Housing Demand and Department of Defense Policy on Housing Allowances

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Frank Camm
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PREFACE

As part of the compensation package that it offers members of the armed forces, the Department of Defense (DoD) provides several housing allowances designed to help members pay certain costs of housing services. This report examines recent trends in the U.S. housing market and relates them to DoD policy. It then reviews the recent professional economics literature on housing demand, particularly the empirical literature, and relates findings from this literature to DoD policy. Finally, the report offers concrete proposals on how to simplify current DoD policy and make it more efficient without compromising any of its basic goals.

The report emanates from the RAND project on "Recent Results from the Professional Economics Literature Relevant to DoD Housing Policy," sponsored by the Office of the Assistant Secretary of Defense (Force Management and Personnel). The research was conducted in the Defense Manpower Research Center (DMRC), which is part of the RAND National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense and Joint Chiefs of Staff.

The report should interest analysts and decisionmakers concerned with defense housing policy, as well as a broader audience concerned with housing markets and government policy changes that affect them. The presentation assumes some familiarity with economic concepts, but aims for a policy-oriented audience whose principal interest is not economic policy or analysis.

SUMMARY

As part of their compensation, the Department of Defense (DoD) pays members of the armed services about $6 billion a year in housing allowances. Under current DoD policy, the nontaxable housing allowance has three components: a basic allowance for quarters (BAQ), a variable housing allowance (VHA), and an overseas housing allowance (OHA).

All members of the armed forces receive a BAQ. They may surrender this in exchange for housing on a DoD installation, or they may spend it as they choose for outside housing.

Almost all members living in the United States but not on an installation also receive a VHA to compensate them for housing costs in their area. An offset policy requires that if they fail to spend the full allowance on housing, they must remit to DoD half the difference between it and their housing cost.

Members living abroad but not on an installation receive an OHA in addition to the BAQ to compensate them for high housing costs. DoD reimburses them dollar for dollar for their housing costs up to the full amount of their allowance.

Each allowance depends on the pay grade of the member and whether the member has dependents. Each is set annually using guidelines that reflect principles of both general compensation for service and specific compensation for local housing costs. The internal consistency of policy on these three allowances is not always apparent to observers, or even to DoD decisionmakers.

The complexity of the current system of housing allowances has hampered efforts by DoD to explain this system to Congress. As a result, the Office of the Secretary of Defense (OSD) is reviewing the policy and considering the possibility of making major changes in it.

This report provides information to support OSD's deliberations. In particular, it provides data on recent trends in the demand for housing by households outside DoD, as well as data from the recent economics literature on the demand for housing. Taken together, this information forms the basis for a proposed reform of DoD's policy of housing allowances that makes the policy simpler and more efficient without sacrificing any of DoD's basic goals for housing policy.

The report reaches four basic conclusions:

- Real housing prices differ substantially from place to place within the United States and have changed significantly over

the last two decades. DoD's ability to recognize and respond to such differences and changes should significantly improve the morale of the force.

- Comparable DoD and non-DoD households are likely to differ significantly in their decisions on how much to spend for rental housing services, when to switch from renting to owning and occupying a home, and how much to spend on a housing asset.
- Such differences should not concern DoD. In particular, DoD should not react to such differences by adopting a new policy on housing allowances designed to make DoD households' decisions more like the decisions of non-DoD households.
- DoD can clarify and streamline its current policy on housing allowances by making changes that
  - constrain as little as possible how DoD households spend the allowances
  - compensate households changing duty stations for changes in the benefits as well as the costs that they associate with housing
  - use a single set of principles to justify and implement all policy on housing allowances.

The report develops a basis for each of these conclusions and recommends actions that DoD can take to follow up on them.

DIFFERENCES IN REAL HOUSING PRICES

Because housing services account for over 25 percent of personal consumption expenditures, swings in the price of housing services significantly affect the well-being of American households. Since 1970, the real price of housing services (that is, adjusted to remove the effects of general price inflation) has fallen more than 15 percent and then risen over 10 percent. Even larger differences in real prices exist from one location to another in the United States. Differences of over 100 percent between metropolitan areas are not unusual, and such differences appear to have grown over time.

Changes and differences in prices lead to large variations in housing expenditures and in household well-being over time and across locations at any given moment. To the extent that DoD uses housing allowances to cover a significant portion of housing costs and to offset the effects of the changes in housing prices that households face when they change duty stations, DoD's policy must respond to these large

changes and differences in price. Even small changes in DoD policy that allow it to track and offset price changes more effectively should have significant positive effects on the morale of the armed forces.

DIFFERENCES IN HOUSING DECISIONS OF DoD AND NON-DoD HOUSEHOLDS

Households make decisions on whether to rent or to own and occupy a home, how much to spend for housing services, and what kind of housing services to buy with the money spent. The economics literature provides the best empirical information about the first two. We can use insights from the literature to look at differences between DoD and non-DoD households and ask how those differences *should* affect their decisions on whether to rent or to own and occupy a home and on how much to spend on housing.

DoD and non-DoD households might make these decisions differently for several reasons. Most obviously, DoD households move more frequently than non-DoD households. Mobility means that DoD households typically have less information about local housing markets than non-DoD households. Moreover, they face higher effective prices for renting or owning a home than non-DoD households do. DoD renters do not receive the rental discounts that non-DoD renters get when they remain in rental units for many years. DoD owner-occupiers must amortize the fixed costs of buying and selling homes over shorter periods of time than non-DoD households that move less often.

The structure of DoD's policy on housing allowances tends to encourage DoD members to spend more on housing than they would otherwise. To the extent that households invest in a home to accumulate savings, military retirement plans can affect the savings behavior of DoD households and hence their demand for housing. Where DoD members have the option of living on an installation, they face housing options that differ basically from those that non-DoD households face; different housing options can lead to different housing choices.

Higher effective prices, poorer information, and variable housing allowances should lead DoD households to spend more for rental housing services than comparable non-DoD households. Higher effective prices for owning and occupying a home and a smaller incentive to buy a housing asset as a way to accumulate savings should lead DoD households to own and occupy homes later than comparable non-DoD households do. These same factors should lead DoD households to spend less on owner-occupied housing assets than do comparable non-DoD

households, unless a variable housing allowance has a large enough effect to offset the effects of these factors.

POLICY IMPLICATIONS OF DIFFERENCES BETWEEN DoD AND NON-DoD HOUSEHOLDS

Empirical evidence of differences, such as those discussed above, between DoD and non-DoD households should not trouble DoD. DoD's primary interest lies not in how its members make housing decisions but rather in how well off its members are in general. DoD and non-DoD households make different decisions about housing because the basic realities of military life lead DoD households to perceive effective prices for housing services and to value the ownership of housing assets in ways that differ systematically from the ways of non-DoD households. Given their general circumstances, DoD households are making the right housing choices for themselves.

DoD may well determine that differences in the housing decisions of DoD and non-DoD households indicate that DoD households are not as well off as their non-DoD counterparts. It should not conclude, however, that changes in housing policy are the best way to improve the morale of the armed forces.

A dollar spent by DoD to compensate members of the armed forces helps them the most if they can use that dollar as they choose. Providing it as general pay ensures that they can use it freely. Providing it as a housing allowance allows members to enjoy the concomitant tax advantage. But forcing members to spend an additional dollar of housing allowance on housing per se could easily more than offset the value of the tax advantage.

The most effective policy provides an additional dollar to the force as a housing allowance that members can spend as they choose. Such a policy will not induce members to spend much more on housing, but it will help them as much as any additional dollar from DoD can.

A SIMPLIFIED POLICY ON HOUSING ALLOWANCES

DoD can simplify and clarify its policy on housing allowances to make that policy easier to explain to its own members and decisionmakers and to Congress. Because DoD pursues several different goals with the policy, some complexity is unavoidable. The six basic goals are to:

- Pay for a significant portion of housing costs in the force.
- Offset the effects of differences in housing prices from one station to another.
- Ensure that all DoD members live in adequate housing.
- Ensure that DoD housing allowances reflect military hierarchy and that allowances not fall as pay grade rises.
- Given the achievement of these goals, ensure that DoD members value resources committed to housing allowances as highly as possible.
- Use the basic goals above to develop policy on special cases associated with households with two DoD members, DoD members separated from their dependents, and so on.

By identifying these goals, devising one simple policy instrument to implement each, and developing a simple method for coordinating the use of these instruments, we can offer a simpler, clearer policy than is currently followed to achieve the goals.

The basic structure of the policy that flows from these goals resembles that of the current policy, but with three important differences. First, except to the extent required to ensure that DoD households live in adequate housing, the approach suggested here allows DoD households to spend housing allowances as they please. Not constraining DoD households to spend allowances on housing ensures that they value these allowances as highly as possible.

Second, our alternative offers a simple way to compensate households for differences in housing costs at different stations and a more complete set of differences in housing benefits at different stations than the current system offers. This more complete approach to compensation would lead to greater differences in housing allowances among stations.

Finally, rather than using diverse principles and methods to justify three individual housing allowances, as the current system does, our recommended alternative uses a single, unified set of principles and techniques to calculate housing allowances. This approach makes the system easier to update and to explain.

DoD is concerned that whatever policy it adopts be credible to its members and to Congress. The system that we propose provides a step in that direction. It simplifies the linking of any aspect of the housing allowances at any time, or any change in them over time, to one of the six goals above.

A critic can challenge the goals themselves, suggesting a basic change in the system. But each linkage is direct enough to leave little doubt about the reason underlying each part of the system. What doubt remains will likely concern the actual estimation of DoD households' housing expenditures and the housing prices that they face, both critical elements of our proposed system to pursue DoD's goals on housing allowances.

Any attempt to build a housing allowance system on data not collected directly from DoD households cannot adequately reflect DoD's goals of (1) covering a substantial share of housing costs, (2) offsetting the effects of locational differences in costs, and (3) keeping DoD households out of inadequate housing. Analogous data collected outside DoD cannot properly capture the true experience of DoD households. DoD need not, however, control the process of collecting or processing such data.

To give its policy greater credibility, DoD should consider the possibility of contracting with an outside organization, such as the Bureaus of the Census and of Economic Analysis in the Department of Commerce or the Bureau of Labor Statistics, to collect data and execute the calculations that DoD uses to implement its policy on housing allowances. In this way, DoD would control the policy and maintain its transparency, while an objective organization with widely recognized credentials for integrity and competence essentially certified the inputs that DoD used to implement that policy.

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Captain Mary Humphreys of the Office of the Secretary of Defense (OSD) sponsored this study and helped shape its goals. Glenn Gotz of RAND provided helpful management support in initiating the study and useful feedback on an early version of it. Michael Murray of Bates College helped us get the project off to a quick start with his basic insights on housing economics. Reviewers of earlier presentations of this material include Thomas Glennan, Susan Marquis, C. Robert Roll, and Ronald Sortor of RAND, Saul Pleeter and Lieutenant Colonel Robert White of OSD, and Michael Murray. Erma Packman ably edited the text. Rosalie Fonoroff prepared the final manuscript. We thank them all and retain responsibility for any errors of fact or interpretation.

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GLOSSARY

BAQ	basic allowance for quarters
BLS	Bureau of Labor Statistics
BMC	basic military compensation
CPI	consumer price index
DoD	Department of Defense
HUD	Department of Housing and Urban Development
OHA	overseas housing allowance
OSD	Office of the Secretary of Defense
SMSA	standard metropolitan statistical area
VHA	variable housing allowance

I. INTRODUCTION

The housing allowance constitutes an important portion of pay and benefits for members of the armed forces. The Department of Defense (DoD) currently budgets about $6 billion a year to provide this allowance.[1] The allowance accounts for about 25 percent of regular military compensation, adjusted to exclude tax advantages, for a typical enlisted person and about 20 percent for an officer.[2]

Because the housing allowance is a nontaxable benefit, it is even more important to total compensation than these percentages suggest. When DoD members live on a DoD installation, they surrender this allowance in exchange for housing services on the installation.[3] When they do not live on a DoD installation, they can use this allowance to pay for a portion of their housing costs.

In response to congressional inquiries about DoD policy on the housing allowance, the Office of the Secretary of Defense (OSD) is currently conducting a comprehensive review of this policy. As part of that review, OSD asked The RAND Corporation to analyze current trends in housing demand outside DoD and recent studies in the economics literature and to use these analyses to address two basic issues:

- What determines the demand for housing outside DoD and how does it compare with housing demand by DoD households?
- How can DoD develop simple and transparent guidelines to justify its policy on housing allowances?

To address the first question, we examine three decisions that households make to define their demand for housing: *tenure*—whether to rent or buy housing, *expenditure*—how much to spend each year on

[1]Actual expenditures were $5.7 billion in FY 1987 and $5.8 billion in FY 1988. Estimated expenditures for FY 1989 and 1990 are $6.1 and $6.2 billion, respectively. See U.S. Department of Defense, Office of the Secretary of Defense, Director of Military Compensation, "Military Housing Allowances," unpublished memorandum, Washington, D.C., n.d., p. 5.

[2]Total housing allowances as a fraction of total estimated basic pay, basic allowance for quarters, variable housing allowance, overseas housing allowance, and basic allowance for subsistence in 1989. Based on data from the OSD Director of Military Compensation.

[3]Throughout the draft, we use the terms "DoD members" and "DoD households" to refer to members of the armed forces and their dependents. We refer to housing on a post or base as housing on an installation.

housing, and *attributes*—what to buy with housing dollars. For various reasons, DoD and non-DoD households might make these decisions differently.

Most obviously, DoD households move more frequently than non-DoD households. This mobility means that DoD households typically have less information about local housing markets than non-DoD households. And there are good reasons, discussed below, for believing that they face higher effective prices for renting or owning housing than do non-DoD households. Nonetheless, because they move so frequently, they are probably better able to make housing decisions that more nearly approximate their actual demand for housing than non-DoD households that move less often and hence adjust their consumption of housing less frequently.

Other factors differentiate DoD and non-DoD demand for housing. To begin with, the structure of DoD's policy on housing allowances tends to encourage DoD members to spend more on housing than they would otherwise. Moreover, to the extent that households invest in a home to accumulate savings, military retirement plans can affect the savings behavior of DoD households and hence their demand for housing.

In addition, where DoD members have the option of living on an installation, they face housing options that differ basically from those that non-DoD households face. Finally, individual landlords may well view DoD and non-DoD households differently, offering them different terms for the same housing; the effects of this differential treatment are likely to differ from one locale to another.

The second issue addressed in this study is how DoD can develop simple, transparent, and justifiable guidelines on housing allowances. Current DoD policy maintains a housing allowance with three components. All members of the armed services receive a basic allowance for quarters (BAQ), which they surrender for housing on a DoD installation or spend as they choose for outside housing.[4]

In addition, almost all members living in the United States but not on an installation receive a variable housing allowance (VHA) to compensate them for housing costs in their area.[5] An "offset" policy requires that if they fail to spend the full VHA and BAQ allowances on housing, they must remit to DoD half the difference between their

[4]This allowance was set at 61 percent of national DoD median housing cost for each pay grade and dependence status. It is designed to be adjusted annually in proportion to changes in general pay, not housing costs. See U.S. DoD, OSD, Director of Military Compensation, "Joint Service Housing Allowance Study," draft, 22 May 1989, p. 10, and data from OSD Director of Military Compensation, 1989.

[5]Data from OSD Director of Military Compensation, 1989.

allowances and their housing cost.[6] About 13 percent of those receiving a VHA remitted some portion of it to DoD in 1989.[7]

Members living abroad, but not on installations, receive an overseas housing allowance (OHA) to compensate them for high housing costs overseas. DoD compensates their housing costs dollar for dollar up to the full amount of their allowance. A household that fails to spend the full allowance must forfeit the entire amount not spent on housing.[8]

These allowances depend on the pay grade of the member and whether the member has dependents. Each is set annually using guidelines that reflect principles of both general compensation for service and specific compensation for local housing costs. The internal consistency of policy on these three allowances is not always apparent to observers, or to DoD decisionmakers.

Because DoD uses its policy on housing allowances to pursue several goals, that policy must embody some complexity. That is, it must be able to address the following goals:

- Pay for a significant portion of housing costs in the force.
- Offset the effects of differences in housing prices from one station to another.
- Ensure that all DoD members live in adequate housing.
- Ensure that DoD housing allowances reflect military hierarchy; allowances should not fall as pay grade rises.
- Given achievement of the goals above, ensure that DoD members value resources committed to housing allowances as highly as possible.
- Use the basic goals above to develop policy on special cases associated with households with two DoD members, DoD members separated from their dependents, and so on.

This report develops a basis for analyzing each of these goals. It proposes an approach that defines a separate policy instrument to implement each goal and coordinates the use of these instruments.[9]

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[6]In 1989, together with the BAQ, this allowance covered 79 percent of median housing costs for DoD members in each location, pay grade, and dependency status in the United States. See "Joint Service Housing Allowance Study," draft, 22 May 1989, p. 10.

[7]Data from OSD Director of Military Compensation, 1989.

[8]This form of compensation constitutes a 100 percent offset arrangement. In 1989, together with the BAQ, this allowance covered total housing expenditures for DoD members up to a ceiling set equal to the 80th percentile of housing costs for members in each location, pay grade, and dependency status outside the United States. The allowance is adjusted for fluctuations in the value of the dollar. See "Joint Service Housing Allowance Study," draft, 22 May 1989, p. 11.

[9]The report does not address the contentious issue of whether housing allowances constitute (a) one specific portion of general compensation or (b) reimbursement for

Section II presents basic background information about recent patterns in housing demand outside DoD. Section III distinguishes expenditures on housing from housing prices and explains the importance of this distinction to DoD. Section IV builds on this distinction to summarize the key empirical findings from the economics literature on housing demand over the last two decades. Section V uses a simple view of the demand for housing to suggest a way to compare demand for housing by DoD and non-DoD households. Section VI uses insights from the literature on housing demand to propose a framework for defending DoD's policy on housing allowances. Section VII summarizes the findings of the study. An appendix explains graphically how DoD households react to housing allowances.

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allowable costs of some kind. Housing allowances include elements of both factors. They are one important and integral part of the total compensation package that DoD members consider when deciding whether to join or remain in the armed forces. They also reimburse DoD members for a portion of the amount by which the members' housing costs rise when DoD requires these members to move to and live in a high-cost area. The question of whether allowances are predominantly compensation or reimbursement probably bears most directly on the question of whether they should be taxable. It is easier to justify tax-free status for a reimbursement than for general compensation. This report makes no attempt to address whether housing allowances should remain tax free. It takes this tax-free status as given and considers its implications for the amount of housing that DoD households demand and the degree to which DoD should constrain the way in which DoD households spend their housing allowances.

II. RECENT TRENDS IN THE COST OF HOUSING

The cost of housing services outside DoD differs substantially from one location to another and has changed significantly in recent years. The same could be said of many other goods and services. But because shelter accounts for about 26 percent of annual household consumption expenditures in the United States, such variation can substantially affect the well-being of households that experience these variations.[1]

This section uses data from the annual and the American housing surveys to illustrate the extent of variation in housing costs across locations and over time in the United States.[2] These data focus on the experience of non-DoD households. DoD households should experience similar variations when not living on DoD installations in the United States; they may experience even greater variation outside the United States.

COSTS INCLUDED IN HOUSING COSTS

Before we look at trends in housing costs, it is useful to reflect for a moment on what those costs are. Two distinctions are important. First, households that rent experience different cash flows from those that buy and occupy dwellings. Table 1 lists the kinds of cash flows that these two types of households face.

All of the cash flows shown in Table 1 are included in at least one measure of housing costs. Cash flows most directly associated with a dwelling, such as contract rent or the down payment and mortgage payments for owner-occupied housing, are almost always included in measures of housing expenditure. Ancillary items, such as parking, furniture, and appliances, appear more selectively.

A quick comparison of cash flows for renters and owner-occupiers reveals the second distinction: Renters pay for a housing *service* alone;

[1]According to the 1982–1984 Consumer Expenditure Survey, the cost of all housing-related services is higher—about 42 percent. U.S. Department of Labor, Bureau of Labor Statistics, *The Consumer Price Index: 1987 Revision*, Report 736, January 1987.

[2]These surveys provide the best data available on non-DoD housing demand in the United States. The Bureau of the Census conducted the Annual Housing Survey for the Department of Housing and Urban Development (HUD) annually until 1981 and again in 1983. HUD replaced this annual survey with the biennial American Housing Survey in 1985. Data on some variables are available through 1983; we have data on others through 1987. In the discussion below, we use data from 1973 to anchor our discussion and compare these data with the most recent data available on each variable of interest.

Table 1

CASH FLOWS ASSOCIATED WITH HOUSING EXPENDITURES

Owners	Renters
Down payment	Contract rent, with discounts
Mortgage payments	
Costs of opening and ending contract	Costs of opening and ending contract
Utilities and city services	Utilities and city services
Parking	Parking
Property taxes and mill fees	
Maintenance and repair	Maintenance and repair
Depreciation	
Furniture and appliances	Furniture and appliances
Less:	
Value of tax advantage	
Value of capital gain	

owner-occupiers incur costs for a housing *asset* that yields both housing and financial services. Thus, we cannot easily compare the costs of renters and owner-occupiers without putting them in comparable terms as flows for housing services. Section III discusses how to do this; for now, we should simply keep this distinction in mind when comparing some simple measures of housing costs for renters and owner-occupiers.

