CBO PAPER

HOUSING PRICES,
HOUSING CHOICES, AND
MILITARY HOUSING ALLOWANCES

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PREFACE

In 1997, the Department of Defense proposed, and the Congress enacted, a new set of procedures for calculating the locality-specific housing allowance that the Department of Defense (DoD) pays to service members stationed in the United States who are not housed in government quarters. The old system, which based allowances on what service members reported spending on housing in each locale, had been justly criticized for paying too little in areas where housing was expensive and too much where housing was inexpensive. The new system bases allowances on the prices that must be paid in each locale to rent certain standard units of housing—a two-bedroom apartment, for example—that DoD will select.

This paper discusses the rationale for the new housing allowance system and the problems that may be encountered in its implementation. The paper is the second of three reports examining various aspects of the military pay system that the Congressional Budget Office (CBO) has prepared at the request of the Chairman and Ranking Minority Member of the Subcommittee on Personnel of the Senate Committee on Armed Services. An earlier CBO paper, *Military Pay and the Rewards for Performance* (December 1995), examined proposals for restructuring the table of military basic pay. The final paper will explore the controversy surrounding the reported "pay gap" between people in the military and their counterparts in the civilian sector.

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SUMMARY

In 1997, the Department of Defense proposed, and the Congress enacted, a new system of housing allowances to be paid to members of the military who are stationed in the United States. The new provisions establish a basic allowance for housing to replace two separate allowances: the basic allowance for quarters (BAQ) and the variable housing allowance (VHA). Like the old VHA, the new system seeks to insulate service members from the effects of variations in housing prices as they are transferred among geographic areas. Both systems pay more where housing is expensive than where it is inexpensive, but they differ in how they determine the allowances for the various areas.

Without some system of variable allowances, the military's practice of moving its personnel from one area to another every few years would subject service members to wide swings in their standard of living. In the most expensive areas of the country where members serve, a given type of housing can rent for three times as much as it does in the least expensive areas. Moreover, housing absorbs a large part of the typical household's budget—30 percent or more of military income for a person in one of the junior enlisted pay grades. As a result, the variation in housing prices around the country would translate into a large variation in the well-being of service members and their families if the housing allowance did not also vary. The services might not worry about the variation in standards of living if they allowed members to choose their assignments, but the freedom to choose is sharply limited by the services' need to match people and jobs. Even if the military abandoned the system of separate allowances for food and housing, it would still have good reasons to pay an allowance that accounted for differences in local living costs, particularly the cost of housing.

This paper compares the new and old approaches to calculating military housing allowances. It shows that neither approach exactly offsets the effects of variations in housing prices on the well-being of service members and their families, although the new system is likely to come much closer than the old to achieving that goal. The paper identifies two potential problems, however, that may cause the performance of the new system to fall short of its potential.

HOW THE NEW SYSTEM DIFFERS FROM THE OLD

The basic mechanics of setting allowance rates under the old and the new systems appear quite similar. The provisions in law governing each system refer to the housing "costs" of each group of service members defined by pay grade and dependency status (with dependents or without). In each system, the total allowance covers a specified fraction of the average cost of housing nationwide. That fraction is intended to be 85 percent, but in recent years it has been about 80 percent. In any local area, the allowance equals the average allowance plus the difference between local housing costs and the nationwide average cost.

The two systems differ because of how they define housing costs. Under the old system, the variable allowances were expenditure based; the Department of Defense (DoD) interpreted housing costs to mean the amount that service members spent on housing in each area of the country. Under the new system, allowances are price based; housing costs are the average prices in each area for certain standard units of housing (for example, a two-bedroom apartment). For each group of service members, DoD will examine the spending patterns of civilian households with similar income to select a standard unit that it determines provides "adequate housing" for the group.

Allowances under the new price-based system will be different from allowances under the old expenditure-based system because service members adjust their consumption of housing in response to the differences in housing prices that they encounter when they are transferred from one area of the country to another. Where prices are high, service members tend to consume less housing than they do where prices are low, choosing a unit that is smaller, for example, or less well maintained, farther from their duty location, or otherwise inferior. As a result, their expenditures for housing vary among areas of the country by less than do the prices of a given type and quality of housing. The old approach reflected their spending decisions in the allowances it paid. The new approach will allow them to consume the same housing in each area without having to sacrifice spending on other goods. Under the new system, allowances will tend to increase in areas where housing is expensive and to fall where housing is inexpensive.

IS THE NEW SYSTEM AN IMPROVEMENT?

Is the new price-based system superior to the old system? The answer to that question may have seemed clear to policymakers as the new system was being developed, but further scrutiny raises some doubts. Neither a price-based nor an expenditure-based approach to setting allowances exactly offsets the effects of price variation on service members' well-being. Which system performs better depends

on how members adjust their consumption in response to changes in housing prices and in their income.

The shortcomings of the old expenditure-based system were readily apparent. Because the system made up for the differences in service members' spending on housing as they were moved from one area to another, what they had left to spend on other goods was the same everywhere. People who moved from an area of average housing prices to one of high prices consumed less housing and so were worse off. Moving to an area of low prices, they consumed more housing and were better off.

The new price-based system tends to make people assigned to locales where housing prices are average worse off than their counterparts who are assigned to areas where prices are either higher or lower. The system allows members of the military to consume the same combination of housing and nonhousing goods wherever they are assigned. But service members would not choose the same combination in every locale. Compared with people who were assigned to places with average housing prices, those who were assigned to areas where prices were high would tend to consume less housing and more of other goods. People who were assigned to locales with low housing prices would tend to consume more housing and less of other goods. In each case, they would choose a different combination than their counterparts in areas of average prices only because they thought it would make them better off.

Determining which system is better requires assessing each against an ideal system—one that exactly offsets the effects of variation in prices on the well-being of service members. The allowances under such a system depend on how service members adjust their consumption of housing in response to variations in prices and in their income. Because those responses are difficult to measure precisely, implementing an ideal system probably would not be practical. Nonetheless, the responses can be estimated with sufficient accuracy to support qualitative conclusions about whether the old or the new system comes closer to the ideal.

The Congressional Budget Office's (CBO's) estimates of service members' responses to price and income variations indicate that the new system has a clear advantage over the old. Consider, for example, the case of service members with dependents assigned to an area where housing prices are above the nationwide average by 60 percent—about the situation around Washington, D.C. On the basis of CBO's estimates, the allowances under the old system in such an area were too low by 11 percent to 22 percent, depending on the person's pay grade. Under the new system, they should be too high in such areas by about 2 percent to 4 percent. In areas where prices are 25 percent below average, the old system paid too much by about 12 percent to 26 percent; in contrast, the new allowances should be too high by no more than about 3 percent. Even if CBO's estimates of how service members

respond to price variation incorporated substantial errors, the superiority of the new system would still be clear.

