	19.2	---	---	17.1	3.9
Insurance services	-0.1	1.0	0.2	0.1	0.3	--	---	5.8	1.4
Other Intermediate consumption	0.0	0.0	0.0	0.0	0.0	---	---	0.0	12.0
Value added	74.9	83.8	82.1	88.5	80.5	87.9	80.0	77.1	82.8
Consumption of fixed capital	29.1	34.7	27.3	48.7	34.0	32.5	41.0	41.4	16.0
Other taxes on production	0.8	0.0	1.1	0.5	1.1	3.3	3.0	-0.8	14.5
Net operating surplus	44.9	49.1	53.7	39.2	45.4	52.0	36.0	36.4	52.3

11. Observations and Conclusions

During the course of the project it became evident that there were institutional differences between housing markets in the United States versus Eastern and Western Europe. These differences affect international comparisons of income and product. In the United States, housing markets are well developed and highly competitive. Individuals can easily buy or sell existing homes, rent out homes they live in, or purchase new homes. Loans to finance the purchase of homes are readily obtainable. Mortgages are now offered in a bewildering array of products, some of which require virtually no down payment. There are so many products that the purchaser can effectively customize his loan, having the interest rate fixed for whatever term he desires. The population is very mobile. The average family moves every seven years. If one does not like the size of one's home, one can readily obtain a different one that is larger or smaller. Moves are readily made to distant cities because obtaining housing is generally not a problem. As a result, all of the opportunities discussed in the user cost model represent true opportunities to owner occupiers and the user cost model can give an accurate measure of the value of housing services.

The converse holds true in Eastern Europe. Because homes are rarely sold, many of the sales are at distressed prices, mortgage loans are difficult to obtain, new homes are difficult to acquire and so on, many of the opportunities postulated in the theoretical derivation of the user costs do not represent true opportunities. Thus, in a theoretical sense, the user cost model is less applicable. Nevertheless, estimates of the value of housing services need to be made and appropriate market prices do not exist. The results of the project demonstrate that the user cost

measure does give reasonable estimates of the value of these services. Some critical assumptions were made: i.e., that the real rate of return is 2.5 percent. Also, the valuation of land is problematical. The difference between land being five percent of the value of dwellings and fifty percent could alter the measure of GDP by as much as two percent. However, by assuming the same real rate of return across countries, the relative magnitude of housing services is made more strictly a function of the relative sizes of the net stock of housing.

The project demonstrated that the CCs have a wealth of data on the characteristics of dwellings from censuses that can be used to make estimates of the net stock of dwellings. Given the damage to the housing stock during World War II, estimates made using variants of the physical inventory method may give more accurate estimates than those based on the perpetual inventory method. In devising the examples for the templates using U.S. data, it proved difficult to reconcile stock estimates obtained with the perpetual and physical inventory methods.

The data from the project suggest that there may be significant institutional differences between the markets for owner-occupied dwellings in the United States and those of the CCs and Western Europe. In the United States, a large part of the services of these dwellings goes toward the payment of property taxes and mortgage interest. In Europe, the share of output spent on these costs is much lower but expenditures on maintenance and repair as well as depreciation are relatively higher. The true extent of these differences is difficult to determine because of the lack of underlying detail and differences in the statistical methodologies used.

Appendix A. Derivation of the User Cost Measure

The user cost of capital measure provides an estimate of the market rental price based on costs of owners. It is directly derived from the principle that, in equilibrium, the purchase price of a durable good will equal the discounted present value of its expected net income (or benefits); i.e., it will equal the discounted present value of its expected future services less the discounted present value of its expected future operating costs. To see this, let $P_{s,t}$ denote the purchase price of an s year old durable at the beginning of year t; $P^e_{s+1,t+1}$ denote its expected purchase price at the beginning of year t+1 when the durable is one year older; $C^e_{s,t}$ denote the expected value of the services of this s year old durable in year t; $O^e_{s,t}$ denote the expected operating expenses for this s year old durable in year t; and r^e_t denote the expected nominal discount rate (i.e., the rate of return on the best alternative investment) in year t. Expected variables are measured as of the beginning of year t. Assume that the entire value of the durable's services in any year will be received at the end of the year, and that the durable is expected to have a service life of m years. From the definition of discounted present value,

$$P_{s,t} = \frac{C^e_{s,t}}{1+r^e_t} + \frac{C^e_{s+1,t+1}}{(1+r^e_t)(1+r^e_{t+1})} + \ldots + \frac{C^e_{m-1,t+m-s-1}}{\Pi_{i=t}^{t+m-s-1}(1+r^e_i)} - \frac{O^e_{s,t}}{1+r^e_t} - \frac{O^e_{s+1,t+1}}{(1+r^e_t)(1+r^e_{t+1})} - \ldots - \frac{O^e_{m-1,t+m-s-1}}{\Pi_{i=t}^{t+m-s-1}(1+r^e_i)} \quad \text{(A1)}$$

When the durable is one year older, the services it renders in year t will have been received and the operating expenses of year t already incurred. Consequently, the expected price of the durable at the beginning of year t+1 is given by

$$\text{(A2)}\qquad P_{s+1,t+1} = \frac{C^e_{s+1,t+1}}{1+r^e_{t+1}} + \frac{C^e_{s+2,t+2}}{(1+r^e_{t+1})(1+r^e_{t+2})} + \ldots + \frac{C^e_{m-1,t+m-s-1}}{\Pi_{i=t+1}^{t+m-s-1}(1+r^e_i)} - \frac{O^e_{s+1,t+1}}{1+r^e_{t+1}} - \frac{O^e_{s+2,t+2}}{(1+r^e_{t+1})(1+r^e_{t+2})} - \ldots - \frac{O^e_{m-1,t+m-s-1}}{\Pi_{i=t+1}^{t+m-s-1}(1+r^e_i)}$$

Dividing both sides of (A2) by $(1+r^e_t)$ and subtracting the result from equation (A1) yields

$$\text{(A3)}\qquad P_{s,t} - \frac{P^e_{s+1,t+1}}{1+r^e_{t+1}} = \frac{C^e_{s,t}}{1+r^e_t} - \frac{O^e_{s,t}}{1+r^e_t}$$

Multiplying both sides of equation (A3) by $(1+r^e_t)$ and combining terms, one obtains the standard user cost measure:

$$\text{(A4)}\qquad C^e_{s,t} = r^e_t P_{s,t} + (P_{s,t} - P^e_{s+1,t+1} + O^e_{s,t})$$

Equation (A4) expresses the expected value of the durable's services as the sum of three components: the expected nominal net operating surplus, the expected decline in the price of the durable during the year, and the expected value of operating expenses. Because it is measured as an opportunity cost, the first of these components, the expected nominal net operating surplus, is measured by the product of the expected nominal discount rate and the price of the durable as of the beginning of the year. As explained in footnote 13, this return to capital is gross of any interest payments made on debt used to finance the purchase of the durable. The expected decline in the price of the durable is usually partitioned into two components: consumption of fixed capital (i.e., depreciation) and the expected capital loss on the durable. The expected capital loss component can be summed with the nominal net operating surplus to yield an expected real net operating surplus. When this is done, the expected value of the durable's services is, consequently, expressed as the sum of the expected real net operating surplus, depreciation, and the expected value of operating expenses.

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