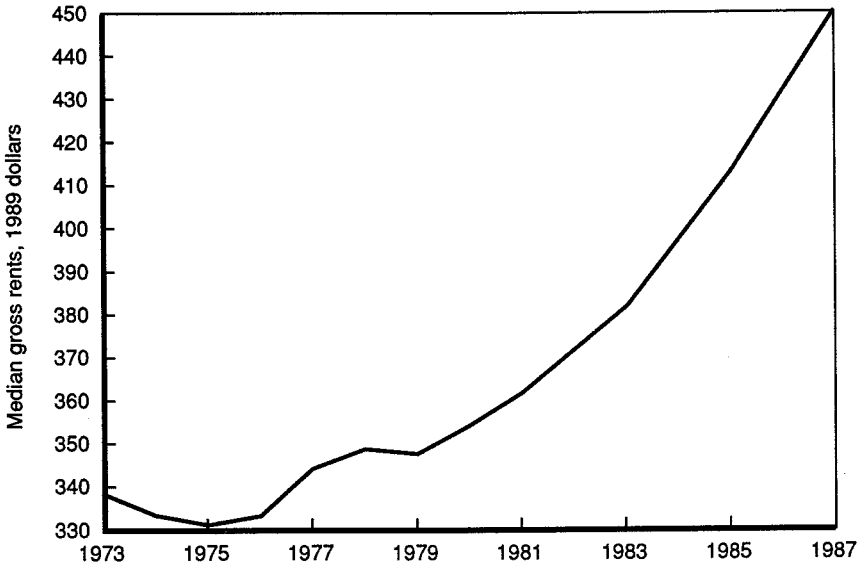
VARIATION OVER TIME

The costs of rental and owner-occupied housing have changed significantly over time. We can illustrate these changes with two simple measures—real median gross rents for rental housing and real median home values for owner-occupied housing. These are not directly comparable values. The measure for rental housing reflects changes in the cost of housing service flows per se; the measure for owner-occupied housing reflects changes in the value of assets that generate these service flows. If real interest rates or tax policy change over time, as they did during this period, we can expect—and, in fact, observe—quite different movements in these series.[3]

[3]For example, very roughly speaking, $12R = AI$, where R is real monthly rent, A is the real asset value of a home, and I is the real interest rate. Hence, $R/A = I/12$. A movement of I from 3 to 6 percent would cause rents to double relative to the values of homes.

Figure 1 shows a time trend for rental housing. Time appears on the abscissa; real median gross rents—that is, contract rent and payments for utilities—appear on the ordinate. We adjusted them to 1989 dollars using the GNP deflator.[4] These data point to a 36 percent rise over the period 1975 to 1987, a real increase of 2.6 percent a year. Given the importance of housing to general expenditure, such an increase accounts for a significant portion of any gain in real per capita income.

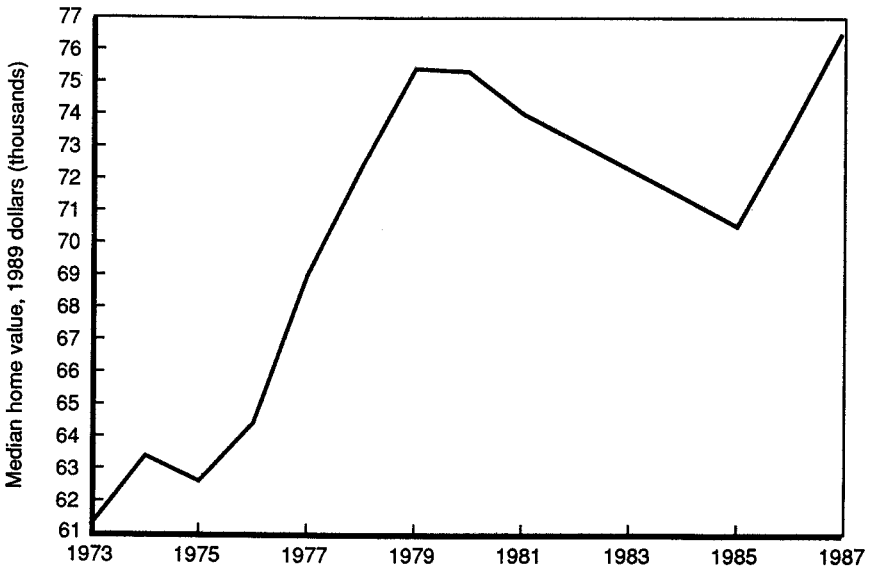
Figure 2 shows data on owner-occupied housing over a similar period. Time appears on the abscissa; real median home value appears on the ordinate in 1989 dollars. The trend shown here differs substantially from that shown in Fig. 1. The home values shown in Fig. 2 are,



SOURCES: *Annual Housing Survey*, 1973–1981, 1983, Part C; *American Housing Survey for the United States*, 1985, 1987.

Fig. 1—Real median gross rents on rental housing, 1973–1987

[4]Some might prefer to use the consumer price index to adjust these data for inflation. We have chosen to use a single deflator throughout the paper for simplicity. Because we should think of housing in general as a consumption and an investment good, we believe a more general index is more appropriate. But using another index should not change our basic conclusions.



SOURCES: *Annual Housing Survey*, 1973–1981, 1983, Part C; *American Housing Survey for the United States*, 1985, 1987.

Fig. 2—Real median home values for owner-occupied housing, 1973–1987

in fact, median values of self-reported estimates of the current market value of owner-occupied housing. They take no direct account of mortgage terms or tax benefits (although, to the extent that these estimates are accurate, they should reflect changes in such factors). Perhaps more important, while Fig. 1 shows data on monthly flows, Fig. 2 shows data on the instantaneous value of stocks.

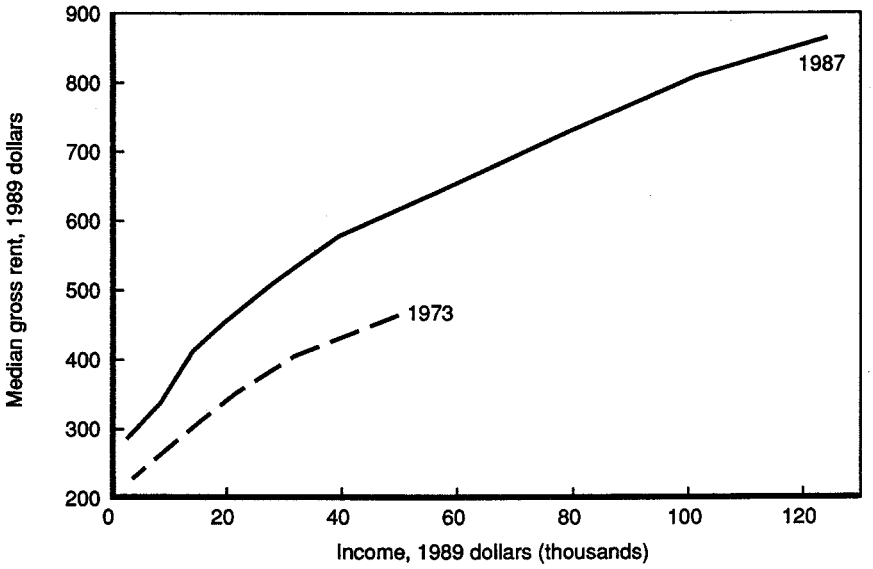
These differences may help to explain the great divergences between the time trends shown in these two figures. In particular, Fig. 2 shows that the values of owner-occupied housing rose 23 percent from 1973 to 1979, fell 7 percent from 1979 to 1985, and then rose 8 percent from 1985 to 1987. These movements in asset values added substantially to per capita income through 1979 and probably offset much of the increase in per capita income from 1979 to 1985.

Costs of rental and owner-occupied housing, then, have changed significantly in recent years and changed in different ways. Understanding why these costs have differed is less important at this point than

recognizing the size of these changes and their implications for policy. They are large enough to significantly affect households and different enough so that we must be sure that any policy addresses both renters and owner-occupiers in special ways.

VARIATION WITH INCOME

Expenditures on housing rise with income. Figure 3 illustrates the increase of rents with income in 1973 and 1987, showing real income on the abscissa and real median gross rent on the ordinate, both in 1989 dollars. The range of income shown covers the relevant range of experience for most DoD households.[5] Over this range of household



SOURCES: *Annual Housing Survey*, 1973, Part C; *American Housing Survey for the United States*, 1987.

Fig. 3—Expenditures on rental housing by income level, 1973 and 1987

[5]The range would have a single junior E-1 at the low end. That person has basic military compensation (BMC) of $13,000. It would have a flag officer receiving an additional housing allowance with a working spouse at the high end. That household would receive an income considerably beyond the range shown in Fig. 3. See *Uniformed Ser-*

incomes, rental expenditures rose systematically, if gradually, as real income rose in both years. A similar absolute rise in rental expenditure from 1973 to 1987 occurred in almost every income class. Expenditures rose about 30 percent for all incomes at which we can make a comparison. Expenditures on owner-occupied housing also rose with income during these two years and rose for each income class from 1973 to 1987.

Using data for 1973 and 1987, Fig. 4 illustrates the increasing percentage of median real income spent on gross rent as household income falls. The abscissa represents the percentage of rent in household income; the ordinate shows the median real income in 1989 dollars. In both years, groups with lower median incomes consistently spent a larger fraction of their income on housing.

The Fig. 4 results are consistent with those in Fig. 3, which show expenditures on rent growing less than proportionately with income. Comparing 1973 with 1987, we see a systematic increase over the 14-year period in median incomes; however, a typical household at any income level spent a higher share of income on housing in 1987 than in 1973. Analogous data for owner-occupiers look quite similar.

VARIATION ACROSS LOCATIONS

Housing expenditures also vary systematically across locations. Figure 5 illustrates this with information on rental housing; similar patterns exist for owner-occupied housing. Again, real income, in 1989 dollars, appears on the abscissa and real median gross rents, in 1989 dollars, on the ordinate. The four traces in the figure, each showing median gross rents for a specified region in 1983, indicate substantial variation at every income level.

The spread between minimum and maximum medians, about 25 percent of rents, was significantly greater at most income levels in 1983

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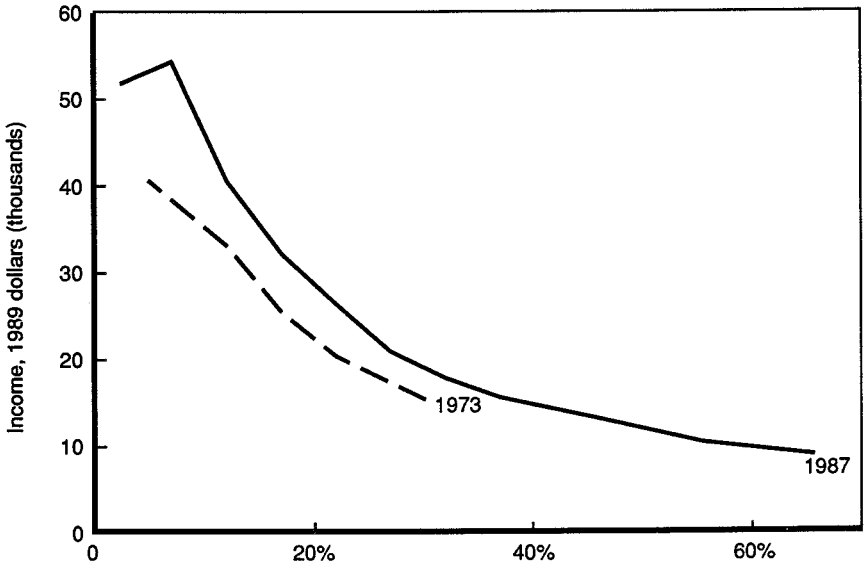
vices Almanac (1989), pp. 10, 22. The vast majority of the force, however, have household incomes of less than $80,000 a year. We do not have data on the actual incomes of DoD households that we can use to determine who lies within this range, but we can develop an estimate. Some 96 percent of senior officers—i.e., officers at the O-5 level and above—are male, and 70 percent of them are married. In 1986, 52 percent of their wives worked (Hayghe, 1986). Military wives have much lower incomes than their civilian counterparts. In 1975, a typical O-6's wife made 11 percent of what he did and only 57 percent of what her civilian counterpart made (ibid.). If she made 25 percent of what he makes today (1989), a BMC of $64,000 would fall near the top of the range. An O-6 with 20 years of service might make this amount. An O-6 with over 26 years of service, a variable housing allowance, some capital income, but no working spouse would make a similar income. These figures suggest that only flag officers are likely to have household incomes consistently above $80,000. They account for only .04 percent of the force. See *Uniformed Services Almanac* (1989), pp. 192–193.

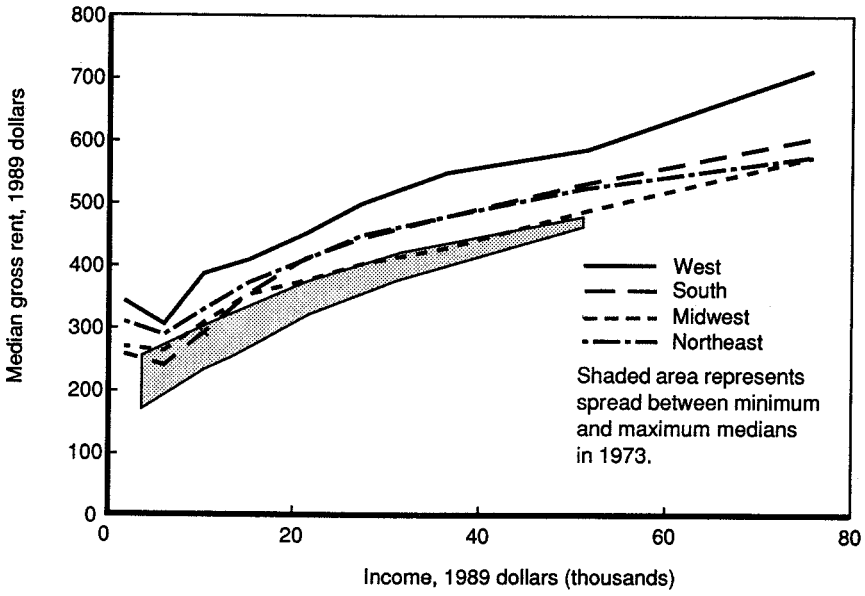


SOURCES: *Annual Housing Survey*, 1973, Part C; *American Housing Survey for the United States*, 1987.

Fig. 4—Gross rent as a percentage of income, 1973 and 1987

than it was in 1973; traces for 1973, analogous to those shown here for 1983, would fit in the shaded area in the figure. The spreads for 1973 ranged from about 40 percent of rents at low incomes to 6 percent at higher incomes. These spreads for 1973 and 1983 are conservative estimates of the extent of locational variations in expenditure; measures based on more disaggregated locations, for example, states or metropolitan areas, would reveal a wider spread than these regional medians suggest.

Figure 6 illustrates the variations that occur even in fairly local housing markets. Real income appears on the abscissa and real median gross rent on the ordinate, both in 1989 dollars. Individual traces show rents for households (a) in suburbs—i.e., in standard metropolitan statistical areas (SMSAs), but not in central cities, (b) in central cities, (c) outside SMSAs, and (d) in the United States as a whole. Spreads among these traces range from 35 percent at low incomes to 20 percent



SOURCE: *Annual Housing Survey*, 1983, Part C.

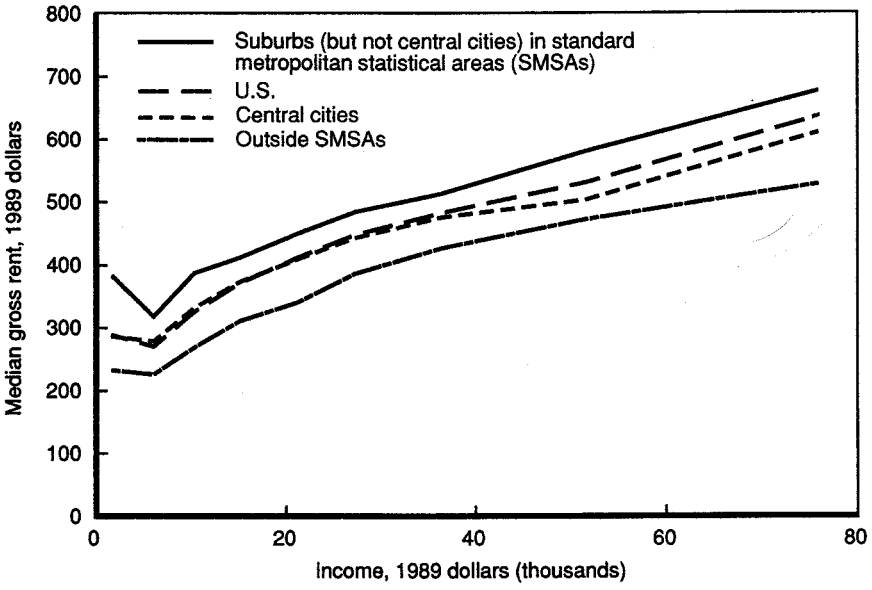
Fig. 5—Regional differences in expenditures on rental housing, 1983

at high incomes. Again, a more disaggregated view of these markets would reveal even greater variation. Similar variation occurs in these markets for expenditures on owner-occupied housing.

SUMMARY

This section examined various factors that affect how much American households spend on housing. Because expenditures are fairly easy to observe and have a certain intuitive appeal as a measure of housing cost, DoD policy on housing allowances focuses on expenditures.

Expenditures on rental and owner-occupied housing vary significantly over time and across locations within the United States. Given the importance of housing in household spending, these variations are large enough to affect the total well-being of American civilian households. As a result, such variations importantly affect DoD's policy on housing allowances, designed to cover housing costs and compensate households for the effects of variation in expenditures across locations.



SOURCE: *Annual Housing Survey*, 1983, Part C.

Fig. 6—Expenditure variation for rental housing within local areas, 1983

III. HOUSING EXPENDITURES AND THE PRICE OF HOUSING

This section suggests that DoD policy should focus on the *price of housing*, rather than on *housing expenditures*. We often speak of the amount we spend on housing as its "price." We say, for example, "I got a good price for the house; it sold for $230,000." To understand the economics of housing demand and its implications for DoD policy on housing allowances, we must understand that housing expenditures and the price of housing are distinct concepts and that DoD should give more attention to the price of housing. After discussing these two concepts, this section presents several techniques for estimating the price of housing services from observable data.

PRICE, EXPENDITURE, AND GENERAL WELL-BEING

We can begin to understand how price and expenditure differ by considering a simple example. A household currently living in Norfolk, Virginia, spends $900 a month to rent a home. DoD transfers the household to Washington, D.C. A comparable home, similarly located, in the Washington area would cost $1800 a month to rent. Because the higher price of housing in Washington will discourage the household from consuming as much housing as it did in Norfolk, we can confidently predict that the household will spend less than $1800 on a home in Washington. Suppose it spends $1200. What does this reduction imply?

The household spends more in Washington for less house. It does so because the price of housing is higher in Washington than in Norfolk. We can say this a bit more precisely by remembering that, for any good or service, the following identity must hold:

$$\text{Expenditure} \equiv \text{Price} \times \text{Quantity} .$$

Suppose that the household pays $1 a "unit" for 900 units of housing in Norfolk. The household buys more units of housing by buying a house that is larger or higher quality, on a larger lot or in a more desirable neighborhood, with better public services or greater access to busi-

ness and shopping opportunities.[1] The product of this price and quantity is $900.

Now suppose that the price of housing in Washington is $2 a unit. The household would then have to spend $1800, as indicated, to buy the original 900 units of housing. Facing a 100 percent increase in housing price, the household chooses to reduce the amount of housing it buys to 600 units, spending instead $1200.[2] The household buys fewer units of housing by buying a smaller, lower-quality house on a smaller lot in a less desirable neighborhood with poorer public services and less access to business and shopping opportunities.

We might argue that, because the household in Washington must give up $300 a month more of nonhousing goods and services to get its housing, this household is worse off in Washington by $300 a month. Such a measure captures the fact that the household's *cost* of housing has risen. It does not reflect the fact that the household also receives fewer *benefits* when it consumes less housing. Changes in both costs and benefits matter.

Figure 7 graphs the changes in costs and benefits associated with the example above, showing units of housing on the abscissa and price per unit on the ordinate. The curve identifies the household's demand function for housing, showing how it reduces demand as price rises. The change in the cost of housing associated with moving to Washington is shown by area (A − C), the change in expenditure. Benefits fall as consumption falls from 900 to 600 units by the area (B + C).[3]

The net effect of the move on household well-being, then, is

$$-(B + C) - (A - C) = -(A + B),$$

the loss in "consumer surplus" precipitated by the move. This area is simply the product of (a) the change in the price of housing and (b) the

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[1]Section IV discusses these "attributes" of housing and the factors that affect household demand for them in greater detail.

[2]This change in demand is consistent with a price elasticity of demand for housing of about −0.6, well within the range of empirical evidence on this elasticity. Section IV discusses this elasticity and its values in greater detail.

[3]Consider a household with utility, U, a function of the quantity of housing services, h, and other goods and services. When a rational household chooses a level for h, it does so in a way that sets $\partial U/\partial h = \lambda p$, where p is the price of housing defined in the text and λ is the household's marginal utility of income. This relationship defines the household's demand function for housing services. When a household behaves in this way, $(\partial U/\partial h)/\lambda = p$. That is, the height of the demand function at any quantity of consumption—that is, p—measures the monetary value of consuming that unit of housing to the household. Integrating over a series of increments (or decrements) in the quantity of housing allows us to measure the total monetary value a household associates with these changes in the quantity of housing consumed. Area − (B + C) represents such an integral for the change from 900 to 600 units.

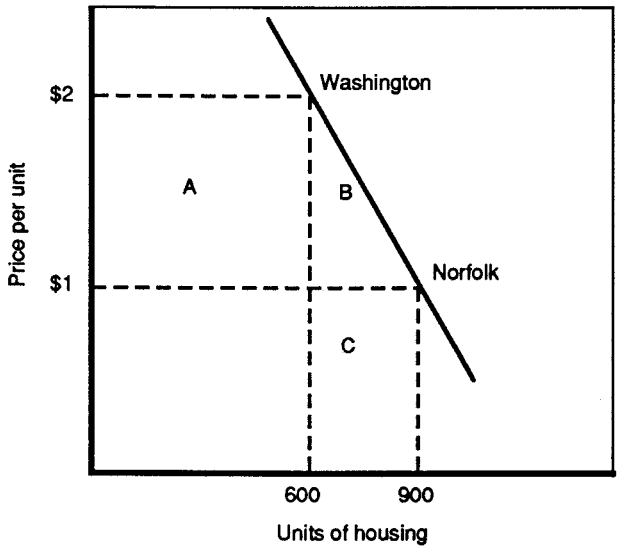

Fig. 7—Costs and benefits associated with a change in housing price

average level of housing quantities consumed in Washington and Norfolk. That is, the true negative effect of the move on household well-being is $\$1 \cdot 750 = \$750$ a month, an amount 2.5 times larger than the measure suggested by the change in expenditure.[4] This consumer surplus–based measure relates more closely to changes in the *price* of housing than to changes in housing *expenditures.*

Two important factors cause housing prices to differ from one location to another. One involves wages; the other, amenities.[5]

First, industry finds some locations to be more productive than others. Private firms in these areas pay higher wages, and these higher wages make private-sector households willing to pay more for their housing. In effect, private firms "compensate" these households for their higher housing costs with higher wages. We can view housing

[4]This is an approximation offered to facilitate the discussion of why price and expenditure differ and how they relate to the true measure of loss associated with changes in the price of housing. For example, the fact that we can use a simple arithmetic average of housing demand in Norfolk and Washington to measure loss results from assuming a linear demand curve. For a more precise discussion of these issues, see Camm (1983).