POTENTIAL PROBLEMS

Although the new system can be expected to perform better than the old, two potential problems may cause it to yield less of an improvement than it might otherwise. First, housing prices are difficult to measure accurately because housing is a good that embodies many characteristics. No approach to collecting price data can hope to measure the price of exactly the same bundle of characteristics in each area of the country. The two candidate price measures that DoD examined as it developed the new system both appear to have problems gauging prices accurately in some localities. Thus, even after DoD selects a method for measuring prices, it may want to continue exploring alternative approaches to identify localities where its preferred approach performs poorly. In particular, it could derive prices from the data that it has collected on the housing expenditures of military personnel, an approach that may yield poor results for some areas but that in theory implicitly accounts for all the dimensions of housing quantity.

The second potential problem would require legislative action to correct. In the new system, allowances are to be linked to the cost of "adequate housing." That means that DoD may base the allowances for a group (categorized by pay grade and dependency status) on the prices of a type or size of housing that does not represent what typical members of that group actually choose to rent. A typical married person in pay grade E-4, for example, might rent an apartment with 800 square feet of living space when assigned to a location where housing prices are about average for the nation. If DoD determined, however, that adequate housing for an E-4 required 1,000 square feet, the allowance would vary from area to area according to the price of that larger, more expensive unit. In that case, E-4s might find that they were better off where housing was expensive than where it was inexpensive. The problem could be eliminated by rewriting the legislative provisions to specify that the *average* allowance for a group would be a certain percentage of the cost of adequate housing for that group but that the *differences* in allowances among areas would be based on the price of the unit that a typical member of the group actually chose to occupy.

CHAPTER I
INTRODUCTION

Since 1981, the variable housing allowance (VHA) has been the major source of regional variation in the pay of military service members stationed in the United States. The goal of the allowance program, as articulated by the Seventh Quadrennial Review of Military Compensation (Seventh QRMC), was to ensure that "a service member should be unaffected by the housing price variations between locations."[1]

The National Defense Authorization Act for Fiscal Year 1998 made a major change in the way housing allowances are determined, a change intended to make the program better serve its goal. Under the earlier provisions for the VHA, the Department of Defense (DoD) used an expenditure-based approach: it derived allowances from what service members reported spending on housing in different areas of the country. The new basic allowance for housing (BAH) will be price based: allowances will vary according to how the price of a given type of housing varies among areas. The two procedures do not produce equivalent allowances because people adjust the amount or kind of housing (and other goods) that they consume, and thus their expenditures for those goods, in response to variations in prices. Those adjustments cause expenditures to vary less than prices among regions or locales. The new procedure will tend to increase allowances in areas where housing is expensive and reduce allowances where it is inexpensive.

The policymakers who developed the new price-based system probably assumed that it would be more successful than the old in insulating service members from the effects of variations in housing prices, but that result was not inevitable. As this paper shows, neither an expenditure- nor a price-based approach exactly offsets the effects of such variations on the well-being of service members. Which system performs better depends on how members adjust their consumption of housing in response to changes in housing prices and changes in their income; economic theory alone does not provide the answer. Thus, the paper develops empirical estimates of the relationships between prices and the housing expenditures of service members. Those estimates indicate that a price-based system has a clear advantage.

Yet the new system may not realize all of the potential for improvement that a price-based approach to calculating allowances can offer. The Congressional

1. Department of Defense, *Report of the Seventh Quadrennial Review of Military Compensation* (August 21, 1992), p. 7.

Budget Office's (CBO's) analysis identified two potential problems, only one of which appears to have been considered as the new system was being developed. The more obvious problem is that housing prices are difficult to measure because housing is a good that embodies a great number of characteristics: size, number of rooms, type of unit (apartment, for example), age, quality of the neighborhood, distance from the duty location, and so forth. Any attempt to measure prices in different areas of the country fixes the type of unit that it is examining in terms of some of those characteristics and ignores others. As a result, alternative approaches to measuring prices yield different results for some locations, and in some cases the differences can be substantial. The Department of Defense could reduce the errors in its price measures by using various approaches as checks against one another.

The less obvious problem arises because the new provisions have added a second goal for the housing allowance system: to ensure that allowances are based on the cost of "adequate housing" and not just on what service members feel they are able to afford. That goal could conflict with the original one of insulating members from the effects of variations in housing prices among areas. Under the new system, the allowances for a particular group—married personnel in pay grade E-4, for example—will differ among areas according to the price of whatever DoD determines to be adequate housing for that group. If the people in the group choose to consume less housing on average, or more, then the differences in allowances will not match the differences in prices that those members actually face. In particular, married service members in the junior enlisted pay grades (E-1 to perhaps E-4) may well decide to spend less than the amount DoD thinks is necessary to obtain adequate housing. If they do, the new allowances could actually tend to make them better off in areas where housing was expensive than in areas where it was inexpensive. Distortions like that could be eliminated, according to CBO's analysis, without eliminating the link to the cost of adequate housing, through a minor rewording of the new legislative provisions. That change would separate the calculation of the *average* allowance for a group from the calculation of how allowances *differ* among areas.

WHY DOES DoD NEED A LOCALITY-SPECIFIC ALLOWANCE?

Two factors argue for making any military housing allowance vary depending on where in the United States a service member is assigned. First, the price of a given type of housing unit differs substantially among geographic areas; prices in the most expensive locales may be as much as three times as high as those in the least expensive. That alone would not be enough to justify a system of variable allowances, however, were it not for the second factor: housing accounts for a major portion of most people's household budgets. Thus, variations in the price of housing would have a strong effect on service members' standards of living as they were

transferred among locations if those variations were not offset by a locality-based allowance.

The same considerations that pertain to military personnel in the United States also apply to those stationed overseas. There, differences in housing and other living costs are further affected by changes in rates of exchange between foreign currencies and the U.S. dollar. The housing allowance for personnel overseas has long been locality specific. It is part of the overseas station allowance (OSA), which is traceable to legislation passed during World War II. In addition to the housing component, the OSA includes a cost-of-living allowance, a temporary lodging allowance, and an interim housing allowance. Unlike the variable housing allowance payable in the United States, the OSA is viewed as a reimbursement under the general category of travel and transportation allowances, and the law governing OSA rates does not specify how they should be determined. This paper does not examine OSA procedures.

Housing Prices Vary Widely

As many newly elected members of the Congress quickly learn, housing is much more expensive in the Washington, D.C., area than it is in most of the rest of the country. Military personnel on their first assignments in Washington may also be shocked by those high housing prices, but if they have served for some length of time, the phenomenon of housing prices that differ sharply from one assignment to the next will be familiar.

The magnitude of variation in housing prices for a given type and quality of housing is evident, for example, in the data on rental costs that the Department of Housing and Urban Development (HUD) compiles. For two-bedroom apartments, HUD's estimates of fair market rents (FMRs) in 1996—as adjusted by DoD to match the geographic boundaries of its military housing areas—ranged from a low of $343 a month in Beckley, West Virginia, to a high of $1,064 a month in Honolulu County, Hawaii. In 1996, a total of 94 service members were receiving housing allowances in the Beckley area, almost all of them at the higher rate paid to members with dependents. In Honolulu County, which covers the entire island of Oahu, more than 13,000 personnel were receiving housing allowances; about two-thirds of them had dependents. The median FMR nationwide, based on the population of military personnel who were receiving allowances, was $531 a month in 1996—that is, half of those personnel were stationed where the FMR was greater than $531 and half where the FMR was less.

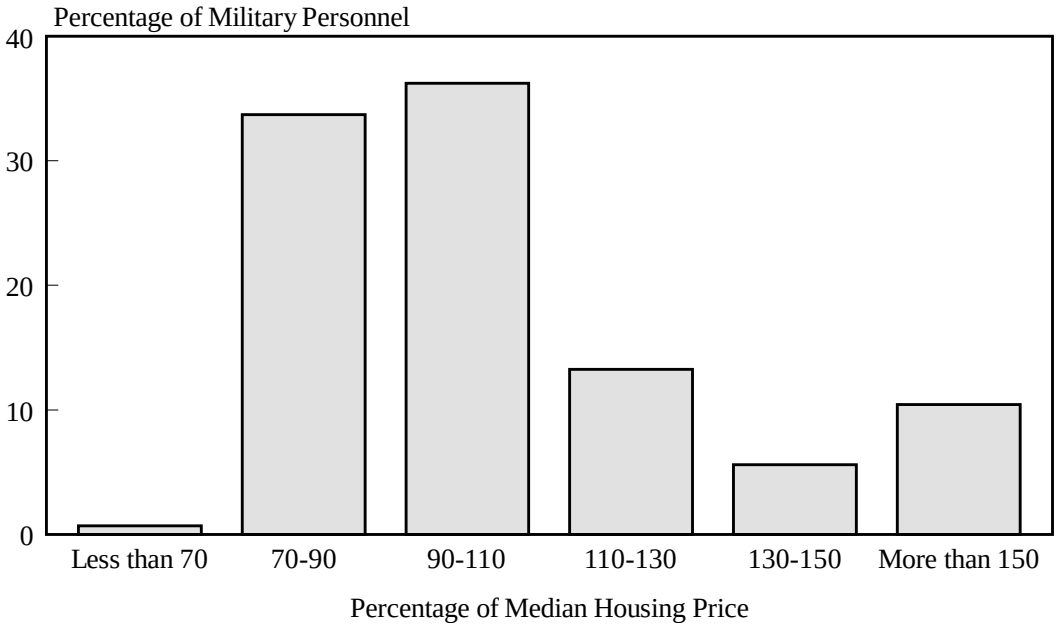
Service personnel are far more likely to encounter housing prices that are well above the median than prices that are well below. Of members with dependents, who

make up about four out of five of the military personnel receiving housing allowances in the United States, about 36 percent were stationed in areas where housing prices, as measured by HUD's fair market rents for two-bedroom apartments, were within 10 percent of the nationwide median (see Figure 1). Another third were in areas where prices were between 70 percent and 90 percent of the median. Almost all of the rest were stationed in locales where prices were well above the median—more than one in 10 service members were in an area where housing prices exceeded the median by 50 percent or more. Among senior officers, the fraction assigned to high-cost areas was even larger (see Box 1).

Housing Absorbs a Large Portion of the Family Budget

The wide variation in housing prices would not justify the complication of a locality-specific housing allowance if housing costs were a small item in the budgets of military families. But in fact, spending on housing can absorb 30 percent or more of the total pay of junior enlisted personnel who have dependents, and nearly as much of the pay of married officers at the beginning of their careers. For example, a

FIGURE 1. DISTRIBUTION OF MILITARY PERSONNEL BY THE PRICE OF HOUSING IN THE AREA TO WHICH THEY ARE ASSIGNED



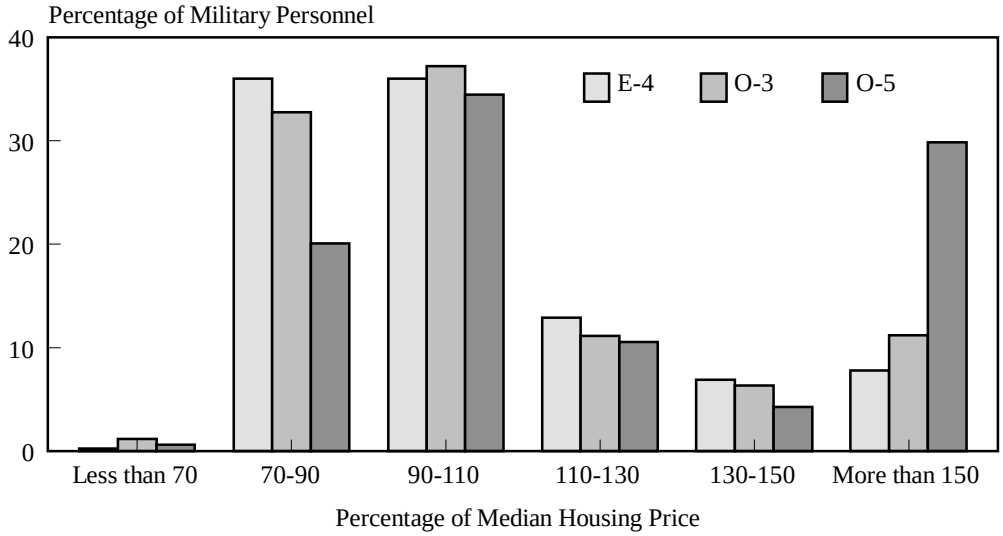
SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: Data are for personnel stationed in the United States who have dependents. Prices are the fair market rents for two-bedroom apartments in 1996, as reported by the Department of Housing and Urban Development.

BOX 1.
VARIATION IN HOUSING PRICES BY PAY GRADE

For the most part, married personnel face the same distribution of housing prices regardless of their pay grade. A notable exception is officers in grade O-4 (major or lieutenant commander) and above, who are much more likely to be serving in the Washington, D.C., area. In that locale, prices are 57 percent above the median—according to the Department of Housing and Urban Development's fair market rents—and many military personnel must live in private housing. As a result, among officers in grade O-5 who have dependents, for example, nearly one-third face prices that are 50 percent or more above the nationwide median, and only about one in five faces prices that are more than 10 percent below the median (see the figure below). By contrast, officers in grade O-3 (captain or Navy lieutenant), whose situation reflects fairly well that of the more junior officers, are much more concentrated in locales where prices are near the median or below it. There are no sharp differences among the enlisted pay grades; the situation of those in grade E-4, which is shown in the figure, is representative.