[5]We thank Michael Murray for his succinct description of these factors, from which we have borrowed liberally.

allowances that vary across locations as a device that DoD uses to pay higher "wages" to DoD households living in these areas to compensate them for these higher housing costs.

Second, some locations offer special amenities. Natural beauty or special amenities (for example, a good symphony or locally accessible hunting and fishing) make them more pleasant places to live. Households will pay more for housing in these locales to be near these amenities. Private firms need not pay their workers more in compensation for high housing prices that result from these amenities; the amenities themselves will compensate the households. That assumes, of course, that households locate near these amenities voluntarily.

DoD households have little control over where they locate. Although they may benefit from amenities in a high-cost locale, they are unlikely to value them as much as the households that have sought them out and bid up housing prices to take advantage of them. Even when a locale offers attractive amenities, then, high housing costs in the locale will hurt a typical DoD household unless DoD compensates the household for these higher housing costs.

Throughout the world, urban wages correlate closely with urban housing prices. This correlation suggests that the first reason for higher housing prices predominates and that therefore, in most instances, DoD should compensate households when they face high housing prices in a locale.

This example illustrates the general insight that the best measure of how a household's general well-being changes as it moves from one place to another is the change in its consumer surplus that results from changes in prices associated with the move. Because housing is a major component of a household's spending and because variation in housing prices is likely to exceed that for other goods of similar importance to a household's spending, it makes sense to focus on changes in housing price as indicators of the general change in consumer surplus associated with a move.[6]

One may think about housing compensation in terms of the money required to buy a "standard" house in different markets.[7] In a sense, the compensation provided in the example above reflects the increase in the cost of buying a standard package of 750 units of housing, which we might think of in terms of, say, a three-bedroom, unfurnished apartment with parking in a good neighborhood not far from work.

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[6]We must not lose sight of the fact that other price changes may also matter. However, because this report addresses the policy on housing allowances, it focuses on changes in housing prices per se.

[7]The technique we propose below for using hedonic indexes to develop a price index uses just this approach. DoD uses a limited version of this approach to calculate the VHA.

That is not to say that a household would live in such housing in Norfolk or Washington, or that policy on housing allowances should attempt to induce a household to choose such housing at each duty station. To the contrary, the example shows that the household buys less than this in Washington, perhaps living farther from work in a less desirable area, and more than this in Norfolk, perhaps by adding a bedroom or improving the quality of schooling. That is, a policy designed to allow a household, if it wants to, to buy a standard bundle of housing wherever it locates, need not and should not induce a typical household to actually select this bundle everywhere.

MEASURING DIFFERENCES IN THE PRICE OF HOUSING

DoD policy currently adjusts the compensation of households moving from one location to another more than enough to reflect typical changes in expenditures on housing as households move between locations but not enough to reflect changes in the price of housing that households experience as they move from one location to another.

Properly reflecting changes in prices would noticeably affect the allowances that households receive. DoD would give households lower allowances than they now receive when they live in low-expense areas and higher allowances than they now receive when they live in high-expense areas. That is, the difference between the lowest and the highest housing allowances would rise from its current level.[8] To do this, DoD must be better able to measure the level of housing prices in particular locations.

Although DoD can fairly easily observe differences in expenditures, it cannot observe differences in the price of housing directly. Fortunately, several methods are available to allow DoD to estimate such differences in price.

All methods of estimating price levels essentially use observable expenditure data to infer price levels. To start such an analysis, we must be sure that we are using the right data on expenditure. As suggested in Sec. II, this raises two issues.

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[8]Suppose that we could identify the typical amount that DoD households spend on housing in each housing area and then rank areas from low-expense to high-expense areas. If we could also measure the housing price level in each area, we would find that (a) the housing price level is low in low-expense areas and high in high-expense areas and (b) as we move from low- to high-expense areas, the price level rises more rapidly than the level of expenditure. Such a comparison correctly suggests that DoD households are not adequately compensated as the housing price level rises from location to location.

- First, we should use expenditures for housing *services*, not housing *assets*, as the starting point. That is, we must convert observable data on expenditures for owner-occupied housing into estimates of expenditures for the housing services that flow from such housing.
- Second, we must *define* exactly which expenditures on housing services interest us.

The methods discussed in this section do not depend on this definition. But the analyst must be clear about it to be sure that he or she uses available data properly and to ensure that his or her estimates of price levels address the housing services of greatest interest to the policymaker. Following a discussion of two ways to convert data on assets into estimates of expenditure on housing services, we discuss three ways in which DoD might infer price levels for these services from data on expenditures for these housing services.

Converting Expenditures on Assets into Expenditures on Housing Services

When a household owns and occupies a dwelling, easily observable data on its housing-related cash flows do not immediately reveal the household's actual monthly cost of occupying this dwelling. For example, tax benefits flow from ownership and depend on factors independent of the dwelling itself. The household's down payment could yield a return if invested elsewhere, which must be counted as a cost of ownership. Other costs associated with ownership, such as the costs of initiating a mortgage and selling a property, must be allocated over the period of ownership.

When these and other factors are properly considered, we can estimate the cost to the household of holding the housing asset for a month. We can then use this cost as an estimate of the household's true expenditure on the flow of housing services that it receives from the asset.

Analysts use two methods to estimate this cost. The first method uses fairly detailed information about a home and the household that owns and occupies it to estimate the monthly payment that, if the household lived elsewhere and received this payment, would give the household a competitive rate of return on its investment in the home. That is, it would reduce to zero the net present value of the home to the household. The second matches an owner-occupied home with similar homes occupied by renters and uses data on the rent paid for

these matched homes to estimate the effective monthly expenditure for the owner-occupied home.[9]

Although it can be shown that these two approaches are conceptually equivalent, their actual equivalence depends heavily on how they are implemented.[10] Moreover, their implementation requires very different data sources and techniques.

Estimating the imputed rent for an owner-occupied housing asset. The first method applies a standard economic technique that is most often associated with the "user cost of capital" to owner-occupied housing assets.[11] A user cost of capital relates an annual (or monthly) cash flow associated with an asset to the value of that asset. Hence, if we know the user cost of capital for housing and the value of a housing asset, we can calculate an "imputed rent" or monthly flow value for housing services.

As a simple example, suppose that a household pays $100,000 cash for an apartment. It expects to sell the apartment for $110,000 cash in five years. It expects no tax benefits, or costs of buying and selling the apartment, and no operating costs. If it invested its money in an alternative asset, the household could earn an annual 5 percent return on the investment after taxes. How much does it cost this household per month to forgo this alternative opportunity and to hold the apartment instead?

If the household bought, say, a bond, it could redeem that investment for $\$110{,}000 \cdot (1.05)^5$ after taxes, or $17,628 more than it would receive for the apartment. If the household received and invested $259 a month at 5 percent after taxes while it owned the apartment, it could accumulate the $17,628 difference between its realized profit on selling the apartment and what it could make elsewhere. In this example, 5 percent is the general user cost of capital, $100,000 is the household's expenditure on the housing asset, and $259 is its effective monthly "expenditure" on the housing service (i.e., the monthly cost to the household of owning and occupying this apartment).

With some additional difficulty, this approach can calculate monthly expenditures for housing under much more complicated circumstances.

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[9]This method is similar to that currently used to calculate the variable housing allowance.

[10]Gillingham (1980, 1983). Cf. Gordon (1981).

[11]The standard reference on the user-cost-of-capital approach is Jorgensen (1971). The standard reference on its application to housing is Dougherty and Van Order (1982). For an especially useful numerical illustration of the approach we have in mind here, see de Leeuw and Ozanne (1981).

For example, de Leeuw and Ozanne (1981) consider the following factors in the analysis of owner-occupied housing:

Purchase Cash Flows
- Initial purchase value of property
- Initial value of mortgage
- Closing costs

Annual Operating Cash Flows
- Imputed annual rent
- Operating annual costs
- Marginal income tax rate
- Property taxes per year
- Mortgage interest per year
- Mortgage amortization per year
- Opportunity cost of capital

Sales Cash Flows
- Final sales value of property
- Selling costs
- Initial value of mortgage
- Sum of operating-year amortization payments on mortgage
- Opportunity cost of capital.

This widely used approach has the important analytic advantage of enabling one to estimate how changes in important policies like tax law and significant economic parameters like interest rates can affect owner-occupiers' effective monthly expenditures on housing and, hence, how such changes affect the relative costs of renting and of owning and occupying a home.[12]

This type of analysis could help DoD adjust its policy on housing allowances over time in response to a changing economic and policy environment. Unfortunately, however, good empirical estimates do not exist for all of the factors important for the analysis. Nonetheless, extensive use of this approach has generated a set of generally accepted values for many of the factors considered by de Leeuw and Ozanne (listed above).

Matching owner-occupied dwellings with rental dwellings. The Bureau of Labor Statistics (BLS) currently uses a simpler and less rigorous technique to measure "owners' equivalent rent," the measure of the price of owner-occupied housing that it uses to compute the

[12]The approach has been especially useful in assessing the effects of tax changes on housing demand. See, for example, the studies in Follain (1986). See also Hendershott (1980) and Hendershott and Slemrod (1983).

consumer price index (CPI).[13] The BLS method matches owner-occupied dwellings with "equivalent" rental dwellings, using explicitly developed techniques to sample and match appropriate households.

The difficulty of finding appropriate rental dwellings to match with owner-occupied dwellings complicates the use of this approach. As the analyst loosens the criteria for matching, a broader sample of matchable dwellings becomes available, but the quality of the match deteriorates. For example, because the BLS captures information about households only through information on where they live, matches may not adequately reflect aspects of tax status that drive choices between owning and renting and, hence, indicate what forms of rental and owner-occupied housing are in fact equivalent.

Only if rental and owner-occupied and "equivalent" rental units match very closely is this approach in fact equivalent to the imputed-rent approach discussed above. To be equivalent, the approach would have to consider all factors included in the imputed-rent analysis to match dwellings. Such a demanding equivalence would make the matching approach impractical for BLS. With fewer dwellings to match in a market, DoD would have still more difficulty implementing a rigorous matching approach.

To choose between the imputed-rent and matching approaches, DoD must choose between rigor and cost. The matching approach will be expensive if DoD seeks a rigorously defensible match of owner-occupied homes with equivalent rental homes. The less spent matching homes, the less defensible the resulting estimate of expenditures on housing services will be. DoD must also choose between an analytical tool with broad policy applicability and one useful only for estimating expenditures at a specific time. The more important the broader capability is to DoD, the more useful the imputed-rent approach will be.

Once we convert expenditures on owner-occupied housing to a simple monthly flow rate, we can use this flow rate as a basis for estimating a price of housing services. Several methods are available to do this.

Estimates Based on the Price Elasticity of Demand

The simplest method of estimating differences in the price of housing in these markets uses information about (a) the price elasticity of demand for housing and (b) typical housing expenditures by similar

[13]For a useful discussion of BLS methods, see U.S. Department of Commerce, *BLS Handbook of Methods* (1988), esp. pp. 175–176.

households in individual markets.[14] Suppose we assume, then, that over the range of relevant price variation, the price elasticity of demand is constant.

Although this simplifying assumption may not accord with all available evidence and although uncertainty persists about the exact way that price affects the demand for housing, the assumption nevertheless generates a simple relationship between price and expenditure.[15] In particular, it allows us to specify the demand for housing, h, as a function of its price, p, as

$$\ln h = \alpha + \eta \ln p ,$$

where η is the price elasticity of demand and α captures all other effects.

Observing similar households in different markets effectively holds α constant. Changing price for such households precipitates a change in demand and hence a change in expenditure, e. We can easily infer the change in price from the observable change in expenditure as

$$\Delta \ln p = \frac{\Delta \ln e}{1 + \eta} .$$

In the example above, using this formula with an estimate for η equal to -0.6 would yield a change in price of about 1.12, fairly close to the actual change of 1.0.[16]

By combining data on observable differences in expenditure by similar households (for example, households grouped by pay grade and dependency status) with either an assumed value of η or a value estimated on the basis of data, DoD could easily calculate differences in price levels and use the results as a basis for policy to compensate households for the effects that flow from these differences in price levels. The cost of this approach would be so much lower than that of the approaches discussed below that it deserves serious consideration.

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[14]An elasticity is a summary measure of economic behavior. A price elasticity of demand measures how much the demand for the quantity of housing changes when price rises by 1 percent. For example, if the elasticity is -2.0, a 1 percent increase in price leads to a 2 percent fall in demand for quantity of housing.

[15]See, for example, Goodman and Kawai (1986).

[16]The difference results because, while our estimate assumes that the elasticity of demand is constant at all levels of demand, this elasticity is not constant along a linear demand curve like that used in the example above. Even when an assumption of constant elasticity is incorrect over the range of price difference in question, then, assuming that it is constant can yield reasonable and useful estimates of price differences.

Although this approach has the advantage of simplicity, it gives DoD considerable latitude to choose a value of η. Because the price levels that DoD estimates in this way are fairly sensitive to DoD's choice of η, this approach could open DoD to criticism for its choice of η. A more empirically based estimate of differences in the price of housing would be less susceptible to such criticism. We turn to two alternative measures that rely more heavily on empirical input.

Estimates Based on a Chain Index

A chain index provides a method for adjusting estimates of a price level over time. That is, although it could not provide estimates of differences in the price of housing across locations at a given time, it could update price estimates over time. It is based on the simple premise that if a household's consumption of housing, h, does not change over time, then changes in the household's expenditure for housing measure exactly changes in the price of housing that the household faces.[17]

A chain index works as follows. Suppose a household enters a house in 1985 and leaves it in 1988. Over the course of its three-year stay, we can expect the dwelling to deteriorate in quality, reducing the effective quantity of housing that the household consumes. If anything else about the home changes during this period—for example, the addition of a bedroom, new appliances, or a paint job—the effective quantity of housing that the household consumes also changes.

After we have adjusted the household's initial expenditure on the home in 1985 for these changes, we compare its expenditure in 1988 with the adjusted expenditure in 1985. We attribute any change in expenditure to a change in the price of housing in this market. By combining similar information from different times and from many households in a market, we can use simple statistical techniques to infer the change in price level during each period covered by the data.

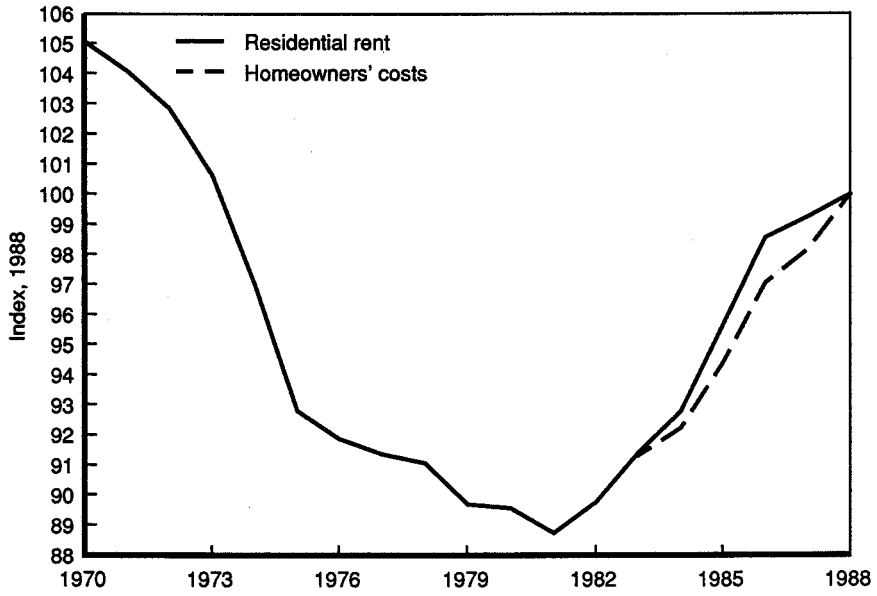
This approach is currently used widely and well understood. In particular, the BLS uses this index to measure changes in the price of housing in the CPI. Figure 8 presents two measures of price based on BLS chain indexes.[18] Time appears on the abscissa and an index equal to 100 in the year 1988 appears on the ordinate. One trace shows changes in the price of rental housing relative to the price level in the

[17]Gordon (1981) puts this approach in the context of alternative approaches and Mark and Goldberg (1984) use actual data to show how it compares with alternatives. Palmquist (1980) shows how to coordinate its use with alternatives. U.S. Department of Commerce (1988) discusses implementation issues.

[18]*Economic Report of the President* (1989), Table B-59, p. 374.

economy as a whole. The other, based on a BLS index that began in 1983, shows the price level of owner-occupied housing relative to the price level in the economy as a whole.[19]

The BLS has developed explicit techniques to sample households and to make the adjustments, discussed above, required to implement a chain index.[20] The approach lends itself to application in DoD, which could use data from identified households as they enter and leave a particular location to construct such an index. DoD is more interested in how prices differ across locations than in how they change over time. But, as noted above, such a technique could be used to update



SOURCE: *Economic Report of the President*, 1989, Table B-59, p. 374.

Fig. 8—Consumer price indexes for shelter, 1970–1988

[19]Because the owner-occupied measure is based on matched rental units, the two measures, unsurprisingly, move rather closely together.

[20]For a useful discussion of BLS methods, see U.S. Department of Commerce (1988), especially pp. 174–175. Because the BLS approach does not correct for the tendency of landlords to give renters discounts as they remain in a dwelling longer, this approach can underestimate the movement of prices in a market as a whole. We discuss this factor in more detail in Sec. V, below. Methods could be devised to correct for this difficulty.

estimates of local price levels once their level relative to prices elsewhere was established. We return to this application below.

Estimates Based on a Hedonic Index

A hedonic index grows out of the notion that the quantity of housing in fact includes attributes associated with size, quality, and accessibility within a market. It assumes that we can associate the total amount that a household spends on housing with these specific attributes in a systematic way. In particular, it asserts that each housing market should be characterized by a set of implicit prices for these attributes and provides a method for estimating implicit prices.

The amount that a household spends on housing in a given market, then, is simply the sum of attribute levels weighted by their implicit prices. That is, once we estimate these implicit prices, we can use the estimates to approximate what a household would pay in a particular market for a home with any arbitrary set of attributes. In particular, we can ask what households in different markets would have to pay for standard housing and ascribe differences in the amount that they would have to pay to differences in the general price of housing in these markets.

As in the chain index above, the hedonic index estimates differences in price by establishing a way to hold the quantity of housing constant across markets and attributing differences in expenditures for this housing to differences in price.[21] We outline here the approach of Malpezzi et al. (1980), the most comprehensive study we have found applying hedonic indexes to the specific problem of identifying differences in the price of housing across locations. We consider it the best approach for DoD's use:

- First, for a set of households in a set of housing markets whose prices are to be compared, collect comparable data on housing expenditures; attributes of the household's dwelling, its neighborhood, and its accessibility; selected attributes of the household; and the date of observation.
- Second, in the sample of households for each market, regress housing expenditure on the other variables. We can interpret coefficients on regressors associated with the dwelling as impli-

[21]In fact, hedonic indexes have been applied in many different ways to measure differences in prices. Rosen (1974) lays the conceptual groundwork for the approach. Bartik and Smith (1987), Follain and Jiminez (1985), and Quigley (1979) provide complementary surveys of applications of the approach.

cit prices. The coefficient on the date provides information on price changes over time.[22]

- Third, select a reference dwelling and household. Using the regressions above, compare the predicted expenditures for this reference dwelling and household in different markets. Use differences to infer differences in price levels.
- A fourth step may prove to be useful as a check on the approach: Compare the estimates of differences in prices that result from more than one reference dwelling and household. To the extent that estimates differ, it may be appropriate to maintain more than one price index.[23]

As an illustration of this approach, Table 2 presents the results of two hedonic price indexes from Follain et al. (1979). This study calculated price indexes for 39 standard metropolitan statistical areas in 1974 and 1975. Each of these indexes of the prices of rental housing services and owner-occupied housing assets uses a standard home and household as a basis for comparison across cities. Although the indexes are somewhat dated, they show that price levels can easily differ by as much as 100 percent from one metropolitan area to another.

Hedonic indexes have many applications, including to prices, an application that is well understood.[24] DoD should be able to collect the data required to construct and maintain such indexes without difficulty.[25] It could use these indexes to estimate changes in housing prices over time and to estimate differences in housing prices across

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[22]This view of time implicitly assumes that samples within a market based on different dates yield the same coefficients on all variables but the date itself. If they do not, separate regressions should be run for individual dates. For a systematic way to address this question, see Palmquist (1980).

[23]Follain et al. (1979) found this to be a particular problem for dwellings that lie at the high and the low ends of the quantity scale for housing; a reference dwelling based on a small expenditure on housing yielded a different price index from a reference dwelling based on a large expenditure on housing. In the context of DoD, this kind of problem might suggest that DoD should maintain separate price indexes for officers and enlisted personnel or differentiate price indexes in some other way. How best to proceed is an empirical question that DoD will have to answer with the data it has available.

[24]Empirical hedonic indexes have gained a somewhat dubious reputation in some other applications. Follain and Jiminez (1985) provides a particularly useful analysis of problems in these applications. Difficulties experienced elsewhere should not color their application here. DoD should take care not to extend its use of hedonic indexes beyond the application of estimating price differences.

[25]In fact, DoD currently uses what is in effect a hedonic index based on a very short list of housing attributes to calculate the VHA. The approaches suggested here would allow DoD to expand this list so as to more effectively reflect differences in the price in the VHA.