DISTRIBUTION OF MILITARY PERSONNEL BY THE PRICE OF HOUSING IN THE AREA TO WHICH THEY ARE ASSIGNED, FOR SELECTED PAY GRADES



SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: Data are for personnel stationed in the United States who have dependents. Prices are the fair market rents for two-bedroom apartments in 1996, as reported by the Department of Housing and Urban Development.

typical married E-4—the pay grade that most enlisted personnel reach by their third or fourth year—spends about 31 percent of his or her military pay on housing (see Table 1). Typical married officers in grade O-1 devote more than 29 percent of their military pay to housing. Only in the senior officer grades or among single service members does the fraction fall to as low as 20 percent, which is still sizable. Because military personnel, like their civilian counterparts, devote a large percentage of their income to housing, the design of the housing allowance system can have a major effect on the extent to which the well-being of service members varies as the military transfers them from one part of the country to another.

TABLE 1. PORTION OF MILITARY INCOME SPENT ON HOUSING, BY PAY GRADE AND DEPENDENCY STATUS, 1996 (In percent)

Pay Grade	With Dependents	Without Dependents
E-1	33.6	21.4
E-2	31.1	21.9
E-3	31.7	25.3
E-4	31.3	24.0
E-5	30.7	23.5
E-6	28.9	21.4
E-7	27.2	19.9
E-8	26.1	20.1
E-9	23.8	18.3
O-1	29.6	23.5
O-2	27.0	21.5
O-3	23.5	19.7
O-4	23.5	20.5
O-5	21.1	18.0
O-6	19.8	16.9

SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: The figures represent the ratio of DoD's reported national median housing costs for each group to the military pay of a typical service member in the group. Military income is the sum of basic pay, basic allowances for subsistence and housing, the average variable housing allowance, and the tax advantage that accrues to members because the allowances are not subject to federal income tax.

Members Are Not Free to Choose Their Assignments

A third factor bolstering the need for a variable housing allowance is that service members do not decide where they are going to spend their time in the military. If they could, the military might use a large variable component of military pay as a tool for matching people with job openings. In general, however, service members have only a limited ability to influence where they serve: they can express their preferences to the people who make assignments, for example, or they can influence their assignments through their choice of a military occupation or service. Some entering recruits may also be given a choice of initial assignment. Ultimately, though, the needs of the military primarily determine where service members are assigned.

Without a locality-specific allowance to account for variations in housing costs, military personnel would experience wide swings in their standard of living as they were transferred from one area of the country to another. Over the course of a military career, a typical service member might expect such assignments to balance out. Some people, however, could spend most of their service time in places where housing was expensive—others, in places where it was inexpensive. And even if a good balance were the rule rather than the exception, that would be small consolation to the recruit whose first, and perhaps only, assignment was in a location where housing was particularly costly. The recruit might decide not to reenlist as a result of the experience, and more generally, the military might find it difficult to keep jobs filled in expensive areas if people decided to leave the military rather than accept assignments that would sharply reduce their standard of living.

WHAT WOULD HAPPEN IF THERE WERE NO HOUSING ALLOWANCE?

Many studies have recommended that the military eliminate its system of separate allowances for food and housing, and adopt instead a simple salary system without pay distinctions between married and single personnel. The Seventh QRMC, for example, foresaw the eventual establishment of a salary system even as it was recommending improvements in the current pay-and-allowances system.

The need for a locality-specific component of military pay in the United States is not a product of the military's current system of paying a cash allowance to service members for whom it does not provide housing directly. Nor would that need disappear if a salary system was adopted. The allowance system merely makes the variation in housing prices, a primary component of cost-of-living variation, particularly apparent. That probably explains why the Congress addressed the problem of housing-cost variation in 1980 but did not tackle the issue of living costs more generally until 1994. In that year, it created a cost-of-living allowance for

personnel stationed in the continental United States (CONUS COLA). The new allowance adds to the pay of service members who are stationed in areas where living costs—exclusive of housing—are particularly high.

Creating a single cost-of-living allowance would be fairly straightforward. When the Seventh QRMC recommended both the CONUS COLA and a price-based approach to calculating housing allowances, it expected that the two allowances would be combined into a single locality-specific component of pay. Combining the two would, it saw, be a natural step on the road to a salary system. The locality-specific component of pay would serve to insulate service members from the effects of differences among areas in the prices of all the goods—both housing and nonhousing—that they routinely consumed.

CHAPTER II

EXPENDITURE-BASED AND PRICE-BASED ALLOWANCES AND THE DEMAND FOR HOUSING

Someone reading the old and the new provisions that govern housing allowances for military personnel might see little obvious difference in the way the allowances are calculated. Both sets of provisions refer to the cost of housing and compensate service members for the differences in that cost among the various areas of the country. Under the old provisions, however, the Department of Defense interpreted "cost" to mean what members actually spent on housing—their housing expenditures—and it made only a limited attempt to account for differences in what they could obtain for those expenditures. Under the new provisions, the relevant "cost" is a price—not what members actually spend but what they would have to spend in each area to obtain a given quantity of housing. Allowances under the old system were *expenditure based*; under the new system, they are *price based*.

This chapter compares the old and the new systems. Their similarities extend to many of the practical details of setting the allowances, which involves four basic steps under each system. Only in the area of determining the "cost" of housing is there a clear difference, but that difference is crucial because people respond to variations in the price of housing by adjusting the quantity of housing that they consume. As a result, price-based allowances will tend to be higher than expenditure-based allowances in areas where housing is expensive. Where housing is inexpensive, price-based allowances will tend to be lower than expenditure-based allowances.

In addition to making a major modification in the interpretation of the term "housing cost," the new provisions dropped two features of the old allowance system. One was the separate minimum allowance, or basic allowance for quarters, which was independent of location; the second was the so-called offset provision of the variable housing allowance, which recouped a portion of the allowance from service members who did not spend it all on housing. As the discussion below shows, those features were inconsistent with the new price-based approach.

STEPS IN SETTING LOCALITY-SPECIFIC HOUSING ALLOWANCES

The desired product under both the old and the new systems is the same: for each of the more than 350 military housing areas (MHAs) into which DoD has divided the United States, a separate allowance rate for each pay grade and, within a pay grade, a separate rate for members with and without dependents. The four steps below

describe, in general terms, the process for calculating the set of more than 350 allowance rates for each group.

Step 1: Determine Local Housing Costs

Because the two systems give different meanings to the term "housing cost," they use very different processes for determining those costs for each of the MHAs. In the old system, DoD surveyed service members annually to determine what they spent on housing. From that information it derived what it called a local median housing cost for each particular pay-grade and dependency-status group in every MHA. Deriving those figures involved some adjustments to the raw data from the survey on rental expenditures, adjustments that were designed to account for owner-occupied housing and, to a limited extent, for variations among areas in the types of housing that service members chose. Because the adjustments were generally fairly small, the discussion that follows ignores them and treats the old system as if it based allowances directly on what members spent for housing. Thus, the term "local median housing cost" for a particular group under the old system can be interpreted, roughly, as the rental expenditures of a typical member of that group stationed in the MHA.

In the new system, "local housing cost" refers to the local price of a particular standard unit of housing, which means that DoD must first establish a housing standard for each pay-grade and dependency-status group. The standard for married personnel in grade E-4, for example, might be a two-bedroom apartment with 1,000 square feet of living space. The new law requires that the standard be based on "the costs of adequate housing for civilians with comparable income levels" (comparable, that is, with the income of the service members in the group). Thus, if comparable civilians nationwide typically spend about $700 a month on housing, the standard unit for the group will be one that rents on average for about $700 nationwide. Armed with that standard unit, DoD then determines what it would rent for in each of the MHAs—that is, the "price" of the unit in each area. In doing so, DoD may either rely on publicly available data on prices or contract with some private company to provide price data.

Step 2: Compute the Nationwide Average

The second step in setting allowance rates under both systems is to compute a reference housing cost—some sort of nationwide average of expenditures under the old system or of prices under the new. In the old system, DoD calculated the arithmetic mean of the estimated local expenditures for a group, weighted by the number of members in the group who were eligible for housing allowances in each

area. Following the provisions of the law, it called that number the "national median housing cost," although it was not actually a median. (The median would be that level at which half of the group had higher housing expenditures and half had lower.) The new provisions have eliminated the inconsistency over the type of averaging by referring to the "national average monthly cost of adequate housing." Thus, for each group, DoD will compute the weighted average of the local prices for that group's standard housing unit.

Step 3: Choose a Coverage Rate

The third step under both systems is to decide what portion of the reference housing cost will be covered by the housing allowance. In the old system, the VHA covered about 20 percent of the reference cost; that is, service members who lived in an area where typical housing expenditures were the same as the reference cost received a VHA equal to about 20 percent of that amount. The basic allowance for quarters (BAQ), which for a particular group was the same in all areas, covered about 60 percent of the reference cost. That fraction varied from year to year as the Congress changed BAQ rates through annual legislation.

Under the new system, the basic allowance for housing is intended to cover 85 percent of the reference cost; that is, service members who live in an area of average prices should receive an allowance equal to 85 percent of the price of the standard unit for their group. Initially, however, the allowance will cover roughly the same 80 percent that the old system covered because of limits on the year-to-year growth in the total cost of the allowance program. A particular group may see a large change in its average allowance, though, because the average price of the standard unit for that group may be more or less than the average expenditure under the old program.

Step 4: Set Local Allowances

The final step in the process—actually setting the local allowances—is also the same under both systems. Although the provisions in law describe the step somewhat differently, it amounts to the following. The reference housing cost and the coverage rate determine the amount of the allowance in some hypothetical reference area. The allowance rate in any particular MHA is equal to the allowance for the reference area plus the difference between the local housing cost and the reference cost. (That difference may, of course, be either positive or negative.) That is, the variable allowance under both systems fully compensates for the difference in housing costs between any two areas, although the difference will not be the same under the two programs because they do not view housing costs in the same way. The old

expenditure-based program ensured that the allowance would cover all but a given dollar amount of typical housing expenses in every area (except as noted below). Under the new price-based program, the allowance will cover all but a given dollar amount of the price of the standard unit.

The typical uncovered expense under the old program was not quite the same everywhere because of the separate BAQ. In areas where typical expenditures on housing were 20 percent or more below the nationwide average, the rate for the variable housing allowance was zero.[1] About 7 percent of all service personnel were assigned to such areas. For them, the BAQ alone covered at least 80 percent of typical housing expenditures.

HOUSING PRICES, HOUSING CHOICES, AND HOUSING EXPENDITURES

As noted earlier, basing allowances on service members' housing expenditures rather than on the price of a given standard unit produces different results because people respond to variations in housing prices among areas by altering their consumption of housing and other goods. Understanding how the results differ, and why a price-based system is likely to be better, is easier with a framework for looking at the relationship between housing prices and people's housing choices. This section provides that framework through the familiar graphic device of a demand curve. It illustrates the adjustments that individual service members make when they are moved from one location to another, drawing on data describing the choices actually made by typical married enlisted personnel in grade E-4.

Every day, people make choices about what products to purchase and how much of each to consume. They weigh the benefit that they would receive from each good against its price and consider the characteristics that distinguish one product from another. For a good with close substitutes, the quantity that people consume tends to fall rapidly as the price of the good rises—demand for the good is very elastic, as economists say. Goods with few substitutes, by contrast, tend to exhibit inelastic demand. People's demand for specific products is also affected by their income. For some goods, the demand rises with income. For others—some food items, for example—the amount that people spend on the good tends to fall as their income rises.

The choices that people make about the housing in which they live reflect the same considerations as their choices about other goods. But housing is unusual in

1. Limits on the year-to-year growth in the total VHA budget meant that in some years the allowance did not cover the full 20 percent of average housing costs. In such years, the allowance would fall to zero in some areas where typical housing costs were somewhat less than 20 percent below the national average.

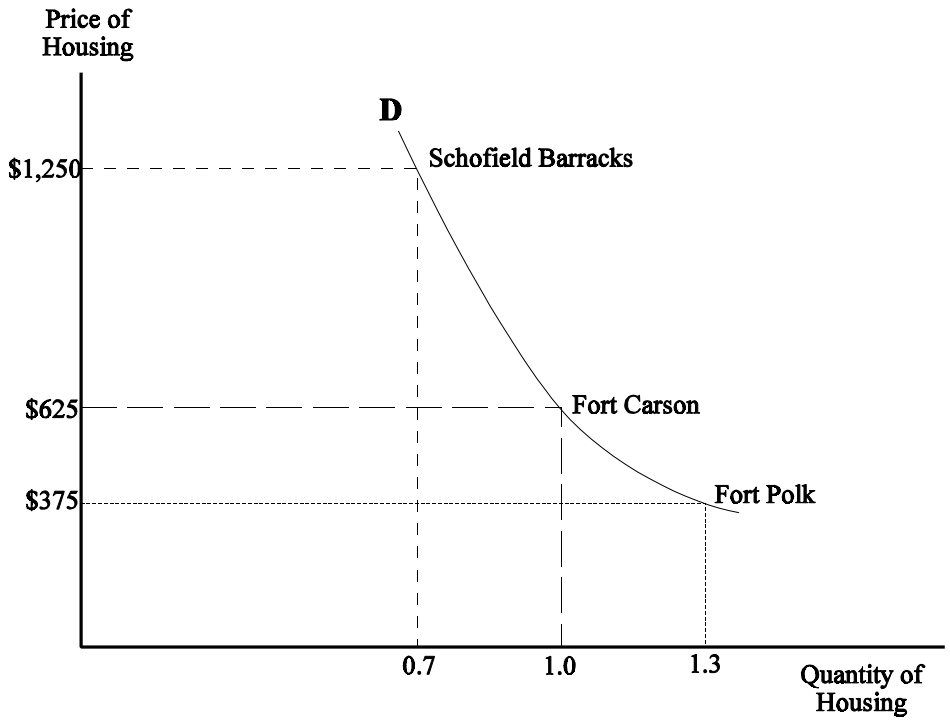
several respects, three of which are particularly important for the design of the military's housing allowance program. Two such factors were discussed earlier: housing prices vary widely among areas of the country, and housing absorbs a large portion of typical family budgets. The third is that the commodity called housing is really a composite of many goods; people choose a type of unit, its size, the number of rooms, the location. Each of those goods embodies, in turn, a myriad of characteristics. Is the unit old or new? What is the condition of its mechanical systems? If it is a rental unit, how well does the landlord maintain it? Is it located on a busy street or quiet cul-de-sac? How good are the public schools? How convenient is it to public transportation and to the person's place of work? In principle, each of these characteristics has a price. In practice, the only price that can be observed is that of the entire package, and two units with the same price may differ dramatically in many of the characteristics that determine that price.