Table 2

RELATIVE PRICE LEVELS FOR METROPOLITAN AREAS BASED ON A HEDONIC INDEX

Location	Renters	Owner-Occupiers
Albany	1.35	1.01
Anaheim	1.63	1.25
Atlanta	.88	.97
Boston	1.34	1.18
Chicago	1.08	1.15
Cincinnati	.73	.80
Colorado Springs	.95	.86
Columbus	.73	.81
Dallas	.90	.81
Detroit	.90	.87
Fort Worth	.67	.79
Hartford	1.23	1.24
Kansas City	.66	.69
Los Angeles	1.07	1.39
Madison	.88	1.08
Memphis	.91	.89
Miami	1.00	1.30
Milwaukee	.95	1.11
Minneapolis	1.22	.94
Newark	1.30	1.30
New Orleans	.88	1.02
Newport News	1.04	.92
Orlando	1.28	.86
Paterson	1.24	1.48
Philadelphia	.92	.79
Phoenix	.97	.84
Pittsburgh	1.06	.84
Portland	.90	.85
Rochester	.93	.82
Salt Lake City	.83	.89
San Antonio	.57	.85
San Bernardino	1.08	.94
San Diego	.99	1.37
San Francisco	1.17	1.42
Spokane	.97	.72
Springfield	1.04	1.06
Tacoma	.95	.84
Washington, D.C.	1.19	1.32
Wichita	.69	.75

SOURCE: Follain et al. (1979).

locations. These indexes, when properly adjusted for exchange rates, should be as effective outside the United States as inside.

Practical Implementation of Price Estimates

We can think of each technique above as generating formal estimates of expenditures and price levels. For example, the imputed rent technique transforms assumptions and data into an estimate of the rent that we should impute to an owner-occupier. With a little effort, we could transform information on our uncertainties about these assumptions and data into information on our uncertainty about imputed rent.

The rent equivalence method also yields an estimate, although it may be more difficult to conceptualize the uncertainties associated with this estimate. Even the underlying data on DoD members' expenditures on rental and owner-occupied housing are likely to come from estimates of these expenditures. And the price-elasticity, chain-index, and hedonic-index approaches to estimating price levels from expenditure data in turn are simply estimators.

DoD will probably want to use some combination of these estimators to establish policy-relevant values for expenditures and price levels. Each estimator has certain strengths. DoD can exploit these strengths by using a combination of estimators and combining their results in a formal way. By using this method, DoD can reduce its uncertainty about actual expenditure and price levels and probably also reduce the variation in the numbers it uses for any particular location over time. The use of this method will make measured differences between locations or years more likely to reflect real differences than the effects of sample selection. As a result, using formal techniques to combine information from several sources is likely to help DoD smooth variations in its estimates of expenditure and price levels over time and should justify for DoD the effective smoothing that results.

Consider two examples of how this might work. First, DoD could develop hedonic indexes to compare price levels across locations every five years or so. In the meantime, it could use chain indexes to update price levels in individual locations annually to reflect local changes over time. After developing a hedonic index, DoD could combine information from both types of indexes to readjust price levels across locations.

Second, DoD can probably combine locations into groups that all have similar price levels and then treat them together. Once a group is established, DoD can substantially reduce its uncertainty about the price level in the group as a whole; alternatively, it can reach a given

level of certainty with a smaller sample from each location. Lower uncertainty means smoother changes in prices over time for the group of locations. Periodically, DoD should test to determine whether particular locations should remain together.

These issues of implementation go beyond the scope of this study. But they constitute an important part of any attempt to adopt the kinds of techniques discussed above. Fairly standard statistical techniques exist to handle some of the issues raised here. Even these, however, should be carefully tailored to DoD's needs.

In addition, DoD should give careful thought to developing innovative methods for combining data from different sources. The techniques required to combine data could look unusual enough that they may raise questions about the credibility of numbers that DoD develops with such techniques. Both of these considerations—the difficulty of the task and the questions that may arise from its complexity—strongly suggest that DoD should consider contracting with an outside organization, such as the Bureau of the Census or the Bureau of Labor Statistics, to develop and maintain the estimates of expenditures and price levels.

SUMMARY

DoD currently uses information on housing expenditures as a basis for calculating housing allowances; more complete information on the price of housing services would provide a better measure of how the cost of housing affects the well-being of DoD households in different locations. Information on price addresses differences in the benefits associated with different expenditures on housing in a way that information on expenditures does not.

DoD cannot observe the price of housing services directly, but it can develop various different estimates of this price from observable data on expenditures. The first step in doing this requires ensuring that DoD uses the right information on expenditures. This information should cover only housing services of interest to DoD, and it should express expenditures by households that own and occupy a dwelling in terms of the effective monthly cost that these households experience for housing service.

DoD can estimate households' monthly "expenditures" on owner-occupied housing by looking at the rent that other similar households pay for "equivalent" housing or by estimating the monthly fee that these households would have to receive to give their investment in housing a net present value of zero if they did not occupy the housing.

The first approach is potentially simpler and less costly but significantly less precise than the second.

Once we can state expenditures for housing services as a monthly flow, we can use this information on expenditures to estimate the price of housing services. Three methods are available, as follows:

- The simplest method uses an assumption about the price elasticity of demand to convert information on expenditures by similar households into estimates of the housing prices that they face.
- The second, a chain index, adjusts for changes in the quantity of housing a household consumes over time and uses information on differences in household expenditures over time to estimate changes in housing prices over time.
- The third, a hedonic index, converts information about expenditures into a price estimate by using information on the attributes of a household's housing services to control for the amount of housing it consumes.

All these techniques yield estimates of the price of housing services. The first method is significantly less costly, but harder to defend, than the second and third. DoD should consider this trade-off carefully, remembering, however, that even the costlier options would absorb only a tiny fraction of the $6 billion that DoD currently pays annually in housing allowances.

In fact, by utilizing the relative advantages of each technique, DoD should be able to coordinate estimates developed using each technique to yield a useful joint estimate over time and across locations. Such coordination could give the appearance of considerable discretion; thus, DoD might have difficulty maintaining the credibility of any estimates it develops in-house. To maintain such credibility, DoD might consider transferring funds to the Bureau of the Census to collect expenditure data and administer the process of transforming these data into estimates of the price of housing services.

IV. THE ECONOMICS OF THE DEMAND FOR HOUSING SERVICES

This section summarizes the basic findings of economists who have studied the demand for housing services in recent years.[1] It emphasizes findings that have been substantiated by empirical analysis and that DoD is likely to find useful as it compares demand for housing services by DoD households with that by non-DoD households and reconsiders the structure of its policy on housing allowances.

Despite important exceptions, economic studies, especially empirical ones, analyze the demand for housing services in terms of three sequential decisions that a household must make:[2]

- The household first decides on tenure—whether to rent or to own and occupy a dwelling.
- It then decides how much to spend on housing services.
- Finally, it decides what attributes of housing to buy.

A distinct set of factors appears empirically to influence each decision.

THE TENURE DECISION

The tenure decision depends on two quite different elements of a household's behavior:

- The housing services that it can consume by renting or owning and occupying.
- The savings that it can accumulate by borrowing to buy a home, repaying this loan, and accumulating equity in the home as it repays the loan and as the home appreciates in value.

Both the consumption and investment motives play important roles in this decision. In turn, they help to explain how the tenure decision

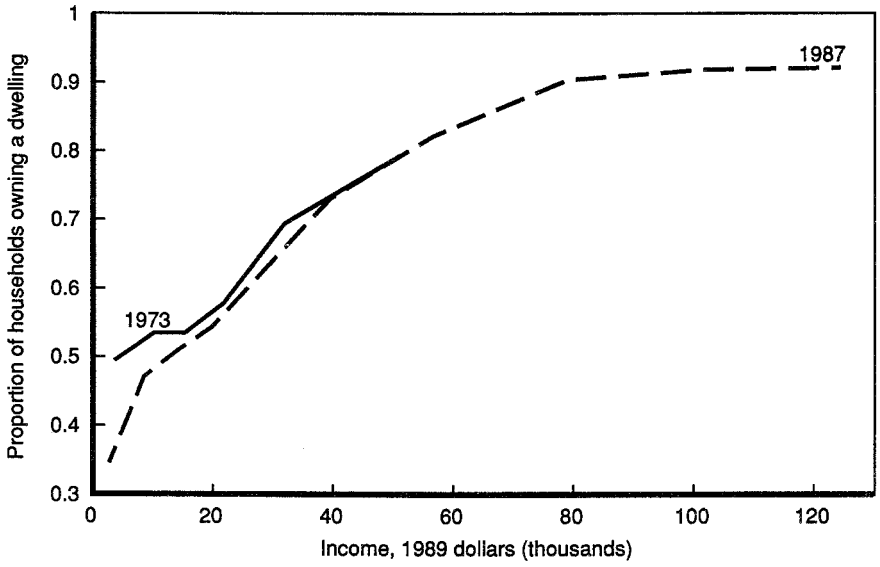
[1]It draws heavily on the literature surveys of various aspects of housing demand. Particularly helpful were Bartik and Smith (1987), de Leeuw (1971), Follain and Jimenez (1985), Mayo (1981), Olsen (1987), Quigley (1979), and Smith, Rosen, and Fallis (1988).

[2]Henderson and Ioannides (1983) provides a theoretical approach to integrating certain aspects of tenure and expenditure decisions. Efforts to integrate the view of housing as simultaneously a consumption and an investment good should also help us view tenure and expenditure decisions simultaneously. These include Bossons (1978), Henderson (1985), and Rothenberg (1983). The findings of these papers have yet to be substantiated empirically.

depends on a household's income, the relative prices of renting and of owning and occupying a dwelling, and the household's perception of the relative uncertainty associated with these two options.

Income

Empirically, home ownership correlates strongly with income. Figure 9 illustrates this relationship with data showing real household income, in 1989 dollars, on the abscissa and the proportion of households owning a home on the ordinate. The two traces, representing data for 1973 and 1987, indicate relative stability from year to year during the past two decades. Since 1960, about 62 to 65 percent of American households have owned and occupied their home.[3] These figures demonstrate the strong tendency of households to move from renting to owning and occupying a home as their real income increases.



SOURCES: *Annual Housing Survey*, 1973, Part C; *American Housing Survey for the United States*, 1987.

Fig. 9—Home ownership as a function of income, 1973 and 1987

[3]Smith, Rosen, and Fallis (1988).

Several factors contribute to this relationship. As income rises, a household is better able to make the down payment that mortgage lenders require to issue a mortgage.[4] Once it is able to borrow the money to buy a home, the household's tax advantage in owning such property rises with its income.[5]

The interest expense associated with buying a house is tax deductible at the household's marginal tax rate, which increases with income over the range of incomes shown in Fig. 9. Hence, the effective price of borrowing to buy a home falls with income. Further, current tax law taxes capital gains from owner-occupied housing at a far lower rate than capital gains from other sources. As we shall see below, expenditure on housing services rises with income. As expenditure rises, the size of the tax benefit from owning rises. This factor encourages a household to avoid inertia or transaction costs that might delay switching from renting to owning.

Finally, income tends to correlate with the maturity of a household. As a household ages, it tends to stabilize and to give greater attention to savings.[6] Stability increases the household's inclination to remain in one dwelling and to amortize the fixed costs of buying and selling a housing asset.

Greater attention to savings increases the household's interest in many assets, housing among them. Given the tax advantages associated with owning and occupying a dwelling, home ownership is one of the first places a household looks to accumulate savings.[7] Because household income tends to correlate with household stability, empirical studies of home ownership can attribute the effects of increasing maturity to increasing income.

Figure 10 indicates the effects of income and maturity by showing real 1987 household income, in 1989 dollars, on the abscissa, and the

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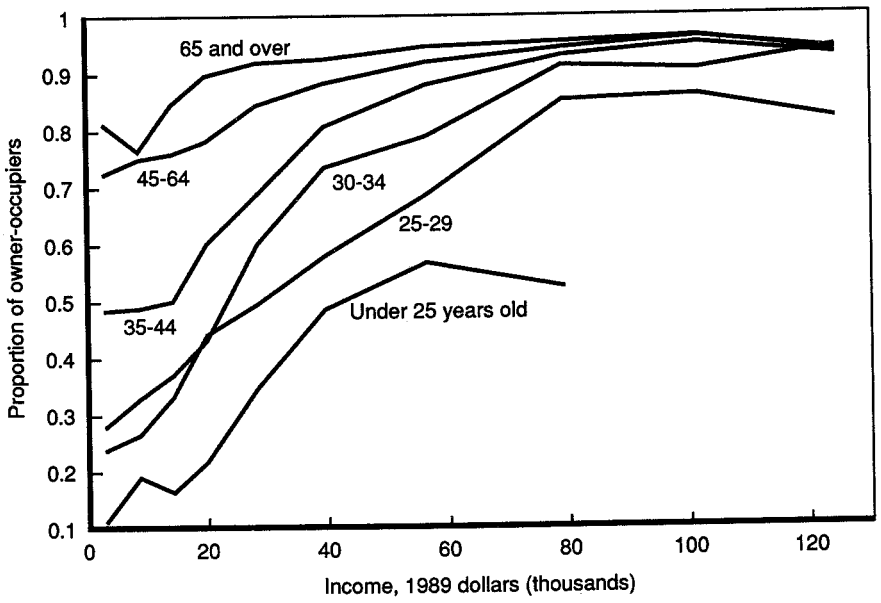
[4]Artle and Varaiya (1978).

[5]An extensive literature documents effects of the tax code on housing decisions. A classic reference is Laidler (1969). Empirical studies include Hendershott and Slemrod (1983), Poterba (1984), Rosen and Rosen (1980), and Rosen et al. (1984). For a useful analysis of the effects of changes like those included in the Tax Reform Act of 1986, see Hendershott, Follain, and Ling (1987). For information on other studies, see Smith, Rosen, and Fallis (1988).

[6]Kendig (1984) lays out a fairly complete picture of the life cycle of housing demand by a typical household over the course of its "life." By increasing maturity, we mean general progress through this life cycle of demand and the circumstances that surround it: an aging head of household, more stability in location and employment of the head of household, a growing number of children and then an empty nest, and all the housing decisions one might associate with these changes.

[7]Bossons (1978).



SOURCE: *American Housing Survey for the United States*, 1987.

Fig. 10—Age, income, and home ownership in 1987

proportion of owner-occupiers in 1987 on the ordinate. Each trace shows the relationship between home ownership and income for a different age group, from under 25 to 65 and over. In the range of incomes that interests us, the positive relationship between home ownership and income holds up well in every age group. And almost without exception, for any income level, home ownership rises with age. Econometric measures of the income effect tend to confound these two important factors; they attribute to income the effects of income and maturity.

Price

As noted above, the price of housing services cannot be observed directly. As a result, price effects have not received as much attention as income effects. Nonetheless, studies that include the relative prices

of renting and of owning and occupying a home consistently show a significant effect.[8]

Tax deductibility of interest and the low taxation of capital gains from housing reduce the price of owning relative to that of renting.[9] In fact, part of the income effect described above acts through a price effect; for example, increasing a household's income increases its marginal tax rate and thereby reduces its cost of borrowing to buy a home. This relationship between income and price effects can complicate efforts to distinguish the two.

Uncertainty

Recent empirical work on tenure decisions has recognized that the demand for assets depends not only on the expected return from these assets but also on the degree of uncertainty about these returns.[10] That is, if two assets yield an equal expected return, a typical (risk averse) household will prefer the asset with less uncertainty about its return. The tenure decision is typically a fairly long-term decision that we can think of as a decision about alternative assets. These general insights suggest that, to compare the options of renting and of owning and occupying, we should consider not only the relative prices of these options but also uncertainty about these relative prices.

This perspective is especially important to DoD because its retirement systems are likely to affect households' demand for savings from current earnings; this demand for savings, in turn, should affect their demand for a housing asset as an investment. That is, a better understanding of how uncertainty about tenure options affects household asset demand could help us better understand demand for housing services by DoD households. Empirical conclusions based on this more realistic portrayal of the housing asset remain tentative; DoD should

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[8]See, for example, Hendershott (1987), Dynarski and Sheffrin (1985), Kent (1983), and Rosen and Rosen (1980). Studies cited above that show an effect of income taxes on housing tenure rely on a significant price effect; empirical evidence of a tax effect is evidence of a price effect.

[9]The tax code has favored rental properties as well. As with owner-occupied housing, property taxes were deductible. Other factors differed. Tax depreciation exceeded economic depreciation. The builder could write off construction period interest and taxes rapidly. And a low tax rate applied to capital gains. Because these are all reflected in the price offered to renters, a household need not consider these factors directly in its tenure decision. But they do affect the relative desirability of renting and of owning and occupying. For an overview of the likely effects of the Tax Reform Act of 1986, see Hendershott, Follain, and Ling (1987).

[10]Goodwin (1986) and Rosen, Rosen, and Holtz-Eakin (1984).

monitor future developments with interest. For now, we can only summarize results from the limited work that has been completed.[11]

Economists have approached uncertainty about owning and occupying housing from two perspectives. First, they have recognized that, although the high inflation of the 1970s substantially reduced the price of owning and occupying relative to renting, households did not respond to this change as much as economic models would have predicted. Rosen, Rosen, and Holtz-Eakin (1984) explained this apparent contradiction by explicitly accounting for the effect of households' uncertain perceptions about inflation in an empirical model of housing demand. According to that study, these perceptions moderated the demand for owner-occupied housing during the period from 1956 to 1979.

Second, economists recognized that households often assert that they own and occupy a home as a hedge against inflation. This hedge does two things. It gives owners an asset that increases in nominal value with the market for housing as a whole, thereby providing insurance that the household can continue to consume the amount of housing that it currently consumes as the price of the housing rises. Second, it represents real capital that households can use as a general hedge against inflation by providing a store of real value. Households can (potentially) draw down this store of value in the future to purchase not just housing services but other goods and services as well.

Goodwin (1986) shows both uncertainty about inflation and the desirability of a hedge to be empirically important factors that, in fact, work to moderate the effects of recent policy changes on the demand for housing. This early work clearly points to the value of continuing empirical analysis of uncertainty.

THE EXPENDITURE DECISION

Empirical analyses of expenditure typically assume that a decision about tenure is complete. Conditional on this decision, studies then investigate the determinants of the demand for expenditure on either rental or owner-occupied housing services.[12] These studies indicate that income, and in particular "permanent" income, is the most important determinant of demand for expenditure. Price also affects

[11]Section V explains that DoD households are likely to be more uncertain about how long they will own a home than non-DoD households. Economists have not examined the empirical effects of this kind of uncertainty.

[12]Olsen (1987) emphasizes that this conditionality has an important effect on the interpretation of coefficients in estimated demand functions.

expenditure, but measurement problems have limited empirical analyses of its effects. Sociodemographic characteristics of households also influence expenditure.

Income

Like the demand for most goods, the demand for expenditure on housing rises with income.[13] It does so for the normal reasons we associate with consumption behavior and also because household income is correlated with household maturity. A growing family typically requires more space over time.

As with the demand for most goods, the income concept of greatest relevance to housing expenditure is "permanent" income. In concept, a household's permanent income is an annualized version of the household's effective wealth, broadly defined to include all human, physical, and financial assets that might yield income in the future. In practice, we cannot directly observe this quantity and we must use proxies to approximate it.

A simple first guess about permanent income is based on a weighted average of several years of observed current household income, adjusted for the fact that real income generally rises over time. Alternatively, drawing on the observation that total consumption is highly correlated with permanent income, measures of household consumption can be used as proxies for permanent income. Whatever empirical method they use to infer the effect of permanent income, studies show that this measure of income is the appropriate one for understanding housing expenditures.[14]

The literature has yielded a wide range of values for the permanent income elasticity of demand expenditure on housing services. Some of this range can be explained by differences in the definition of housing services, of expenditure itself, and of permanent income. When we correct estimates for these differences, we find values in the range of 0.5 to 1.0; a 10 percent increase in a household's permanent income would increase its expenditure on rental or owner-occupied housing by about 5 to 10 percent.[15] Values appear to be slightly lower for rental than for owner-occupied housing but to fall in the same range.

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[13]For citations of evidence on this effect, see the discussion of income elasticities below, in this subsection.

[14]This result was recognized early in the literature. See, for example, de Leeuw (1971). For an especially useful discussion of its empirical importance, see Polinsky and Ellwood (1979).

[15]Carliner (1973), de Leeuw (1971), Goodman and Kawai (1982, 1984, and 1986), Harmon (1988), Ihlanfeldt (1981), Lee and Kong (1977), Mayo (1981), Polinsky and Ellwood (1979), and Venti and Wise (1984).

We need not interpret this broad range as an indication of imprecision in individual estimates. Rather, households represented in different samples might easily have different elasticities in this range.[16] We could probably be confident that the elasticity for DoD households lies in this range, but could not be more exact without careful empirical investigation.

Price

Price also determines demand for expenditures on housing services, but the literature that supports this statement is far more limited than that on the income effect discussed above.[17] Housing prices are hard to measure in any case, and the price of housing services can be particularly problematic. Studies use various measures of prices: Some use measures based on the techniques discussed in Sec. III, above; others use data on the value of land and the cost of inputs to housing construction to estimate price.

The study of price effects raises a difficult econometric problem, as we have good reason to believe that, in U.S. urban areas, price correlates negatively with income.[18] That is, differences in the locational value of land lead to differences in the price of housing services within an urban area.

Theory predicts and empirical studies affirm that higher-income households, which want to spend more on housing services, will tend to locate in parts of the urban area with low prices, where they can get the most for their large expenditure.[19] As a result, price and income effects are confounded in many studies despite the fact that we do not have the same real interaction of price and income effects that we found in tax benefits relevant to the tenure decision, discussed above.[20]

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[16]For a useful discussion of legitimate reasons for differences among estimates, see Olsen (1987).

[17]For references, see the discussion of the price elasticity below, in this subsection.

[18]Muth (1969) explains the basis for this problem. Polinsky (1977) explains its econometric implications. Polinsky and Ellwood (1979) provides useful empirical evidence on the problem.

[19]More specifically, theory states that households choose their location within an urban area by weighing the relative advantages of reducing housing price by moving farther from the city center and reducing transportation costs by moving closer to the city center. Households with differing incomes sort themselves among different distances from the city because the nature of this trade-off changes with income level. In the United States, the demand for housing empirically rises fast enough with income so that higher-income families prefer to move away from the center to exploit low prices, despite the higher cost of transportation to the center that results.

[20]This complication tells us that we need good measures of price not just to understand the direct effect of price on expenditure but to study the effect of income as well!