Housing is also unusual in that both rental and ownership arrangements are common for individual consumers. Because the decision to buy housing has an investment component, any examination of the housing consumption of people who own their homes must impute a rental-equivalent cost, which can be difficult. This discussion ignores that difficulty by looking only at the situation of people who rent their housing.[2]

Although the variety of characteristics that underlie the good called housing make the demand for it somewhat more complex than the demand for other goods, the same general concepts apply. Consider a young married enlisted person who has been assigned to Fort Carson, Colorado. Observing rents in the area and the prices of other goods, and aware of her total income, she chooses to rent an apartment for her family that costs $625 per month, including utilities. For convenience, the "quantity" of housing services that she consumes each month can be taken to be one unit, obtained at a price of $625 and resulting in a monthly housing expenditure—price times quantity—that is also $625 (the area defined by the long dashes in Figure 2). That one unit of housing embodies a particular set of characteristics—it is perhaps a two-bedroom apartment in a large complex, located in a low-crime neighborhood with limited public transportation and about a 30-minute commute to and from her duty location.

2. For a discussion of the buy/rent decision for military personnel, see Frank Camm, *Housing Demand and Department of Defense Policy on Housing Allowances*, R-3865-FMP (Santa Monica, Calif.: RAND, September 1990).

FIGURE 2. ILLUSTRATIVE DEMAND FOR HOUSING WHEN THERE IS NO VARIABLE HOUSING ALLOWANCE



SOURCE: Congressional Budget Office.

NOTE: D = demand curve for housing.

If the same enlistee was sent to Schofield Barracks in Hawaii, she would find that housing there was considerably more expensive. In particular, the same apartment that she rented in Colorado for $625 might cost $1,250 per month. If there was no variable housing allowance to add to her income (and assuming, for the sake of simplicity, that the prices of other goods are the same), she would decide to consume less housing, unless she was very unusual. She would probably spend more for that lesser amount of housing, however—perhaps $875 a month (the area defined by the shorter dashes in Figure 2). That lesser amount of housing could mean a smaller apartment or one that was farther from her duty station, less well-maintained, or in some other way inferior. She probably could not say that she was consuming a little more than two-thirds as much housing as she had at Fort Carson, but that would be the quantity implied by the relative prices and her decision to spend $875 ($875 ÷ $1,250 per unit = 0.7 units). She could say, however, that her standard of living had fallen, compared with her situation at Fort Carson, because she would be consuming less housing and also have less of her income to spend on other goods.

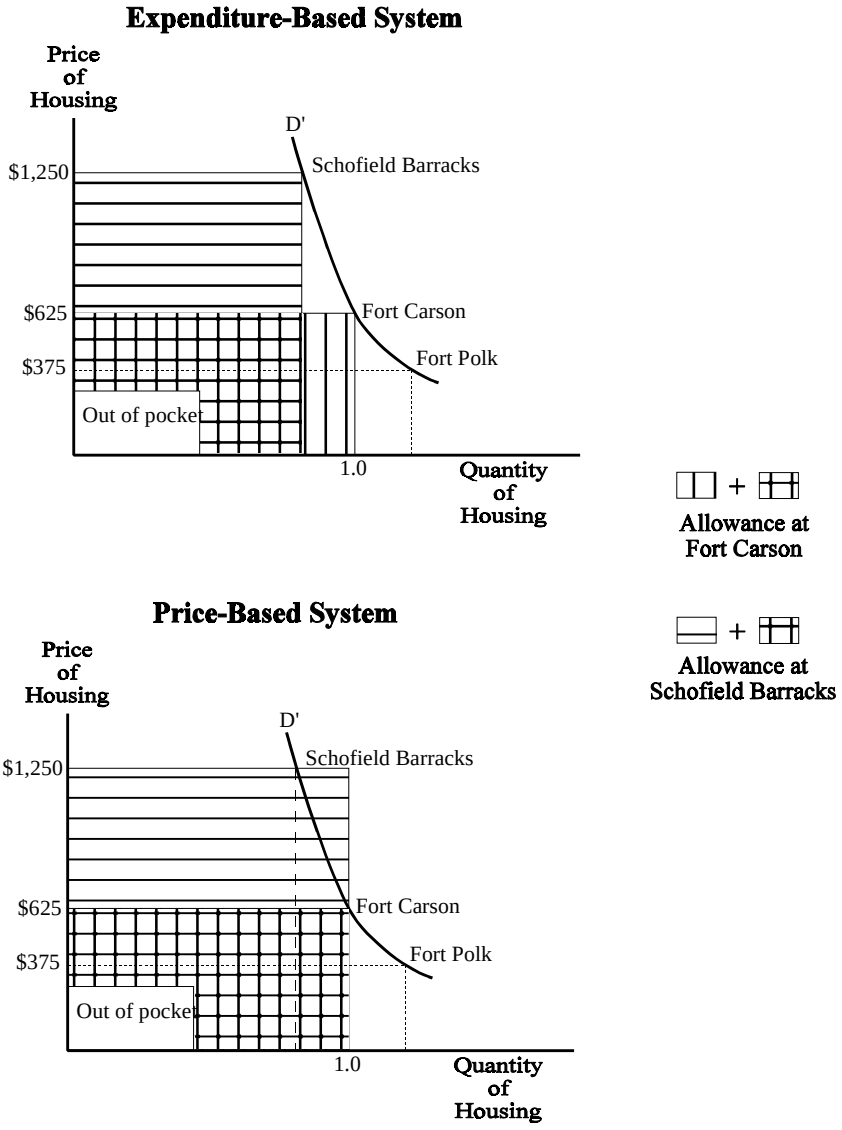
In contrast, the enlistee's standard of living would have risen if she had been sent instead to Fort Polk, Louisiana. Housing there is less expensive than at Fort Carson; the same apartment that rented for $625 in Colorado might be had for only $375 (the area defined by the dotted lines in Figure 2). In that case, the enlistee would consume somewhat more housing, perhaps spending $490 and obtaining 30 percent more housing—larger, closer, or otherwise better.

The three combinations of housing prices and quantities consumed trace out the enlistee's demand curve for housing (the line labeled D in the figure). The quantity of housing that a person consumes may not be as readily observed as the quantity of, say, apples or oranges. Nonetheless, for each price there is an implicit quantity that can be expressed relative to the quantity chosen at some base price level.

The demand curve shown in Figure 2, sometimes called the ordinary demand curve, is not what one would actually observe for military personnel today because the variable housing allowance changes their income as they move. In the case of the hypothetical service member discussed above, the larger allowance at Schofield Barracks (compared with Fort Carson) would lead her to spend somewhat more on housing than she otherwise would. She would also spend more on other goods—the additional money looks just like money from any other source. At Fort Polk, she would spend somewhat less on housing than she otherwise would. Thus, the demand curve observed for her is steeper—less elastic, an economist would say—than the ordinary demand curve.

The demand curve for housing helps in illustrating the difference between an expenditure-based housing allowance—the old approach—and the new price-based allowance. Suppose that the demand curve D' in the top panel of Figure 3 shows the observed demand under the old allowance system. (The curve is derived from data for a married service member in pay grade E-4.) Under the expenditure-based approach, the allowance at each location would be equal to the typical member's spending on housing less the out-of-pocket portion that the member covered from other income. In the figure, spending is represented by rectangles; the shaded portions indicate the amounts of the allowances.

FIGURE 3. DEMAND FOR HOUSING AND THE CALCULATION OF A VARIABLE HOUSING ALLOWANCE UNDER EXPENDITURE-BASED AND PRICE-BASED SYSTEMS



SOURCE: Congressional Budget Office.

NOTE: D' = observed demand curve under an expenditure-based approach to calculating housing allowances.

Allowances under the new price-based system depend on the standard unit that DoD chooses for a particular group of service members. For simplicity's sake, suppose that the price of that standard unit at Fort Carson is $625, the same amount that the typical service member chose to spend under the old system. When she moves to Schofield Barracks, her allowance rises by the full amount of the difference in price for that unit between the two locations. Unlike the expenditure-based allowance, the price-based allowance does not depend on how a typical member responds to the difference in price or to the additional income that the allowance provides. On the basis of the relationships shown, the two methods for calculating the allowance at Schofield Barracks will yield allowances that differ by about $195, or 16 percent of the price at that location. For the move from Fort Carson to Fort Polk, the relationship between the two approaches is reversed; the price-based method yields a smaller allowance.

A look at the amounts of the allowance and the person's spending—again, for the illustrative junior enlisted member—helps to clarify the relationship between the expenditure- and price-based approaches, and why neither exactly offsets the effect that variations in housing prices have on service members' well-being. It also shows why the new allowance system dropped two features of the old system: the separate minimum allowance (BAQ) and the offset provision that penalized members who did not spend all of their allowances on housing.

Housing costs at Fort Carson are about equal to the national median. Under the old system, the service member received a BAQ of $375 and a VHA of $125 (see Table 2). (Those amounts are illustrative; they represent roughly the situation in the mid-1990s for a married person in grade E-4.) The VHA of $125 is equal to 20 percent of this typical member's spending on housing, and together the two allowances cover 80 percent—again, the typical situation in the mid-1990s. The enlistee devotes about 30 percent of her disposable income to housing. In the new system, the results are the same except that the two allowances are combined into one. Under both systems, she has $1,375 a month to spend on goods other than housing; for the sake of simplicity, the example ignores the possibility that she might not spend all of her income.

How would a move to Schofield Barracks affect the service member? If the variable allowance was based on expenditures, she would be worse off than at Fort Carson; if the allowance was based on prices, she would be better off. With an expenditure-based variable allowance of $555, her additional spending on housing—$430—would exactly equal the additional allowance. That implies that her spending on all other goods would be the same as at Fort Carson. Assuming again, for the sake of simplicity, that other goods had the same prices that they had at Fort Carson, her consumption of those other goods would also be unchanged. But she would consume fewer units of housing; her apartment would be smaller, perhaps, or farther

TABLE 2. ILLUSTRATIVE HOUSING ALLOWANCES AND CONSUMPTION CHOICES FOR A JUNIOR ENLISTED SERVICE MEMBER (In dollars)

Basis for Allowance	Housing Allowance			Disposable Income	Quantity of Housing[a]	Expenditures	
	BAQ	VHA	Total			Housing	Other Goods
Fort Carson (Housing price = $625)[b]							
Expenditures	375	125	500	2,000	1.00	625	1,375
Prices	n.a.	n.a.	500	2,000	1.00	625	1,375
Schofield Barracks (Housing price = $1,250)[b]							
Expenditures	375	555	930	2,430	0.84	1,055	1,375
Prices	n.a.	n.a.	1,125	2,625	0.89	1,115	1,510
Fort Polk (Housing price = $375)[b]							
Expenditures	375	-60[c]	315[c]	1,815	1.18	440	1,375
Prices	n.a.	n.a.	250	1,750	1.14	430	1,320

SOURCE: Congressional Budget Office.

NOTE: The data roughly represent the situation in the mid-1990s for a married service member in grade E-4. BAQ = basic allowance for quarters; VHA = variable housing allowance; n.a. = not applicable.

a. The quantity of housing is measured relative to the quantity that the typical service member chooses when assigned to Fort Carson.

b. Monthly rental cost for the unit that the typical service member chooses when assigned to Fort Carson. In the case of the price-based allowance, that unit is also assumed to be the standard unit that the Department of Defense selects for the group of personnel to which the illustrative service member belongs.

c. The negative figure for the VHA is what the allowance formula yields. In actual practice, the minimum VHA amount would have been zero, and the minimum total allowance would have equaled the BAQ amount.

from her duty station. Thus, she clearly would be worse off than she was at Fort Carson.

A price-based allowance for Schofield Barracks would make the typical service member better off there than at Fort Carson. The allowance would be higher than the expenditure-based allowance by $195—a large enough amount that the typical member could consume the same quantity of housing as at Fort Carson without cutting her consumption of other goods. But there is no reason to expect her to spend all of the additional money on housing; if she was typical of her peers, she would put some toward housing, but she would also spend some on other goods. This typical service member would have sufficient income to consume the same

quantities of both housing and other goods that she consumed at Fort Carson, but she would choose not to. Because that choice is entirely voluntary—a simple reflection of the difference in relative prices between housing and other goods—it must be that the choice would make her better off than she was at Fort Carson. Furthermore, she would be better off despite spending more than 40 percent of her income on housing, a far greater percentage than she spent at Fort Carson.