Empirical studies of the price elasticity of demand for the *quantity* of housing services yield estimates in the range of 0.5 to 1.0, which implies a range of 0 to 0.5 for the price elasticity of demand for *expenditures* on housing services.[21] That is, a 10 percent increase in price would raise expenditures by 0 to 5 percent. Results do not appear to differ significantly for rental and owner-occupied dwellings. Again, this range of estimates need not signal imprecision in individual studies. We should expect the relevant elasticity for DoD to fall within this range; with good data and careful analysis, we might be able to refine it to a narrower range.

Sociodemographic Factors

Empirical studies have considered the effects of many household characteristics on household expenditures for housing services. Inconsistent treatment of these characteristics, in terms of both their definition and their inclusion in models, has limited the comparability of empirical results on sociodemographic factors, which include family size or number of children and the race and gender of the head of household.[22]

Holding other factors constant, larger households tend to spend more on housing.[23] Households with minority heads tend to spend less on housing.[24] This result is consistent with some theories of racial discrimination, but the exact cause of this effect is not clear. House-

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The useful literature on income effects is limited by the difficulty of getting good price data.

[21]De Leeuw (1971), Goodman and Kawai (1982, 1984, and 1986), Hanushek and Quigley (1980), Harmon (1988), Ihlanfeldt (1981), Lee and Kong (1977), Mayo (1981), and Polinsky and Ellwood (1979).

[22]Other factors widely tested are age and education of head of household. The literature has reached no consensus on their effects.

[23]De Leeuw (1971), Goodman and Kawai (1982 and 1984), Ihlanfeldt (1981), and Venti and Wise (1984) reported a positive (although not always significant for home owners) relationship between household size and the demand for housing. Goodman and Kawai (1986) reported a negative relationship. In his survey, Mayo (1981) reported that while Fenton (1974), Kain and Quigley (1976), and Maisel, Burnham and Austin (1971) found positive relationships between household size and the demand for housing, Li (1973) reported a negative one. Mayo further reported that Maisel and Winnick (1960), Lowry, DeSalvo, and Woodfill (1971), and David (1962) all found that housing expenditures first increase, but then decrease as household size increases.

[24]Researchers who considered race in their studies uniformly reported negative coefficients from their regression equations. This includes the following studies: Carliner (1973), Goodman and Kawai (1982, 1984, and 1986), Harmon (1988), Ihlanfeldt (1981), and Venti and Wise (1984). Mayo (1981) noted also that Fenton (1974), Kain and Quigley (1976), Li (1973), and Smith and Campbell (1976) included race in their studies and each found that blacks (or nonwhites) spend less at comparable levels of relative price and income than do whites.

holds with female heads tend to spend more on housing.[25] This result may be a reflection of the fact that divorced women often remain in a home occupied before the divorce. In this case, the quality of the home could reflect an earlier, higher level of income not captured in the empirical analysis.

THE ATTRIBUTES DECISION

The analysis of demand for attributes requires much better data and more sophisticated techniques than analysis of tenure and expenditure decisions. As a result, fewer empirical analyses of the demand for attributes have been conducted, and those that have been conducted have yielded less useful results than those summarized above.

To study the demand for an attribute, we must first define the attribute. Many attributes are relevant to housing demand. Table 3 lists a representative set used in Malpezzi et al. (1980).[26] Any analysis of the demand for attributes must begin by grouping these attributes into composites that we can study as economic entities.

Most commonly, studies group attributes into a *size* composite, referring to the size of the structure and occasionally reflecting the size of the lot; a *quality* composite, typically covering the structure and its utilities and appliances, but sometimes including the quality of the lot, neighborhood, and local amenities; and an *accessibility* composite, which most often refers to distance between the home and workplace or the time required to travel this distance. Studies use hedonic techniques to group attributes into composites; to the extent that these composites reflect different underlying attributes, they differ slightly from study to study.[27]

To study demand for attributes, analysts also attempt, using hedonic techniques, to construct information on the prices of these attributes. Whereas the techniques required to construct the hedonic indexes discussed in Sec. III are straightforward, however, those required to identify and analyze the prices of attributes or composites based on

[25]Carliner (1973), Harmon (1988), Ihlanfeldt (1981), and Venti and Wise (1984) reported that female-headed households spend more on housing. Mayo (1981) mentioned that Fenton (1974), Kain and Quigley (1976), and Li (1973) also reported positive relationships. An exception was Goodman and Kawai (1984).

[26]Malpezzi et al. (1980) uses many different functional forms to represent these characteristics. The table is meant to give a flavor of the characteristics that might be considered in such analysis. These characteristics draw on data from the Annual Survey of Housing.

[27]Follain and Jimenez (1985) provides an excellent survey of the literature on these effects, as well as useful illustrations of these statements.

Table 3

ATTRIBUTES OF HOUSING USED IN MALPEZZI ET AL. (1980)

General Characteristics	Factors Represented by Coefficients in Models	Rental Model	Owner-occupied Model
Services included in rent	Heat included in rent?	x	
	Nonheat utility included in rent?	x	
	Parking included in rent?	x	
	Furniture included in rent?	x	
Date	Time trend	x	x
Size of dwelling	Number of rooms	x	x
	Number of bedrooms	x	x
	Number of bathrooms	x	x
Structural characteristics of dwelling	Garage?		x
	Basement?		x
	Elevator?	x	
	Single family detached?	x	x
	Single family attached?	x	
	Number of units in structure	x	
	Age of structure	x	x
	Landlord lives in building?	x	
Energy use characteristics of dwelling	Cook with electricity?		x
	Steam or hot water heat?		x
	Wall or room heater with flue?	x	
	Electric units?		x
	Room air conditioner?	x	x
	Central air conditioner?	x	x
	Number of rooms without heat	x	x
	Poor utilities?	x	x
Problems with structure	Pass through bedroom to room or bath?	x	x
	No electrical outlets in any room?	x	x
	Bad hall lighting?	x	
	Leaks, cracks, holes, or rats?	x	
Neighborhood characteristics	Excellent neighborhood rating?	x	x
	Good neighborhood rating?	x	x
	Poor neighborhood rating?	x	x
	Abandoned housing nearby?	x	x
	Litter in neighborhood?	x	
	No convenient shopping?	x	
Location	In primary central city?	x	x
	Central city inflation differential		x
Household characteristics	Black head of household?	x	x
	Spanish surname head of household?	x	x
	Length of tenure	x	x
	Persons per room	x	x

attributes are demanding and rarely implemented properly. As a result, few studies of the demand for attributes succeed, and to the extent that good results depend on good price data, still fewer yield useful results.[28]

The principal empirical results on the demand for attributes concern income.[29] As permanent income rises, studies indicate that demand for size is only about half as elastic as the demand for expenditure on housing in general. The elasticity probably falls well below 0.6. The income elasticity of demand for quality is well above unity; a 10 percent increase in permanent income could easily raise demand for quality by 20 to 30 percent.[30] Demand for accessibility is not especially responsive to changes in income. Recent studies reach less of a consensus on price. The price elasticity for size appears to be small but larger than the income elasticity; demand for lot size may be more elastic than demand for home size.[31]

SUMMARY

Empirical analysis of the demand for housing services typically looks at three decisions and assumes that households make these decisions sequentially. First, they decide on whether to rent or to own and occupy a dwelling. A household's income, the relative prices of renting and of owning and occupying, and the relative uncertainties the household associates with these options affect this decision; the results on uncertainty are new and tentative, but promising.

The household then decides how much to spend on housing. Household demand for expenditure on housing services rises less than proportionally with permanent income. The household spends more to buy less housing when the price of housing services rises; larger

[28]Recall from the discussion above that good measures of price data can be important to more than measures of price effects. This problem is less well understood for the analysis of demand for attributes than for analysis of demand for total expenditures on housing, but there are good reasons for believing that it presents problems in both contexts.

[29]See studies cited in Follain and Jimenez (1985). See also Bajic (1984), Barnett and Noland (1981), Blackley and Ondrich (1988), Brueckner and Colwell (1983), Gross (1988), and Palmquist (1984).

[30]The importance of the relationship between income and quality raises a potential issue for DoD. If DoD did not improve the quality of housing on installations substantially when it moved to an all-volunteer force, the balance of demands for housing on and off installations could easily have shifted in favor of living outside an installation. That is, this relationship points to one concrete place that would benefit from coordination between policy on the housing allowance and policy on housing provided in kind.

[31]Follain and Jimenez (1985). Cf. Quigley (1979).

households spend more, and households with minority heads spend less. Spending behavior looks similar for owner-occupiers and renters who are similar in other ways.

Finally, the household decides which attributes to buy. The demand for attributes is not well understood. Given their spending, households demand smaller, higher-quality dwellings as their permanent incomes rise. DoD will be most likely to succeed in studying the demand for housing if it focuses on the tenure and expenditure decisions, for which the literature, data, and empirical techniques are best developed.

V. HOUSING DEMAND IN DoD AND NON-DoD HOUSEHOLDS

Focusing on the two housing decisions that economists understand best—tenure and expenditure (discussed in Sec. IV)—we can say that income, price, and a few key sociodemographic factors are the systematic factors that drive these decisions.[1] To the extent that these differ between DoD and non-DoD households, we would expect the two sets of households to consume systematically different kinds and amounts of housing.

This section reviews the housing decisions that a typical non-DoD household might make over its lifetime and compares them with decisions that a typical DoD household might make when it lives in housing outside an installation. The review will suggest how DoD policymakers should react to observed differences in the housing demands of DoD and non-DoD households. It will also suggest how we might use microdata to compare housing decisions by DoD and non-DoD households in a way that helps us understand why differences arise.

HOUSING DECISIONS BY A TYPICAL NON-DoD HOUSEHOLD

Figure 11 illustrates the decisions that a typical non-DoD household might make over its life cycle about the amount it spends on housing services and the kind of housing it consumes.[2] It shows time on the abscissa, starting with the formation of the household, and real annual expenditures on housing services on the ordinate.

A typical household starts by renting a dwelling. It rents because either the price of owning is higher than the price of renting or the household does not have the wealth to make a down payment on a home that it wants to purchase and occupy. As time passes, the rent can change for that dwelling. For the purposes of this illustration, let us allow rent to rise. Rent rises for this household more slowly than that for the market as a whole because landlords typically give current,

[1]Idiosyncratic factors associated with individual households also play a key role. We should not allow our focus on systematic factors to obscure the importance of these so-called random elements in housing demand. The housing demand of individual DoD and non-DoD households could easily differ dramatically from that of the "typical" households discussed here.

[2]For a useful unified treatment of this life cycle, see Kendig (1984).

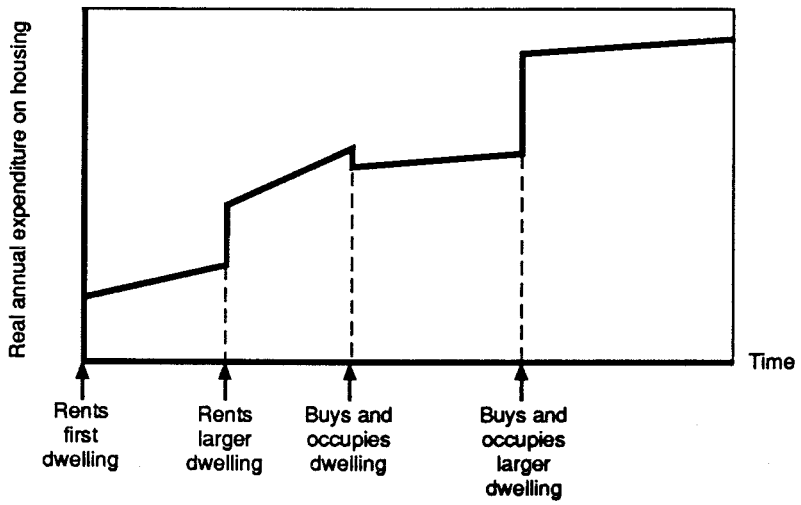

Fig. 11—Non-DoD household expenditures for housing services over time

desired tenants a continuingly increasing discount to encourage them to stay.[3]

As the household matures and its wealth and permanent income increase, however, the household demands more housing. This growing demand overcomes the price advantage of remaining in the initial dwelling and the household moves to a new one, which it also rents. The household pays significantly more for this new dwelling and receives significantly more housing benefits. As the household remains in this second rental dwelling, the real rent for this unit rises, again, at a rate lower than for the market as a whole. A household may move between rental units several times; Fig. 11 shows one such move.

The transition from the first to the second rental dwelling has an important feature. Although economic theory would suggest that demand for expenditure on housing services rises continuously with maturity and permanent income, we observe a significant jump in expenditure from the first to the second dwelling. As already noted,

[3]A solid theoretical basis for this phenomenon has not been established, but it has come to be seen as an important empirical regularity in many studies. For example, see Noland (1980) and Malpezzi et al. (1980).

this increase in expenditure results in part from the fact that the renters no longer receive the original discount.

The expenditure on housing also jumps because renters find moves to be costly. Toward the end of their tenure in the first dwelling, they consume less housing than they want because the added net benefit they would receive by moving into better quarters is not worth the cost. Similarly, toward the beginning of their tenure in the second dwelling, they consume more housing than they want, a level of housing that they expect to demand in the future as their maturity and permanent income rise. This anticipation allows them to have more housing in the future without incurring additional moving costs.

Hence, the more expensive a move is to a household, the greater will be (1) the divergence between the household's actual and desired consumption of housing and (2) the change in its annual expenditure on housing services when it moves.[4] We illustrate these factors here for a move between rental dwellings, but they apply to a move of any kind.

At some date, the household reaches the point where it makes more sense to own and occupy than to rent. Growing maturity brings with it the stability needed to stay in a home long enough to make a purchase worthwhile. It makes savings more attractive, and owning a home is a prime form of savings because of the tax advantage it offers. Growing income increases the size of that tax advantage and increases a household's ability to make the down payment required to buy and occupy a home.

Moving costs and other sources of inertia, including psychological and financial, may delay the decision to buy. Eventually, however, the net advantage in terms of price and savings opportunities leads a household to change its tenure from renting to owning and occupying.

When this occurs, the price of owning will usually be lower than the price of renting. Because the price elasticity of demand is less than unity, a household's desired expenditure on housing falls when it buys a home. The household's desired consumption of real housing services rises as this price falls, but the falling price allows it to pay less for these services. This prediction may not appear consistent with the typical experience that we observe, so let us put it into perspective.

First, in real life, cash flow problems often accompany the first years of owning a home. The household surrenders a hard-earned down payment, pays its share of brokerage costs, pays "points" to initiate a

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[4]Empirical evidence on the difficulty of adjusting actual to desired housing consumption levels is strong. See, for example, Hanushek and Quigley (1978, 1979), Muth (1960), and Weinberg, Friedman, and Mayo (1981). See also Venti and Wise (1984).

mortgage, and usually puts additional money into a dwelling to fix it up or simply transform it into a home more attuned to its tastes. Our analysis effectively amortizes all of these costs over the life of the expected stay in the new home.

Recall from Sec. III that the expenditure on housing services for an owner-occupied home is the imputed rent that the household would have to receive on a monthly basis if it did not live there to make its investment in the home financially competitive. When we say that we expect a household's expenditure on housing services to fall when it first buys a home, we are speaking of this expenditure, which typically looks quite different in the first year of ownership from the cash flows that the household experiences in that year.

Second, although a household may want to spend less on housing when it first buys a home, the cost of moving may induce the household to spend more. As we noted earlier, a household typically consumes less housing than it wants at the end of its time in a home and more than it wants at the beginning of its time in the home. The more important this consideration is, the more likely a household is to spend more when it moves from rental to owner-occupied housing. As we noted earlier, this consideration becomes more important as the cost of moving rises.

Once the household owns and occupies a home, a new cycle begins. As time passes, the maturity and permanent income of the household continues to grow until the household considers another move. When it moves, its expenditure rises, and it rises more the more a move would cost. This cycle could occur several times; Fig. 11, above, shows moves to two owner-occupied homes.[5]

In sum, when joined with effects of the cost of moving, the simple factors identified in Sec. IV can generate a fairly complicated series of decisions. They predict that typical households will move from renting to owning and occupying and will spend more on a home as time passes, but these changes do not occur in a smooth, well-behaved way over the household's life cycle. We can expect significant deviations from these trends before we even consider the more idiosyncratic factors that also play a major role in a real household's life. When we look across many households, however, we should expect these basic trends in decisions about tenure and expenditure to stand out.

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[5]Increasing household maturity ultimately leads to a household with no children. At this point, the remaining parents may well reduce their demand for expenditure on housing services. The figure does not illustrate this stage in the household life cycle.

HOUSING DECISIONS BY A TYPICAL DoD HOUSEHOLD

Let us now apply an analogous analysis to a DoD household living outside a DoD installation.[6] Figure 12 uses the same axes as Fig. 11 and reproduces the non-DoD locus from that figure as a dashed line. The solid line in Fig. 12 represents an analogous locus for DoD households.

Like non-DoD households, DoD households start as renters. Their rents rise over time. They receive discounts from their landlords as they remain longer in a home. They increase their demand for housing expenditures as they mature and their permanent incomes grow.

But DoD households move more often than non-DoD households. And DoD compensates many DoD households in a way that is likely to encourage them to buy more housing than they would otherwise. Frequent moves and special compensations lead to four important differences between DoD and non-DoD households.

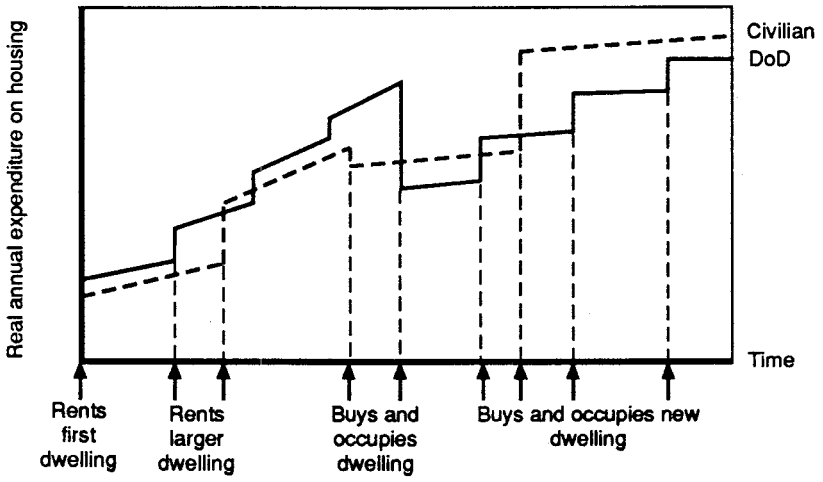

Fig. 12—Comparison of DoD and non-DoD household expenditures for housing services over time

[6]Living on an installation involves a fundamentally different kind of decision process from living outside. On an installation, a household is offered a specific home in exchange for its basic housing allowance. This package deal does not involve the kind of marginal decisionmaking described above for the non-DoD household. We constrain our analysis to this kind of decisionmaking by focusing on DoD housing decisions outside installations. For a simple analysis of the decision to live on or outside an installation and its implications for the well-being of DoD households, see Gertcher (1981, 1983).

- First, because DoD households find themselves in unfamiliar housing markets more often than non-DoD households, they probably make housing decisions on the basis of poorer information.[7]

Networks inside DoD tend to ameliorate this problem, and growing experience in home shopping may make more senior DoD members better able than their less peripatetic non-DoD counterparts to use available information. On average, however, DoD households may be expected to pay more for housing of a given type than their non-DoD counterparts.

- Second, because DoD households tend not to remain in a rented home as long as non-DoD households, they do not benefit as much from the rental discounts that non-DoD households receive.

On average, DoD households are likely to pay higher rents than non-DoD households. This effect reinforces the first.

- Third, DoD households that receive the variable or overseas allowances, but do not spend more than their allowances on housing, perceive the existence of effective marginal subsidies to housing and respond by increasing the total amount, including the allowance, that they spend on housing.

As noted in Sec. I, one in eight households receiving the VHA would fall in this category. We do not expect similar behavior from households that receive only the basic allowance for quarters, which could increase or decrease spending depending on local housing options on and off DoD installations.[8] That is, for some identifiable DoD households, we have a third reason to observe higher expenditures on rental housing.

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[7]The complexity of housing services makes the costs of getting useful information on them high. See Chinloy (1980) and Muth (1974).

[8]The basic allowance for quarters should not influence housing decisions outside an installation directly; it may affect it indirectly in terms of the relative desirability of living on or outside an installation. The variable housing allowance with its offset policy provides an effective 50 percent subsidy for housing up to the full amount of the subsidy. If a household does not spend the full allowance on housing, it must remit 50 percent of the amount it did not spend to DoD. The overseas housing allowance provides a 100 percent effective subsidy for housing up to the full amount of the allowance. If a household does not spend the full allowance, it receives only the amount that it spends. Hence, we would expect each form of allowance to have a different effect on DoD household decisions. For a fuller justification of these statements, see the appendix.

- Finally, because DoD households can expect to remain in homes for a fairly short time, they can more closely tailor those homes to their desired consumption of housing.

Poorer knowledge about housing markets will offset this effect to some extent. At the beginning and end of a stay in a home, however, we should expect DoD households to buy an amount of housing closer to what they want than do non-DoD households. If DoD households moved among markets with similar price levels, we would expect their expenditures for housing to increase more smoothly over time than the expenditures of non-DoD households.[9] Figure 12 illustrates this point.

As DoD households mature and their permanent incomes rise, we can expect them to make the transition from renting to owning and occupying. Five factors cause this transition to take longer for DoD households than for non-DoD households.

- First, the stability that non-DoD households tend to achieve over time does not come to DoD households.

Because DoD households move more frequently, they find it harder than do comparable non-DoD households to justify the fixed costs—broker fees, points, adjustment costs, and so on—of buying a home. Moreover, the hedge against rising housing costs in a given market is not as compelling for a transient DoD household unless it expects that hedge to be useful across housing markets. In effect, the price of owner-occupied housing is higher to DoD households than to comparable non-DoD households.

We might expect an important variation on this prediction within DoD. If a DoD household expects to return to a housing market in the future, it may take a longer-term point of view that allows it to amortize fixed costs over more time and to hold the house as a hedge for use in the future. The services tend to assign many personnel more than once to certain housing markets. For example, Navy personnel can often expect multiple assignments to San Diego or Norfolk; Air Force personnel can expect multiple assignments to San Antonio or Dayton.

In such markets, we should expect a greater tendency among DoD households to own and occupy and to do so earlier in their life cycles. Even here, however, we would not expect home ownership to come as early or be as common as it is among non-DoD households.

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[9]As Sec. II makes clear, the potential exists for great volatility in housing service prices as DoD households move from one assignment to another. And current DoD housing policy does not insulate DoD households against this volatility. Such volatility changes the simple progression in expenditures that we observe in Fig. 12, but it does not change any statements about DoD expenditures on housing services relative to non-DoD expenditures in similar circumstances.

- Second, DoD households move not only frequently but at irregular intervals.

Because households have little control over permanent changes of station, they cannot easily predict when they will be transferred. Even if, for the time it expects to be at a duty station, a household prefers owner-occupied housing to rental housing, uncertainty about how long it will remain at this duty station reduces the relative attractiveness of owning a home for a typical risk-averse household and hence can delay a household's decision to switch from renting to owning and occupying.

- Third, DoD households receive a larger portion of their gross income as nontaxable benefits than do non-DoD households.

Thus, at any point in their life cycles, DoD households have a lower taxable income than comparable non-DoD households. To the extent that applicable federal and state taxes are progressive, DoD households usually face lower marginal tax rates than do comparable non-DoD households. Because the tax benefit of owning a home is approximately proportional to the household's marginal tax rate, the tax code tends to offer DoD households a smaller tax advantage from owning a home than it offers a comparable non-DoD household.[10]

- Fourth, U.S. citizens living overseas are likely to confront institutions of home ownership and conditions placed on ownership that complicate any attempt to buy housing.

We have not examined detailed information on the conditions for ownership outside the United States, but the rarity with which DoD households buy overseas suggests that the costs of ownership are high relative to those at home. Such costs would discourage DoD households' ownership overseas and make them less likely than DoD and non-DoD households in the United States to buy and occupy housing.

- Fifth, DoD households that expect to receive military retirement may save differently from otherwise comparable non-DoD households.

Although a DoD household can rely on retirement income as a form of forced savings that displaces the need for other forms of savings, a comparable non-DoD household without such a retirement plan will

[10]We thank C. Robert Roll of RAND for this insight.

take a more active interest in accumulating assets.[11] An owner-occupied home will be among the first assets that such households acquire. Hence, DoD households that expect to receive retirement income appear to lack some of the motive to save that accounts for a significant portion of non-DoD demand for owner-occupied housing. This difference should lead these DoD households to defer the transition from renting to owning and occupying.[12]

One countervailing factor works to accelerate the date of this transition. To the extent that non-DoD households benefit more than DoD households from the discounts that renters receive for living longer in a home, DoD households have less to lose than non-DoD households in moving to owner-occupied housing. Although this effect may speed the date at which DoD households buy a home, it is unlikely to offset the factors discussed above that discourage ownership.

Figure 12, above, illustrates the deferred decision to own and occupy among DoD households. Even DoD households, however, face falling prices for owner-occupied housing as they mature and move into higher marginal tax brackets. At some point, ownership will probably look attractive. Just as occurs for the non-DoD household, the shift by DoD households from renting to owning and occupying brings a drop in effective price, an increase in consumption of housing services, and a reduction in expenditure on housing services.

DoD home ownership will differ systematically from non-DoD home ownership in several ways. DoD households will continue to move more often than non-DoD households. This will allow DoD households to adjust their housing demand more often than do non-DoD households. If they move among markets with similar prices, they will adjust annual expenditures upwardly more gradually than civilians to reflect growing maturity and permanent income. Particularly at the beginning and end of their stay in any home, they will consume an

[11]A retirement plan increases cash flows in future periods, allowing a household to increase consumption in those periods without reducing current consumption through savings. Unless a household's time preference is very unusual, increasing its future cash flows will reduce its tendency to set money aside today for the future—that is, reduce its demand for savings.

[12]We should not overstate the importance of this factor. Many non-DoD households receive pensions that could reduce their savings behavior, and most DoD households will not receive pensions because they will not maintain their association with DoD for the 20 years required to earn the pension. The effect posited here depends on differences in how generous households expect their pensions to be. Further, like non-DoD households not expecting a pension, DoD households that expect a pension but also want to save will tend to choose an owner-occupied home as the first asset that they buy. Nevertheless, the DoD retirement plan does affect the financial behavior of DoD households and can, by reducing the urgency of saving, lead DoD households to behave differently from non-DoD households.

amount of housing closer to their true demand at that time than non-DoD households do. Figure 12, above, illustrates this trend.[13]

How much DoD households spend relative to non-DoD households each year is problematic. On the one hand, frequent moves and uncertainty about them raise the effective price of housing services to DoD households. The smaller tax benefit that they get from home ownership has a similar effect. They will spend more money for less housing than non-DoD households.

In a given housing market, buying less housing will mean that DoD households make smaller expenditures for the housing *assets* that they buy than non-DoD households do. But the amount they must set aside each month to justify such expenditures will be higher because they amortize fixed costs of ownership over shorter periods; in this sense, a DoD household's expenditure on housing *services* is higher even though its expenditure on housing *assets* is smaller. This difference between DoD and non-DoD households will be smaller for DoD households investing for the long run in anticipation of returning to a home in the future.

On the other hand, DoD households that expect to receive military retirement income are likely to have a lower demand for housing services at any price. These households could well spend less than their civilian counterparts on housing services. In a given market, this means that they spend less for housing assets as well.

The net effect of these factors on expenditures for housing services is unclear. The net effect on expenditures for housing assets is negative; DoD households that expect retirement benefits and invest in housing for the short run spend less on housing assets than comparable non-DoD households. Figure 12, above, cannot illustrate this prediction.

DoD owner-occupiers who receive variable housing allowances and do not spend more than their allowances may spend more on housing than they would without the allowances. This effect could offset the effect above. That is, although DoD households will tend to spend less than non-DoD households on housing assets in markets where DoD households do not receive variable housing allowances, this is less likely to be true in markets where DoD households do receive variable housing allowances.

In sum, we expect DoD and non-DoD households to have broadly similar housing demands. Both start as renters and become owner-occupiers. When stationed overseas or in particularly short

[13]As noted above, if prices for housing services vary significantly when DoD households move, their expenditures will as well.

assignments, DoD owner-occupiers may revert to renting in a way that we do not expect to see often among non-DoD owner-occupiers, but otherwise similar trends should exist for both. And expenditure on housing services should rise for both DoD and non-DoD households as they mature and become wealthier. But we also expect important differences. We can state these as a series of hypotheses:

1. DoD households spend more for rent than comparable non-DoD households.
2. DoD households transit from renting to owning and occupying later than comparable non-DoD households and, in general, are less likely to own and occupy than comparable non-DoD households.
3. DoD households spend less on housing assets than comparable non-DoD households unless they receive a variable housing allowance for the asset and do not spend more than that allowance.
4. DoD households typically consume an amount of housing closer to their desired level of housing than comparable non-DoD households.

We also expect several important differences among DoD households. These lead to more varied differences between DoD and non-DoD households:

5. Given a housing price level, comparable DoD households should spend more on housing services when they receive a variable housing allowance and their housing expenditure does not exceed the allowance than when they receive only the basic allowance for quarters. Given price, they should spend more on housing services when they receive an overseas housing allowance and their housing expenditure does not exceed the allowance than when they receive a variable housing allowance.
6 DoD households stationed in housing markets that they expect to return to are more likely to own and occupy than comparable DoD households stationed elsewhere.
7. DoD households that expect military retirement income are less likely to own and occupy than comparable DoD households that do not expect military retirement income.
8. DoD households stationed overseas are more likely to rent than comparable DoD households stationed in the United States.

These hypotheses can serve as the basis for an empirical investigation of differences in housing demand among DoD and non-DoD households. We will address such an investigation below. First, let us consider briefly what such differences should mean to policymakers.

MEANING OF DIFFERENCES BETWEEN DoD AND NON-DoD HOUSEHOLDS

The economic arguments above point to the potential for considerable differences in the demand for housing by DoD and non-DoD households. If we in fact observed such differences, what would they mean for DoD policymakers? If DoD renters spend more for housing services and DoD owner-occupiers spend less for housing assets than their non-DoD counterparts, should DoD seek policies that will eliminate these differences? If DoD households delay the date at which they shift from renting to owning relative to their non-DoD counterparts, should DoD seek policies that encourage DoD households to buy sooner? The simple answer to these questions is no.

Once DoD presents its members with the option of living outside an installation, it has little direct interest in the housing decisions that these member households make.[14] Rather, DoD must concern itself with the overall well-being of its force members. To the extent that difficulties associated with housing affect this general well-being, DoD can examine these difficulties. To overcome them, however, DoD should remember that even if a difficulty arose in the context of housing, its solution should address DoD's ultimate concern for general well-being, not the issue of housing per se.

All of the differences above result from the housing decisions of households responding rationally to the general circumstances in which they find themselves. The fact of short tours leads to higher rents and a lower incentive to buy. The fact of living overseas discourages buying and encourages spending on rental housing. The fact of expecting military retirement benefits makes a housing investment look less attractive.

To the extent that military duty requires short tours, frequent moves, and tours overseas and compensates certain personnel through

[14]DoD has a legitimate interest in requiring certain DoD members to live on installations to ensure their readiness and responsiveness and to build unit cohesiveness. Once DoD allows a member to live outside an installation, however, the basic nature of DoD's concerns for that member's housing changes. Household decisions to live in poor housing in Europe presented DoD with political difficulties that it does not want to repeat. Housing decisions that do not directly affect DoD's effectiveness or image lie beyond its legitimate concern.

a generous retirement system, DoD personnel will reasonably react by demanding housing that differs in kind and amount from that of their non-DoD counterparts. By hypothesis, they are doing as well as they can, given basic circumstances of military life beyond the realm of housing policy per se.

If DoD were to conclude that DoD households do not buy enough housing, DoD would presumably be saying that (a) DoD households do not consume as much housing as their non-DoD counterparts and that (b) as a result, they are not as well off as their non-DoD counterparts. That may well be true but it need not be.[15]

If DoD goes on to conclude that it can improve the lives of DoD households by introducing policies that encourage them to buy more housing, that conclusion may also be correct. But it is less likely to be correct. Such a policy would not recognize that any increase in military compensation designed to improve the well-being of DoD households will help them most if it is not tied to housing.[16] That is, any increase in compensation designed to help DoD households by increasing their consumption of housing would help them even more if these households could apply this increase to buy whatever they want.

If DoD households currently buy less housing than non-DoD households, the arguments above suggest that they do so because DoD households face higher prices for housing than non-DoD households and value housing assets less for saving and hedging purposes. Under such circumstances, DoD households should be able to use any budgetary increment from DoD to buy things other than housing—things for which they do not have to pay high prices.

We can put this argument another way. Suppose DoD concludes that it should reallocate the current budget for military compensation in a way that increases housing consumption by military households. For example, it could shift more compensation into a single housing allowance and make receipt of the allowance contingent on spending the full amount of the allowance on housing. Such a policy would predictably increase the amount of housing that DoD households consume, perhaps reducing a difference between their consumption and that of non-DoD counterparts. Just as predictably, such a policy would

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[15]As explained above, DoD households may consume less housing than their non-DoD counterparts simply because they face higher perceived housing prices than their counterparts do. In this situation, DoD households can easily spend their income on goods and services other than housing that make them better off than their non-DoD counterparts.

[16]This and following arguments abstract from the fact that housing allowances are tax-free benefits. The arguments in the text focus essentially on whether or not DoD controls the way in which a household spends its tax-free housing allowance.

reduce the well-being of DoD households and probably decrease DoD's ability to attract and retain a capable force.

In sum, if DoD concludes that the kind of differences discussed above are bad, it should do so because these differences make DoD households worse off in general. To correct such a problem, DoD should think of ways to make DoD households better off in general. The best way to do that is to increase compensation in a way that gives DoD households as much freedom as possible in how to use that compensation. The solution to a problem that DoD might associate with housing, then, probably should not involve housing at all.

With these caveats in mind, DoD may still find it useful to compare the housing decisions of DoD and non-DoD households. Let us now turn to a discussion of how DoD might use data to compare these housing decisions empirically.

DETECTING EMPIRICAL DIFFERENCES BETWEEN DoD AND NON-DoD HOUSEHOLDS

We need two things to enable us to detect actual differences between DoD and non-DoD households: an econometrically sound method for making the households "comparable" and data to implement such a method. Each of the eight hypotheses listed above depends on establishing comparability between households. Within the resource constraints of this project, we have not attempted to develop a complete, formal method for detecting differences, but we can outline an approach and suggest what data are available to implement it and what questions remain in implementing this approach.

Suppose that we could estimate equations that model the demand for housing by non-DoD households in the United States. We could then substitute data on DoD households living in the United States outside DoD installations into these equations and use them to predict what kind of housing these DoD households would choose and how much they would spend on housing if they were non-DoD households.[17] By comparing these predictions with the actual decisions of these DoD households, we can estimate the differences in decisions that we expect between DoD and "comparable" non-DoD households.

[17]The terms of living on a DoD installation differ enough for us to question the validity of any attempt to predict DoD decisions about such housing on the basis of non-DoD housing decisions. The fact that DoD households sometimes have the option of living on an installation suggests that the DoD households we observe off an installation have been selected in some way. We have not studied this problem in detail, but it raises serious econometric issues that deserve more attention before the approach suggested here is implemented.

If the DoD environment increases the perceived price of housing enough, we may observe more than the effects posited as hypotheses above. We may also observe that this perceived high price discourages households with a strong preference for housing from associating with DoD at all. That is, the tastes of DoD and non-DoD households may actually differ with regard to housing.

Such a difference in preferences could lead to underestimates of how the DoD housing environment would affect any particular non-DoD household's demand for housing. It would not, however, change any qualitative results. Although the analyst should attempt to correct for this selection problem, the failure to do so completely should not threaten this approach.

To pursue this strategy, we would first estimate each of the following variables as a function of observable data on individual non-DoD households:

- Tenure, i.e., rental or owner-occupancy
- Given a tenure decision to rent, current monthly expenditure on housing services
- Given a tenure decision to own, current market value of the home.

We would then use the hypotheses identified above to help explain differences between actual DoD decisions and predicted decisions by "comparable" non-DoD households:

- According to hypothesis 1, the actual DoD rental expenditure should exceed the predicted rental expenditure.
- According to hypothesis 2, the tenure equation will misclassify DoD renters as owner-occupiers more often than it misclassifies non-DoD renters.
- According to hypothesis 3, the predicted value of the owner-occupied home less the value of the DoD owner-occupied home should be a function of whether or not the DoD household receives a variable housing allowance and fails to spend more than that allowance. If the household receives no allowance, or if it spends more than the allowance, the difference should be positive. Regressing this difference on a dummy representing the contingency stated here should yield a negative coefficient on the dummy.
- According to hypothesis 4, the predicted rental expenditure of a DoD household less its actual rental expenditure should depend on how long the household has lived in a home. The difference should be small and potentially negative when a household first

enters a home and should grow as the household remains in the house.

- According to hypothesis 5, when the DoD household receives a variable housing allowance and does not spend more on housing than the allowance, the predicted rental expenditure will be even lower, relative to the actual rental expenditure, than hypothesis 1 suggests.
- According to hypothesis 6, the tenure equation will misclassify fewer DoD renters as owner-occupiers than hypothesis 2 predicts when they live in certain identifiable housing markets.
- According to hypothesis 7, the tenure equation will misclassify fewer DoD renters as owner-occupiers than hypothesis 2 predicts when they do not expect to receive military retirement income.
- Hypothesis 8 does not apply to an analysis that considers only housing decisions inside the United States.

This approach begins with a specification and estimation of the three equations above. The tenure decision should be a function of permanent household income and the relative prices of housing services from renting and from owning and occupying. One might also profitably test for effects of sociodemographic factors.

Measures of the perceived uncertainty associated with the tenure decision that we discussed in Sec. IV have not been developed for microdata on individuals and probably cannot be applied at this point. The contingent expenditure amounts should each be a function of the household's permanent income, the price of the relevant housing service, the time that the household has occupied the home, family size, and the race and gender of the head of the household.

The American Housing Survey provides data on non-DoD household decisions about housing demand. Such data could allow the implementation of the approach suggested here. However, the data cover only households living within the United States; thus, they would probably not apply to housing choices outside the United States.

In addition, the survey provides data on current tenure choice. It provides a measure of current monthly rent and information about the services paid for by this rent, enabling us to develop an appropriate measure of rent. It provides a measure of current housing asset value. It provides a measure of current household income that could be used as a proxy for permanent income. We know that this will bias the

coefficient on this variable downward.[18] We will discuss this serious problem below.[19]

The survey also provides data on how long a household has lived in a home and on any sociodemographic variables that we might consider. It does not, however, provide a measure of price. As explained in Sec. IV, we need data on price to identify price effects directly and to remove certain predictable biases in the income coefficient. Malpezzi et al. (1980) demonstrates that the survey provides sufficient data on housing characteristics to develop hedonic indexes that we could use as measures of price. If these indexes are difficult to specify and estimate, we could choose to limit the analysis to a selected set of locations and estimate indexes only for these locations.[20]

The DoD housing survey collects data that we could use to characterize DoD households in this analysis. We have not examined this survey in detail. If it does not now collect data that could be used to conduct such a study, it could do so in the future.

According to our understanding, the DoD survey provides data on current tenure choice and expenditures on rental housing. It provides data on relevant sociodemographic factors and enough data on housing characteristics to develop suitable hedonically based measures of price.[21] It provides data on how long a household has lived in a home.

The DoD survey apparently does not measure current household income; instead, it provides information on pay and benefits for the DoD member in the household. A crude proxy of household income could be developed from such a figure, but direct information on household income would be preferred.

The DoD survey reports household location. We could use this with military subjective judgment to specify when a household lives in an area that it might expect to return to.

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[18]This is a specific instance of an error-in-variables problem. For a discussion of this problem and evidence on its importance, see Polinsky and Ellwood (1979).

[19]Information on current income would not provide information on expected retirement pensions and tax-free benefits unless it was properly adjusted. Such adjustment is highly desirable. Without it, matching DoD and non-DoD households will be problematic. Even with an adjustment for expected pension income, however, current income continues to present an error-in-variables problem.

[20]To alleviate difficulties associated with the income effect, we need a price measure that reflects price variation within metropolitan areas. Hence, we could not rely on a single price level for a metropolitan housing market. But we could develop indexes for a limited number of metropolitan markets and design and use them to calculate price variations within these markets.

[21]It might prove useful to coordinate sampling from this survey and the American Housing Survey so that the same hedonic indexes could be used to estimate prices for DoD and non-DoD households. Such a decision could reduce the need for completely comparable data on housing characteristics on DoD households by allowing us to use prices derived from non-DoD data to characterize DoD households.

The survey does not report household expectations about receiving military retirement, but it should be possible to use time in service to develop a useful proxy. A simple proxy might state that DoD members with more than 12 years of service expect to receive military retirement and others do not.[22] A more sophisticated proxy might use observable data on continuation rates to calculate the probability that a DoD member with a given number of years of service will remain in the force to retirement and use this probability as a proxy.[23]

Given that DoD can potentially collect data comparable to those in the American Housing Survey, the absence of data on the permanent income of non-DoD households appears to present the biggest challenge to this approach. We know that using current income as a proxy for permanent income will bias the income coefficient downward. That does not present a problem for this analysis unless we expect the relationship between current and permanent income to differ for DoD and non-DoD households.

The relationship between current and permanent income for DoD and non-DoD households probably does differ when a DoD household expects income from the military retirement system. That is, our approach will systematically underestimate the probability that a "comparable" non-DoD household will own and occupy a home and the amount that a "comparable" non-DoD household would spend on housing when the relevant DoD household expects military retirement. This problem threatens the usefulness of this analytic approach and deserves more careful attention before implementation is attempted.[24]

SUMMARY

Many good reasons exist for "comparable" DoD and non-DoD households to make different housing decisions. They work and live in different economic environments. These environments should lead them (1) to perceive the prices of renting and of owning and occupying a dwelling differently, (2) to value housing assets differently as ways to

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[22]Models of retention behavior suggest that once a member stays in the force for this period of time, he or she has a strong incentive to remain in so as to collect retirement benefits. Actual behavior in the force is consistent with this finding. See Gotz and McCall (1983) and Arguden (1986).

[23]Such proxies could well pick up and confound the effects of maturity. They could also reflect effects of seniority on housing demand that we have not discussed here; these possibilities deserve careful attention.

[24]For alternative methods of estimating permanent income with one-year data on individual households, see Ihlanfeldt (1981), Lee and Kong (1977), and Polinsky and Ellwood (1979). See also Olsen (1987), pp. 996–998.

save and to hedge against inflation, and (3) to adjust their consumption of housing services differently over time.

The economic theory of housing demand tells us that these differences in environment should generally lead DoD households to pay more for rental housing services, switch from renting to owning and occupying later, and spend less on owner-occupied housing assets than comparable non-DoD households. These differences result from decisions that make these households as well off as they can be in the economic environments they face.

Hence, DoD should not conclude that such differences are inappropriate or even an indication that DoD households are less well off than non-DoD households. And DoD should certainly not conclude that policies designed to make DoD housing decisions look more like non-DoD housing decisions will improve the well-being of DoD households. If DoD wants to improve the well-being of DoD households, it should do so directly, by providing compensation that these households could spend on the goods and services that they value most, given the prices that they must pay.

DoD may find it useful to understand how much DoD and non-DoD housing decisions differ and why. The economic theory of housing demand provides a way to examine differences in the decisions of "comparable" DoD and non-DoD households. Difficulties in the data available to implement this comparison raise challenging econometric problems. The most serious one concerns the poor measures available for household permanent income. If this problem can be overcome, it should be possible to compare DoD and non-DoD housing decisions in a rigorous way that would not only provide good empirical estimates of differences, but also provide a fairly detailed structure that we could use to explain these differences.

VI. SIMPLIFIED POLICY ON HOUSING ALLOWANCES

Repeated congressional questions about DoD housing policy have heightened OSD's concern that it does not have a simple basis for defending its policy on housing allowances. Incremental fixes in the system over time have progressively increased its complexity, and Congress and DoD members alike have difficulty understanding DoD housing policy.

This section lays out what appear to be the basic DoD goals that motivate a desire for housing allowances. The fact that several goals are important prevents DoD from using a single unifying principle to justify its policy on housing allowances. Once we understand DoD's key goals, however, we can choose a policy instrument that DoD can use to implement each goal and show how these instruments work together. To do this, we first identify and discuss basic goals and then explain a housing allowance policy that would implement these goals as simply as possible.

BASIC GOALS OF POLICY ON HOUSING ALLOWANCES

Internal OSD memorandums and discussions with OSD personnel suggest that DoD uses its policy on housing allowances to pursue four general policy goals. DoD also seeks simple ways to pursue these general goals in special cases. Adding a fifth goal of economic efficiency can sharpen policy decisions without sacrificing any of the goals that concern DoD most. The sixth goal focuses on special cases. The goals are as follows; we discuss each of them in more detail below.

1. Pay for housing. As an integral part of DoD members' compensation package, pay for a significant portion of the housing costs of these members.
2. Offset variations in housing price. Alleviate the hardship on members of (a) variation in housing costs as they move from station to station and (b) a series of stations with unusually high housing costs.
3. Guarantee adequate housing quality. Prevent any DoD member from living in inadequate housing.

4. Maintain the DoD hierarchy. Ensure that housing allowances remain consistent with the hierarchical structure of DoD, i.e., that they do not fall as pay grade rises.
5. Use a fixed budget for housing allowances as effectively as possible. Subject to the goals above, use whatever resources are committed to housing allowances to maximize the well-being of DoD members.
6. Handle special cases. Treat special cases in a way consistent with these other goals. Cases of special current interest include:
   — Households with two DoD members
   — Members with dependents living apart from them following a divorce
   — Members on sea or field duty with dependents apart from them.

Pay for Housing

Consider a *typical* DoD member in a particular pay grade and dependency status.[1] Whatever that typical household spends for housing, DoD believes that it (DoD) should pay a substantial portion of that housing cost. DoD cites a constitutional mandate to do this, but the mandate seems tenuous and in fact has not led DoD to pay all housing costs.[2] One might say more reasonably that DoD believes that it should include payment related to housing cost as part of the compensation package that it uses to attract and retain DoD members.

In principle, we could estimate the policy effects of this decision by asking how, holding constant the costs to DoD of the total compensation package, a decision to shift a dollar from the housing allowance to straight salary would affect DoD's ability to attract and retain the people that it wants. For our purposes here, we take this decision as given.[3]

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[1]Dependency status currently asks whether or not the member has dependents. It could be more detailed, classifying members according to numbers of children. Or, if policymakers consider the presence and number of dependents irrelevant to policy on housing allowances, we could effectively maintain a single dependency status. The discussion below suggests that definitions of adequate housing depend on information about the number of dependents. Otherwise, the discussion that follows is consistent with any of these interpretations.

[2]According to the Third Amendment, "No Soldier shall, in time of peace, be quartered in any house without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law." See Office of the Secretary of Defense, "Joint Service Housing Allowance Study" (1989).

[3]The fact that the allowance is tax-free in itself gives DoD a compelling reason to believe that a decision to move income from the housing allowance to salary would hurt

In fact, households with a DoD member in the same pay grade and dependency status and in a given location (facing similar prices and the same housing allowance) buy very different amounts of housing. Presumably, DoD wants to ensure that its members can consume the amount of housing consumed by a typical household.

If a household consumes less than the typical amount, however, DoD seldom has reason to give this household less compensation than other similar households.[4] DoD should give the household the capability to have what the typical household takes, but generally leave the household free to buy what it wants. That is, the goal to pay a portion of housing costs does not necessarily require that DoD tie payments to actual housing costs; DoD's view of housing does not focus exclusively on income or reimbursement; rather, it incorporates elements of both.

Offset Variations in Housing Price

DoD forces members to move to many places in which the price of housing varies substantially. In fact, variation in the price of housing probably accounts for most of the variation in the cost of living from one place to another. Unless DoD takes account of this variation, households that experience a disproportionately high number of high-cost assignments will not achieve the level of well-being that they might have expected in DoD.

Facing the risk, before entering DoD, of several high-cost assignments, a household may decide not to join; a policy to reduce such risk would probably enhance DoD's ability to attract and retain the personnel that DoD wants. The analysis in Sec. III makes clear that, to reduce such risk as effectively as possible, DoD should offset variations in the price of housing, not in housing expenditures. Hence, the current DoD policy of offsetting variations in expenditures requires close attention.

Guarantee Adequate Housing Quality

For political or paternalistic reasons, DoD wants to ensure that no DoD member or his or her dependents lives in inadequate housing, whether they choose to or not. The basis for this concern is

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the force; for the same reason, a decision to move a dollar from salary to housing allowance should help the force, certainly as long as a household is not required to spend the allowance on housing. From a broader perspective, we do not know why the tax code should be used to subsidize DoD's personnel costs relative to comparable costs experienced in the private sector. In fact, the Tax Act of 1986 worked hard to remove such tax subsidies.

[4]Discussion below shows that goal 3 creates one important but narrow reason to constrain a housing allowance to spending on housing services.

apparently that the U.S. government should pay an adequate amount to those who volunteer to serve their country; that amount should provide, among other things, adequate housing.

To the extent that the definition of adequate housing depends on the size of a household, this concern requires that DoD give some attention to the dependency status of a member. However, that concern need not extend past the issue of adequate housing; beyond the low end of the pay scale, the full range of housing allowances need not reflect dependency status.

Note also that this issue is likely to arise only for junior members of the force and in a limited set of locations. As a result, policy to implement this goal should respond to exceptional circumstances. A number of responses, discussed below, may prove useful, and DoD may want to use different responses in different locations.

Note also that the pursuit of this goal requires DoD to constrain the behavior of junior members of the force, forcing them to spend their military compensation in a way that they may not choose. We will see below that it also complicates DoD's task in allocating available moneys for housing allowances among alternative uses. Dropping this goal would simplify DoD's implementation of policy on housing allowances and probably make the force as a whole better off. We include it here because DoD believes it is important, and, in the end, we must accept its expression of its own policy goals in this area.

Maintain the DoD Hierarchy

Unless constrained, the goals listed above conceivably would be consistent with a housing allowance policy that gave member A a higher allowance than member B, even though member B was in a higher pay grade than member A. This goal ensures that such reversals do not occur in the structure of housing allowances. It does not prohibit holding an allowance constant across several increasing pay grades if this pattern conforms to other goals.

Maximize Member Well-Being Subject to These Constraints

Once its other goals are achieved, DoD has a strong incentive to spend its housing money as effectively as possible. It can do this by trying to make DoD members as well off as possible with the limited funds available for housing allowances. This goal again applies the logic that places housing policy in a broader perspective. It essentially states that, except when a DoD member would otherwise demand inadequate housing, DoD has no direct interest in the amount that a

household spends on housing. It provides housing allowances that cover a large share of typical housing costs, but it allows DoD members to spend this allowance on anything that promotes their well-being.[5]

Handle Special Cases

Any compensation system that attempts to serve several goals is likely to face difficult special cases. The three listed above are the ones most often mentioned. At a minimum, a housing allowance policy must address these cases coherently. Understanding how the policy addresses these should also suggest how it might address other special cases that arise. The more predictable the system's treatment of special cases is, the more easily members will be able to understand, accept, and even support the housing allowance policy in general.

Other Considerations

The approach suggested in this study treats housing allowances for locations inside and outside the United States in the same way. The current DoD system treats them differently and, in particular, pays for a higher percentage of housing costs outside the United States. This may suggest that another goal of the current system is to provide higher compensation for overseas housing costs. We have found no documentation to support this view and therefore do not include higher compensation for overseas costs as a goal. We could, however, easily incorporate such a goal in our approach; we explain how below.

Our approach also makes no judgments about the importance of dependency status. The economics literature clearly indicates that the demand for housing depends on dependency status; larger families demand more housing. As a result, a policy that does not consider family size will tend to pay for a higher proportion of housing costs for small families and a smaller proportion of costs for large families. Similarly, a policy that does not consider a particular household's taste for housing will undercompensate households that enjoy good housing and overcompensate those that do not.

Although we would not expect the value of a DoD member's labor for DoD to increase with that member's household size, DoD has traditionally paid members with larger households more, through housing

[5]Some argue in favor of constraining a household to spend its allowance only on housing as a way of controlling the cost of DoD's housing allowance program. In fact, constrained allowances are likely to increase the size of the program or reduce the share of housing costs that DoD pays for with a program of fixed size. For an explanation, see the appendix.

allowances, subsidized medical and food costs, and so on. As noted above, the approach suggested here can accommodate such DoD preferences if they persist and drop them if they do not. DoD need only decide how many dependency categories it wants to recognize for differential treatment to implement the approach.

A SIMPLIFIED SYSTEM OF HOUSING ALLOWANCES

Given these goals, a simple way to implement them is to identify an instrument that DoD can use to pursue each goal and then investigate how these instruments work when applied together. This subsection describes a housing allowance system that uses a set of instruments in a series of steps. Each step essentially addresses one of the goals above and coordinates its pursuit with that of goals addressed in earlier steps. We first summarize these steps, linking them to the goals specified at the beginning of this section, and then address each in more detail.

Summary of Steps

1. (a) Develop an adequate quality standard for DoD housing worldwide. DoD housing policy will seek to ensure that no DoD member lives in housing that does not meet this standard. (b) In locations where this standard is routinely violated, develop a policy to eliminate violations. The relevant local commander will use a set of general DoD policy templates to devise and administer this local policy. All following steps take the outcome of this step as given. These local policies implement goal 3.
2. (a) For each pay grade and dependency status, estimate the amount that DoD members pay for housing worldwide. (b) Make a policy decision that DoD will pay a given fraction of this expense. This worldwide policy implements goal 1.
3. Where steps 1 and 2 yield allowances that fall with rising pay grade, correct this outcome. This worldwide policy implements goal 4.
4. (a) For each location, estimate the price level for housing. (b) Develop price indexes that distribute DoD housing allowance funds for each pay grade and dependency status among locations in a way that offsets differences in housing prices across locations. This worldwide policy implements goal 2.
5. (a) Set the basic allowance for quarters for each pay grade and dependency status equal to the minimum allowance across

example, one simple transition strategy would exempt personnel in the force today for the duration of their stay at their current duty station. Given the short stay at most military duty stations, this could easily protect most people in the force today.

An exemption, however, would affect the collection of information contemplated in the structure offered here. As a result, the structure itself should be tailored to support the transitional policy for the duration of the transition. That will take careful planning that we do not examine in detail here.

Step 1. Guarantee Adequate Housing Quality

Housing programs outside DoD typically establish adequate quality standards.[6] DoD could achieve its political goals by choosing standards like those used elsewhere. These could address, for example,

- Quality of structure
- Quality of plumbing, heating, and electrical supply
- Space per person
- Security.

To achieve DoD's goal, there is no reason why these standards should differ from one place to another. Once they are set, however, the cost and difficulty of meeting them will differ substantially from one place to another, and DoD should plan to use different methods for enforcing the standard in different places.

Recent DoD experience suggests that this problem is likely to arise only in certain places; DoD need not commit regulatory resources in locales where it is not a problem. Similarly, this problem has arisen to date only with respect to rental housing; in the absence of contrary evidence, it seems reasonable to focus regulatory interest on rental units. Where DoD members prefer inadequate housing, DoD might consider two alternative ways to maintain these standards.

First, a relevant commander in each locale could maintain a registry of eligible housing; DoD members could receive housing allowances only if they lived in housing listed with the registry. The commander could reasonably expect most landlords interested in renting to DoD members to get their units on the list. Where this fails, enterprising members could also recommend units for the list. Inclusion on the list would require an inspection to ensure compliance with the adequacy standards.

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[6]For a useful review of these policies, see Weicher (1979). Weicher (1983) also addresses the question of adequate quality.

The principal difficulty with this system is that it would require a commander to monitor quality in housing to ensure that it remained above the standard over time. Where DoD members do not naturally demand housing as good as the adequacy standard, both landlords and DoD members have incentives to let the quality of housing slide and to let rents remain low. That is, although maintaining a registry may give a commander an illusion of tight control over these standards, the use of a registry is ultimately not self-enforcing. A commander would probably have to commit significant resources to maintain control over the situation.

In an alternative approach, a local commander would periodically determine how much it cost in his or her locale to achieve the adequacy standard. To the extent that cost depends on number of dependents, his or her estimate would have to account for numbers of dependents. Call this cost M_{ij} for the ith location and jth dependency status.

The commander would pay members housing allowances in two disbursements. The first would reimburse housing costs dollar for dollar up to this amount, M_{ij}. The housing allowance in any locale for any pay grade and dependency status would be at least this high. To the extent that a housing allowance exceeded this amount and a household spent at least the minimum required on housing, the commander would disburse the remainder unconditionally.

In economic terms, this would supplement disposable income by the amount of the total housing allowance and set the effective price of housing equal to zero for payments up to M_{ij}. Each member would then have an incentive to buy housing at least as good as the adequacy standard. This approach would require periodic monitoring to ensure that members did not make gross mistakes; such monitoring would be required in the first alternative as well. In general, we would expect this approach to require less of the commander's attention to ensure compliance with the adequacy standard.

On a priori grounds, then, the second alternative looks better than the first. However, this kind of administrative decision lies well within the expertise and authority of a local commander. He or she should retain control over administration; DoD should focus on the more general goal of setting and maintaining the adequacy standards it demands.

In certain locales, DoD may have difficulty achieving an adequacy standard in the private housing stock available. Under these circumstances, DoD should probably consider expanding installation housing; the local commander who controls local installation housing is in the best position to consider this kind of issue as well.

Step 2. Pay a Portion of Housing Cost

The simplest way for DoD to pursue the goal of paying for a significant portion of housing costs is to cover a fixed proportion of typical housing expenditures for all pay grades that can achieve the adequacy standard with such an allowance.[7] To the extent that dependency status is important, housing allowances could be designed, subject to the adequacy standard, to cover a fixed proportion of typical housing expenditures for each combination of pay grade and dependency status.

Such a system would also help DoD pursue its goal of maintaining a sense of hierarchy, as empirical evidence strongly suggests that demand for housing correlates positively with income over relevant ranges of income (see Sec. IV). Therefore, we can expect typical housing expenditures to rise with pay grade, ensuring that a housing allowance based on a fixed proportion of housing cost will also tend to rise with pay grade.

To achieve such a system of housing allowances, DoD would first estimate the average housing expenditures worldwide for each pay grade and, as appropriate, each dependency status within a pay grade. Call this H_{jk} for the jth dependency status and the kth pay grade. Second, it would consider the number of households in each cell, N_{jk}, and the total DoD budget available for housing allowances, H, and calculate a factor,

$$a = \frac{H}{\Sigma N_{jk} \cdot H_{jk}},$$

that identifies the proportion of total housing costs that DoD can cover. DoD would then identify a tentative housing allowance, $T_{jk} = a \cdot H_{jk}$, for each pay grade and relevant dependency status.

DoD should understand how a higher value of a (or of H; the two have equivalent effects) would increase expenditures on housing. The effect of such a change would depend on whether DoD *constrained* its members to spend their housing allowances on housing. If they did not, increasing a would have only a limited effect. It would alter housing demand by increasing disposable income. If housing accounted for a typical 30 percent of a household's income and the household's income elasticity for housing was a typical 0.7, then a rise in a that increased the household's housing allowance by $10 would increase its spending on housing by $0.3 \cdot 0.7 \cdot 10 = \$2.10$.

[7]If, in addition to the goals stated here, DoD wanted to provide higher compensation for housing costs outside the United States, this approach could accommodate that goal by paying different proportions of typical housing expenses inside and outside the United States. Otherwise, the approach would be identical to that proposed here.

If DoD forced member households to spend their allowances on housing, the effect could be larger. The effect would also be the same for households that spent more than the allowance on housing. For those that would spend less, however, such a constraint would reduce their effective price for housing to zero up to the full amount of the allowance. An increase in the allowance of $10, for these households, would likely increase their spending on housing by $10.

Given the more direct effect of a "constrained" housing allowance, DoD may be tempted to prefer it to an "unconstrained" allowance. Before adopting this more rigid policy, DoD should review its goals carefully. It seeks to pay for a significant portion of housing costs; as long as adequacy standards are met, it does not seek to increase the amount that households spend on housing.

To weigh the constrained and unconstrained allowances, DoD should ask which makes DoD members better off when DoD spends a given amount on housing allowances. By definition, the unconstrained allowance allows members to buy what they value most; if that is not housing—as it presumably is not if they prefer to consume a small incremental amount of housing—forcing them to spend on housing makes them worse off than letting them buy what they want.

This conclusion suggests a very strong case for giving an unconstrained allowance unless, as in cases when members prefer inadequate housing, DoD wants to induce its members to buy more housing. As noted in Sec. V, DoD members would be better off with such an allowance even if they spent less on housing then their counterparts in the private sector. Even so, DoD could use a constrained budget to help its members most by giving them an unconstrained allowance that would let them continue to spend less on housing than their civilian counterparts if that was how they want to use their available income.[8]

Step 3. Maintain Hierarchy

DoD cannot sustain a structure of housing allowances in which allowances fall as pay grades rise. It can deal with this issue as follows. It would check each housing allowance generated to ensure that $T_{jk} \geq T_{jk'}$ whenever pay grade k exceeded pay grade k′. When this

[8]It is also possible that the tax-free status of housing allowances depends on whether DoD constrains their use or not. Congress and the courts have upheld the tax-free nature of DoD housing allowances in the past when no constraints were placed on their use. In the future, however, Congress could become less sympathetic to this point of view. Presumably the more of a housing allowance households spend on things other than housing, the greater this concern becomes. Since housing allowances currently cover only a fraction of typical housing costs, this is unlikely to be a serious problem today. But it could become a concern in the future.

while the other makes up for some shortfall in housing costs. Neither has an independent existence.

The approach calculates a set of total housing allowances that implement the DoD's basic goals for housing allowances and then back-calculates BAQ and VHA as components of this allowance. The approach would work just as well without this final breakout.

This final set of housing allowances is specifically designed to do the following:

- Cover a portion of housing costs defined by the amount that each pay grade and dependency status pays for housing, H_{jk}, and DoD's choice of a
- Offset the effects of differences in housing costs on DoD member well-being by reflecting differences in prices in P_i
- Ensure that housing allowances are large enough to allow DoD members to pay the cost of housing that meets DoD's adequacy standard, M_{ij}
- Ensure that housing allowances never fall as pay grades rise in any dependency status or any locale
- Subject to these other constraints, maximize the well-being of DoD members by leaving them free to spend their housing allowances as they wish.

In sum, this set of housing allowances uses a simple set of instruments to pursue DoD's key goals in using a housing allowance.

Step 6. Handle Special Cases

The general principles underlying the approach above provide a basis for addressing special cases that do not quite fit the conditions assumed above. We can illustrate how to apply these principles by addressing three cases of special current interest to DoD.

Households with two DoD members. Goal 1 above states that DoD seeks to cover a portion of typical housing expenditures. If household members are not collocated and maintain separate housing, each should receive a separate housing allowance that reflects the member's dependency status in each location. That is, the member uses the dependents collocated with them to determine his or her individual dependency status.

If the members are collocated, none of the goals above would justify providing two allowances.[10] What should that allowance be? To

[10]Other goals important to DoD, however, may dictate two allowances. For example, giving two allowances to an unmarried couple living together and only one to a married

satisfy goal 4, it should depend on the pay grade of the senior DoD member in the household.

Members with remote dependents following divorce. The relevant goals here are the first and second; DoD wants to cover a portion of housing expenditures that reflects the local housing price associated with those expenditures. Pursuing these goals to their logical end could become quite complex. It seems best in a complicated situation to have a default option. As long as the member can demonstrate that he or she supports dependents, he or she is eligible for an allowance that reflects these dependents, but is based on the member's location.

If the member wants to protest that his or her dependents live in an area with higher housing prices, DoD should provide a simple procedure that allows the member to certify this. If it is true, then DoD should determine what portion of the member's housing costs are attributable to these dependents and adjust this portion of his or her housing allowance up to reflect the difference in housing prices between the relevant locations. If necessary, this procedure could easily be applied to any number of locations.

The principal difficulty with this procedure is that it requires a price level for the dependents' location, a level that DoD may not calculate. This issue deserves additional attention.[11]

Members with remote dependents during sea or field duty. DoD presumably provides the member's housing in such circumstances. If the member has no dependents, he or she gets this housing in exchange for his or her BAQ.[12] Goal 1 above, however, strongly suggests that DoD should also cover a portion of the typical costs of housing dependents, costs that are not likely to be much lower than they would be if the member were with his or her dependents. That is, according to the first goal, the dependents should receive the full housing allowance justified by the member's pay grade and dependency status and the location of the dependents. Pricing houses in the

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couple creates a disincentive to marriage. To avoid such a disincentive, DoD could give both members a full allowance whether they are married or not.

[11]Many possibilities exist. For example, if enough dependents live in an area, DoD could include that procedure in its system for estimating housing price levels. DoD could coordinate its indexes with those of the Bureau of Labor Statistics or the Department of Housing and Urban Development to make comparisons. Or DoD could judge subjectively that any particular location is like some other location within its system and use the corresponding price level.

[12]If government-provided housing is not available, DoD should provide a BAQ for the member as though he or she had no dependents. This is similar to current policy (*Uniformed Services Almanac*, p. 31).

dependents' location raises the same problems discussed under the case immediately above.[13]

SUMMARY

Because DoD uses policy on housing allowances to pursue several goals, we must expect some complexity in the policy. But by identifying DoD's major goals and identifying one simple instrument that we can use to pursue each goal, we can develop a simple, coherent policy on housing allowances. That policy provides general principles that define the system as a whole as well as special housing situations that DoD members can face.

The approach proposed here identifies six policy goals.

- It pursues the goal of paying for a substantial portion of the housing expenditures of DoD households by estimating these expenditures each year and covering a specific percentage of these expenditures.
- It pursues the goal of offsetting the effects of variations in housing prices from one location to another by estimating housing price levels for these locations and making housing allowances in these locations proportional to these price levels.
- It pursues the goal of ensuring that DoD households live in adequate housing by developing a single worldwide housing adequacy standard for all DoD households and ensuring that all households meet this standard.
- It pursues the goal of maintaining the military hierarchy by guaranteeing that housing allowances do not fall at any location when pay grade increases.
- It pursues the goal of using DoD moneys available for housing allowances to help DoD households as much as possible by not constraining households to spend the allowances on housing in most cases.
- It pursues the goal of treating special cases simply by providing a transparent set of goals that apply to general and specific situations as well.

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[13]We address only housing allowances here. The policy options discussed here need not alter other related policies that are currently in effect. For example, DoD presumably maintains the family separation allowance paid during any extended period of separation to promote goals unrelated to those we discuss here (*Uniformed Services Almanac*, p. 31).

Broadly speaking, this system looks very much like the current DoD policy on housing allowances. But differences are important. Current housing allowance policy often penalizes households for spending housing allowances on goods and services other than housing; the approach here would do this only if these households failed to consume adequate housing. This approach would allow DoD to get the most from its housing allowances in terms of their effect on the overall morale of the force.

Current variable housing allowances reflect differences in housing expenditures across locations; the approach here would emphasize differences in price. The approach compensates households not only for typical changes in the housing costs that they face, as the current system does, but also for typical changes in the housing benefits that they face as they move from station to station.

The current system treats households inside and outside the U.S. quite differently; the approach here would not. It simplifies policy by using a single set of principles to justify and calculate all housing allowances. The net result is that the approach suggested here is simpler, more transparent, and more efficient than the current system without sacrificing any of the current system's considerable strengths.

VII. CONCLUSIONS

DoD spends $6 billion a year on housing allowances. Because allowances are intended to cover a large portion of the force's housing costs and to offset differences in costs from one station to the next, DoD faces a challenging task in devising an equitable and understandable policy for distributing these allowances.

Both the price of housing and expenditures on housing have changed dramatically relative to the economy as a whole during the last two decades. Moreover, both price levels and expenditures differ substantially from one location to another within the United States. Such variation would be even greater if we included locations outside the United States. The variations indicate that small changes in policy on housing allowances can have significant effects.

In this report, we examine two questions relevant to policy on housing allowances: How we might detect and interpret differences in the housing decisions of DoD and non-DoD households and how DoD might simplify and clarify its policy on housing allowances to make that policy easier to explain to its own members and to Congress.

With regard to the first question, using basic insights from the recent economics literature on housing demand, we predict significant differences between comparable DoD and non-DoD households in decisions on how much to spend on rental housing services, when to switch from rental to owner-occupancy, and then how much to spend on owner-occupied housing assets. We outline a method that DoD might use to determine how important empirically such differences are. To implement this approach, DoD will have to overcome difficult analytic problems.

Most important of all, however, we strongly recommend that DoD not worry about such differences if it detects them. In particular, without careful study to understand the consequences for members of the armed forces, DoD should not pursue policies designed to make DoD decisions on housing more like decisions made by non-DoD households.

DoD should recognize that the housing decisions of DoD households will probably reflect basic realities of military life that differ from the circumstances of civilian life. If DoD believes that these realities of military life make DoD members worse off than civilians, it can find better ways to correct this situation than to encourage DoD members to demand the same kind of housing that non-DoD households demand.

With regard to how DoD might simplify and clarify its policy on housing allowances to make that policy easier to explain to its own members and decisionmakers and to Congress, we recognize that because DoD pursues several different goals with the policy, some complexity is unavoidable. By identifying these basic goals and one simple policy instrument to implement each goal, and by developing a simple method for coordinating the use of these instruments, however, we believe we can offer a simpler, clearer policy that still achieves DoD's basic goals. Those goals are the following:

- Pay for a significant portion of housing costs in the force.
- Offset the effects of differences in housing prices from one station to another.
- Ensure that all DoD members live in adequate housing.
- Ensure that DoD housing allowances reflect military hierarchy and that allowances not fall as pay grade rises.
- Given the achievement of these goals, ensure that DoD members value resources committed to housing allowances as highly as possible.
- Use the basic goals above to develop policy on special cases associated with households with two DoD members, DoD members separated from their dependents, and so on.

The basic structure of the policy that flows from these goals resembles that of the current policy, but with three important differences. First, except to the extent required to ensure that DoD households live in adequate housing, the approach suggested here allows DoD households to spend housing allowances as they please. Not constraining DoD households to spend allowances on housing ensures that they value these allowances as highly as possible.

Second, although the current system compensates households for differences in housing costs at different stations, our alternative would consider differences in costs and benefits measured in a simple way. This more complete approach to compensation would lead to greater differences in housing allowances among stations.

Finally, rather than using diverse principles and methods to justify three individual housing allowances, as the current system does, our recommended alternative uses a single, unified set of principles and techniques to calculate housing allowances. This approach makes the system easier to update and to explain to DoD members and to Congress.

DoD is concerned that whatever policy it adopts be credible to its members and to Congress. The system that we propose provides a step

in that direction. It simplifies the linking of any aspect of the housing allowances at any time, or any change in them over time, to one of the six goals above.

A critic might challenge the goals themselves, suggesting a basic change in the system. But each linkage is direct enough to leave little doubt about the reason underlying each part of the system. What doubt remains will likely concern the actual estimation of DoD households' housing expenditures and the housing prices that they face, both critical elements of our proposed system to achieve DoD's goals on housing allowances.

We believe that any attempt to build a housing allowance system on data not collected directly from DoD households cannot adequately reflect DoD's goals of (1) covering a substantial share of housing costs, (2) offsetting the effects of locational differences in costs, and (3) keeping DoD households out of inadequate housing. Analogous data collected outside DoD cannot properly capture the true experience of DoD households. DoD need not, however, control the process of collecting or processing such data.

To give its policy greater credibility, DoD should consider the possibility of contracting with an outside organization, such as the Census and Economic Analysis bureaus in the Department of Commerce or the Bureau of Labor Statistics, to collect data and execute the calculations that DoD uses to implement its policy on housing allowances.[1] In this way, DoD would control the policy and maintain its transparency, while an objective organization with widely recognized credentials for integrity and competence essentially certified the inputs that DoD used to implement that policy.

Having the data collected outside DoD could prove to be quite costly, of course. DoD must weigh this cost against the value of credibility that it provides for its housing allowance program.

In this study, we attempt more to open the discussion on the two questions above than to resolve them in fine detail. The results of this analysis point to a number of areas for further work.

DoD may want to implement an empirical comparison of housing decisions by DoD and non-DoD households. DoD need not execute such a comparison to prepare for any specific changes in policy on housing allowances, but the comparison may help put the housing

[1]Ideally, these organizations would collect and analyze data worldwide for DoD. But even if they are constrained to operate within the United States, their credibility could enhance DoD's housing allowance program. Their expertise could also enhance DoD's collection and analysis of data from outside the United States. Reliance on private contractors to collect and analyze data worldwide would in all probability not provide the credibility that DoD seeks.

decisions of its members in better perspective. The discussion in Secs. IV and V emphasizes the importance of understanding behavioral aspects of housing demand before attempting such a comparison.

The approach suggested here involves several difficult problems of econometric specification and data collection. Obviously, other approaches are possible, but the problems are so basic that they are likely to occur in any other approaches used to compare decisions on spending or the choice between renting and owning and occupying a home.

The most pressing problem involves the measurement of the permanent income of individual households. A large literature has addressed this problem, and a careful examination of the options tried should lead to a solution. Selection problems associated with households that have the option of living on a DoD installation also offer an analytic challenge.

Earlier studies have pointed to shortcomings of American Housing Survey data on housing characteristics, but that has not prevented them from using these data successfully in analyses like the one contemplated here. We need a better understanding of the housing data that DoD currently collects; if additional data are needed, however, we foresee little difficulty in restructuring parts of the DoD housing survey to gather data comparable to those in the American Housing Survey.

DoD may want to look closely at the methods suggested here for estimating household expenditures on housing and housing prices in different locations. It may consider pilot studies to implement estimates of the imputed rent associated with owner-occupied housing to determine the difficulty of estimating imputed rent in practice. Such studies should consider the alternative of matching owner-occupiers with comparable renters and closely examine why the Bureau of Labor Statistics continues to match households rather than estimate imputed rent to calculate the consumer price index.

DoD should also look at the feasibility of estimating hedonic indexes for different locations and using them to construct price indexes. Because several organizations have already achieved this with readily available data, we see no difficulty in DoD's estimating such indexes. Nonetheless, a pilot study would help DoD anticipate problems before it goes to full implementation. In such a pilot, DoD should examine whether it should maintain a single price index or different indexes for different DoD members, such as officers and enlisted personnel.

As part of a pilot study, DoD should also examine how best to coordinate estimates of expenditure and price level from different estimators. In all likelihood, DoD will want to use a combination of estimators to develop its expenditure estimates and price indexes. How best

to coordinate these will probably depend heavily on institutional and empirical factors associated with DoD housing policy. For example, if, in an effort to maintain the credibility of its estimates, DoD were to contract with an outside organization to develop these estimates, its coordination strategy might differ from the strategy it would use if it ran the program in-house.

Before implementing all or part of the framework recommended here, DoD should seriously consider simulating it and comparing the results that would come from the current system. Such simulation would give DoD a better understanding of what to expect under the new system.

The simulation should attempt to identify and deal with special cases to ensure that the system did not have perverse effects around the edges. But it should also give careful attention to more typical circumstances and the effects of changes on the system as a whole. In all likelihood, such a simulation would succeed best if it followed efforts to implement techniques to estimate imputed rent and hedonic price indexes so that the simulation could use the products of these efforts.

Once DoD was satisfied that it understood the system that it wanted and the likely effects of that system, it should also investigate how best to transit from the existing system to the new one. We would expect fairly substantial changes as members gained greater freedom to spend their allowances as they pleased and as differentials increased among locations.

Members in certain individual locations that currently have relatively low housing prices would feel worse off under the policy even though it would tend to make them better off over the course of their careers in DoD. DoD should not let these transition problems dominate its concerns or actually dictate the particulars of the long-term policy reform that it seeks. The development of a well-defined transition policy should help DoD achieve a complete reform without incurring excessive criticism from political sources in the process. The policy will benefit from careful planning.

In sum, much remains to be done. This study identified basic issues relevant to policy on housing allowances and pointed the way to resolving these issues, that is, to move policy in a constructive direction.

Appendix

THE SIMPLE ECONOMICS OF HOUSING ALLOWANCES

This appendix uses basic price theory to explain how DoD households react to alternative forms of the housing allowance. It starts with a simple model of housing allowances. It then shows that a variable housing allowance will probably increase a household's spending on housing more than will a basic allowance for quarters and that an overseas housing allowance will probably increase a household's spending on housing more than will a variable housing allowance.

Finally, the appendix shows that allowances that constrain a member's spending to housing services tend to increase the member's spending on housing. Thus, they tend also to increase DoD's cost of covering a given percentage of housing expenditures or covering the housing expenditures of households that fall in any particular percentile of the force.

THE BASICS

We start with the simple premise that each household has a demand function for housing services. The function states that, holding price constant, an increase in income increases the household's demand for housing services and, holding income constant, an increase in price reduces the household's demand for housing services. These features typify a household's demand for most goods and services and are consistent with the empirical results for housing services summarized in Sec. IV. These features are all we need to assume about household demand for housing services to get the results reported here.

Figure A.1 illustrates a demand curve, D_1, for a typical DoD household. It shows the quantity of housing service units that a household demands on the abscissa and the price per unit that the household pays on the ordinate. If the market price equals p_1, the household buys q_1 units of housing, spending $p_1 \cdot q_1$ on housing.

Now suppose that we give the household a housing allowance that covers all expenditures up to an amount that would allow the household to buy q_2 units of housing at price p_1. To start, we allow the household to spend this allowance any way it would like. Such an

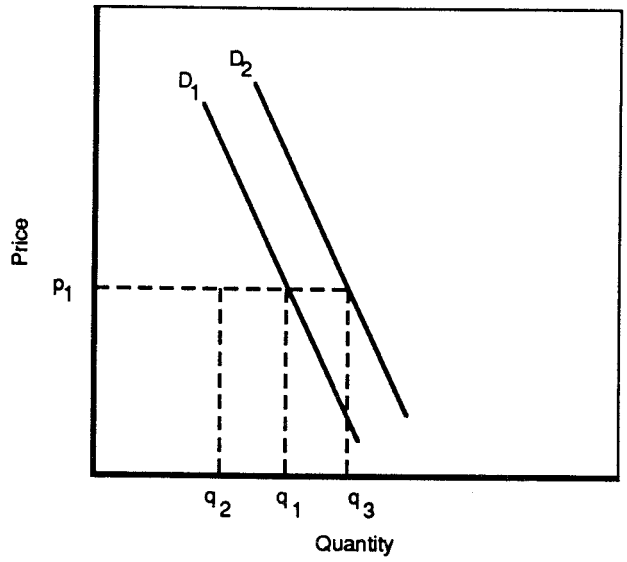

Fig. A.1—Basic effects of a small housing allowance

allowance essentially augments the household's income, shifting its demand curve from D_1 to D_2. The household reacts by increasing its consumption of housing services from q_1 to q_3. The allowance increases the household's income and thereby encourages it to buy a bit more of everything, including housing services.

Suppose now that we give the household the same housing allowance, but allow it to use only the portion that it spends on housing. Such an allowance not only increases the household's income, but also reduces its effective price for housing services to zero for the first q_2 units it buys. That is because the household can have each dollar of allowance up to this point only if it spends the dollar on housing; we essentially give these units of housing free to the household.

The household will buy q_2 units and then realize that it is willing to pay more than p_1 for another unit of housing. It will continue to buy housing services up to q_3, the point where the height of its demand curve equals p_1. That is, in this case, the household buys q_3 units of housing whether we constrain how its spends the allowance or not.

Figure A.2 illustrates the effect of a larger allowance, one that would allow the household to buy q_4 units of housing services at price p_1.

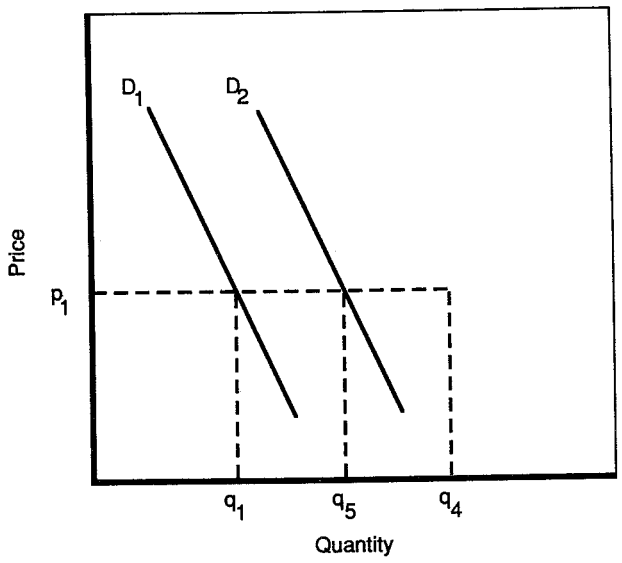

Fig. A.2—Basic effects of a large housing allowance

Suppose to start that we give the household the allowance no matter how it spends it. This is a cash grant that increases income enough to shift the household's demand curve from D_1 to D_2. The household responds by increasing its demand from q_1 to $q_5 < q_4$.

If we pay the household only the portion of the allowance that it spends on housing, we in effect reduce its price of housing to zero up to a quantity of q_4. The price remains p_1 beyond q_4. The household will buy housing up to q_4. When it considers whether to buy more, it realizes that an additional unit of housing is worth less than p_1 to it. Hence, it buys q_4 units of housing, spending its full allowance on housing. This allowance has essentially increased the household's demand for housing from q_1 to q_5 by increasing its income and from q_5 to q_4 by reducing its price to zero.

Housing allowances influence household behavior in two key ways: (a) They always induce a small increase in housing demand by increasing income. (b) If a household receives only the portion of an allowance that it spends on housing services *and* the allowance is large enough to cover more than the amount the household spends in the absence of the allowance, then the allowance can induce the household

to spend the full amount of the allowance on housing by dropping its price to zero up to that full amount of housing.

BASIC, VARIABLE, AND OVERSEAS ALLOWANCES

We can use the simple discussion above to understand the relative effects of the basic allowance for quarters, variable housing allowance, and overseas housing allowance. We illustrate these in Fig. A.3. In the absence of any allowance, a household has a demand curve, D_1, and consumes q_1 units of housing at price p_1. The figure compares what happens if we use three different ways to provide the same total amount of allowance.

The first allowance includes only the BAQ. It would allow the household to spend enough to buy up to q_2 units of housing services. A household is free to spend the BAQ as it chooses. Hence, this allowance induces only an income effect. It shifts the household's demand curve from D_1 to D_2, increasing its consumption from q_1 to $q_3 \leq q_2$.

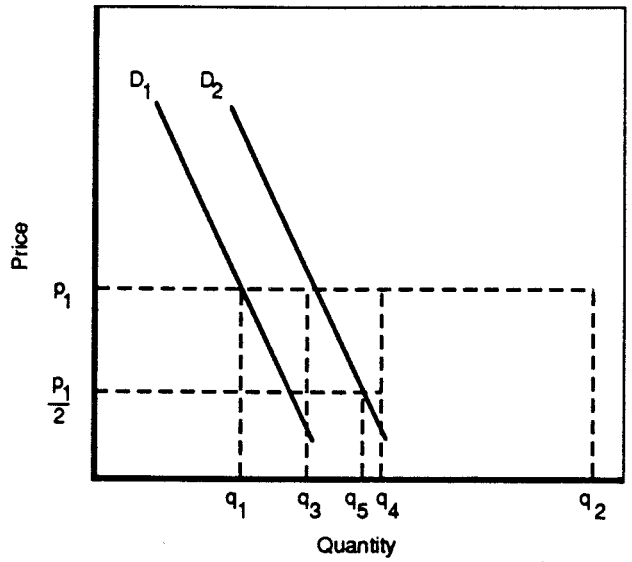

Fig. A.3—Relative effects of basic, variable, and overseas allowances

The second allowance is half BAQ and half OHA. The household can spend the BAQ as it pleases, but receives the OHA only if it spends it on housing. This arrangement induces the same income effect that the first allowance did. It also reduces the household's price up to the amount of the OHA or $q_2/2$. This induces the household to increase its consumption from q_1 to $q_4 = q_2/2$.

The third allowance is half BAQ and half VHA. The VHA has an offset clause that requires that a household remit to DoD half of any portion of it that the household does not spend on housing. Rather than giving a household free housing services up to the full amount of the VHA, this forces a household to give back 50 cents of every dollar left unspent, leaving the household with an effective price of $p_1/2$. Given this price, the household chooses to consume an amount q_5, where $q_1 \leq q_5 \leq q_4$.

In sum, the BAQ, VHA, and OHA differ in the way they affect the effective prices that households face for housing services. The price is highest for the BAQ and lowest for the OHA. Hence, we can expect the OHA to do the most to encourage housing consumption and the BAQ to do the least.

CONSTRAINED ALLOWANCES AND THE DoD BUDGET FOR HOUSING ALLOWANCES

It should be clear from Fig. A.2 and the accompanying text that if a housing allowance is large enough, constraining the allowance so that households can spend it only on housing will tend to increase household spending on housing services. If DoD attempts to cover a portion of total housing expenditures or attempts to cover the total expenditures of some percentile in the DoD household population, its housing expense will rise as household expenses rise. That is, when it constrains the use of housing allowances, it increases the amount that it can expect to spend on housing allowances. Thus, a "constrained" policy actually increases DoD's housing cost.[1]

Figure A.4 illustrates how this happens. It shows the demand curves for three households that receive the same housing allowance, half BAQ and half VHA, which allows them all to buy q_0 units of housing service. The demand curves shown reflect the housing allowance. The

[1]This is true if DoD holds the proportion of housing costs that it covers constant, but not if it fixes the total budget for housing allowances, as we assume in recommendations in the text. If DoD fixes its total budget, by definition, the total cost of housing allowances cannot increase. But a constrained policy will still lead DoD members to increase their aggregate demand for housing and thereby reduce the proportion of total housing cost that DoD can cover with its fixed budget.

households differ only in how much housing service they demand. If they can spend the allowance as they choose, they demand, respectively, q_1, q_2, and q_3 units of housing services.

Moving from a policy that allows them to spend the allowance as they choose to a constrained policy affects the three households differently. It reduces the marginal price for household 1 to $p_1/2$, increasing its demand from q_1 to q_4. It does not affect the demands of the other two households. That is, moving to a constrained allowance tends to increase the demand of households in a particular location, pay grade, and dependency status that have a relatively low demand for housing among their peers.

This change increases the aggregate demand for housing services by DoD households and therefore increases total spending on housing services. Such a change will increase DoD's budget for housing allowances unless it adopts a less generous policy.

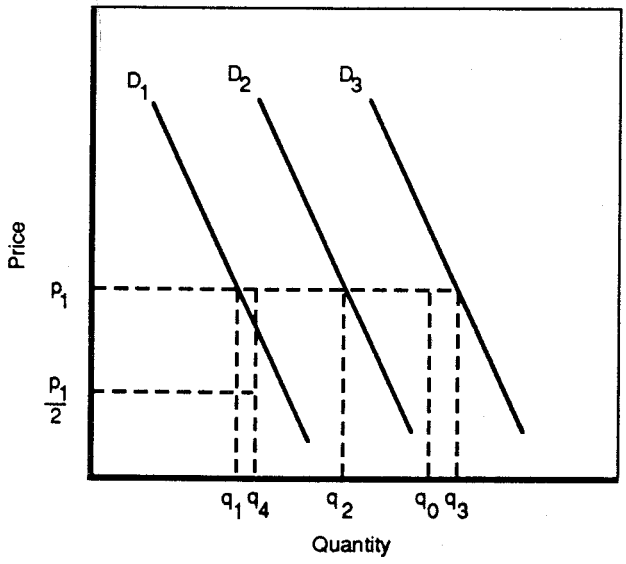

Fig. A.4—Effects of constraining allowances to be spent on housing

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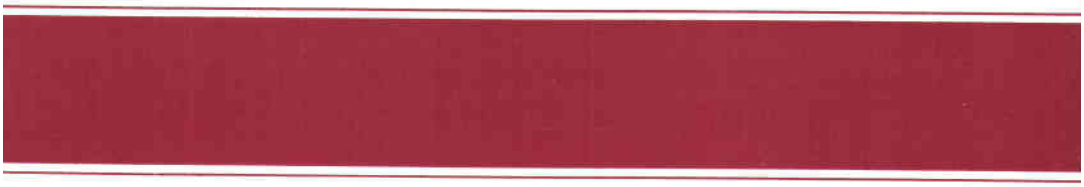
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