Going from Fort Carson to Fort Polk, the service member would be better off under either an expenditure- or a price-based allowance system. As with the move to Schofield Barracks, the price-based allowance would allow her to consume the same quantities of housing and of other goods at Fort Polk that she consumed at Fort Carson. Again, however, she would choose some other combination—a little more of the relatively cheap housing and a little less of other goods—because that combination would make her better off. The expenditure-based allowance is even larger than the price-based allowance because it reflects the service member's decision to consume more housing.

The outcomes of an expenditure-based approach—that is, the allowances for the various areas—are uniquely determined by the parameters of the system and by how members respond to differences in prices and in their income. Apparently, some observers believe that the system could generate an endless spiral of allowances because of its feedback effect—a change in service members' spending in a particular locale would cause a change in their allowances, leading them to further adjust their spending, and so forth. Press reports about the old system often mentioned a downward spiral of allowances, and concerns about such a phenomenon may have encouraged policymakers to develop a new system. An expenditure-based system, however, does not have any inherent tendency to cause allowances to rise or fall in an uncontrolled manner (see Box 2). Rather, a shock to the system, such as a change in prices, creates a new equilibrium that the system eventually reaches.

As noted earlier, two features of the old housing allowance system would be magnified under a price-based procedure. The first is the artificial floor under the total housing allowance that is created by the separate basic allowance for quarters. Table 2 indicates that under an expenditure-based approach, the VHA for Fort Polk should be -$60, but the actual allowance cannot fall below zero. Thus, the typical member's out-of-pocket housing cost—the portion not covered by the allowances—would be only $65 ($440 minus $375), compared with $125 for both Fort Carson and Schofield Barracks. Under a price-based allowance system, the problem would be even more severe: the service member's total housing allowance at Fort Polk should be $250, only two-thirds of the amount ($375) that she received under the old system as her BAQ. That phenomenon explains why the new price-based housing allowance combines the fixed and variable portions of the old allowance system into a single allowance.

BOX 2.
FEEDBACK IN AN EXPENDITURE-BASED ALLOWANCE
AND THE "DOWNWARD SPIRAL"

Discussions about reforming the military's housing allowance program have often focused on a supposed tendency of the old expenditure-based system to lead to a "vicious cycle" of service members' housing expenditures and their allowances chasing each other in a downward spiral. The *Air Force Times*, for example, reported the following: "The survey method [that is, the expenditure-based system] has been criticized because it tends to drive down the allowance in a vicious cycle. Service members often pay for the housing they can afford, not for the housing they need, because the allowance is too low. But that cheaper housing becomes the basis for calculating the allowance."[1]

Although the old allowance system had its faults, a tendency for allowances to fall or rise in an uncontrolled manner was not one of them. The perception that it was seems to rest on a faulty understanding of how the system reaches a new equilibrium in response to a shock, such as housing prices rising or falling in some locality. Moreover, the illustrative example in Table 2 on page 18 is fairly accurate in its depiction of allowances and service members' expenditures under both expenditure- and price-based systems.

To see how the old system could adjust in a predictable manner to a new equilibrium, consider what would happen if housing prices in an area suddenly increased. Suppose, for example, that a large number of troops were moved to Fort Polk as part of a reduction of forces in Europe. The new troops would quickly bid up housing prices, and if long-term leases were not common in the area, even service members who were already assigned to Fort Polk would see their rents rise. To be specific, suppose that the increase averaged 50 percent, so that rents around Fort Polk were suddenly the same as those around Fort Carson. What would happen to housing allowances and members' housing expenditures?

The first response of housing allowances, following the next survey of service members, would be a sharp increase, something that the vicious-cycle discussion tends to ignore. Following that would, indeed, come a downward spiral—despite the higher allowances, service members moving to Fort Polk would tend to spend less on housing than the soldiers they replaced, and with each new survey the allowances would fall. The fall would not continue forever, however, as eventually housing allowances, and members' expenditures, would match those at Fort Carson. Assignments to Fort Polk would not be as attractive financially as they once had been, but only because the system had tended to pay too much there (and too little at Schofield Barracks).

The vicious-cycle theory is flawed because it fails to consider what starts the change. Housing allowances under the old expenditure-based system could spiral down or up, but only when they began from a level that was not appropriate for the local conditions and only until they reached a level that was appropriate.

1. "Allowance Changes Are Among Proposals," *Air Force Times*, November 18, 1996, p. 3.

The second feature of the old system that would have played a larger role under the new price-based allowance is the so-called VHA offset provision. For service members who spent less on housing than the sum of their BAQ and VHA, the provision reduced the VHA payment by 50 cents for each dollar under the total allowance that the person spent on housing. The provision saved the government only about $50 million in 1990, compared with a total housing allowance budget of about $6 billion.

Under a price-based allowance procedure, the offset loses its rationale. The procedure is designed to make it *possible* for people to consume the same housing in all areas, but it recognizes that what they actually *choose* to consume is up to them. If the offset had been retained in the new price-based system, it would have affected many more people, particularly in high-cost areas. The numbers shown in Table 2 for Schofield Barracks suggest that outcome: a price-based allowance system would result in the typical service member's spending $10 less on housing than her total allowance. Even in areas where prices are less extreme, people who chose to economize only slightly, relative to their more typical counterparts, would stand to lose part of the allowance.

CHAPTER III
IS A PRICE-BASED SYSTEM BETTER THAN AN EXPENDITURE-BASED SYSTEM?

As policymakers discussed the desirability of changing the way in which housing allowances were calculated, they tended to focus on the defects of the old expenditure-based approach. Critics charged—quite correctly—that the old system ignored the adjustments that people made in their consumption of housing and other goods when they moved among areas with different prices for a given quantity of housing. In effect, the system subsidized the decisions of service members to consume more housing when they moved to an area of lower prices from an area where prices were higher. For a move in the other direction, the system penalized them for their decisions to consume less housing.

The new price-based system can also be criticized for ignoring how people respond to different prices for housing. The system gives service members sufficient income to choose the same combination of housing and nonhousing goods regardless of where they are assigned. Because they respond to price variation, however, they will not always make the same choices. When members move from an area where housing prices are moderate to one where housing is inexpensive, they will tend to consume more housing and less of other goods, making themselves better off in the process. Similarly, when they move from an area of moderate prices to one of high prices, they will tend to substitute in the opposite direction—less housing and more of other goods—again making themselves better off as a result.

Both the old and the new systems represent attempts to insulate service members from the effects on their well-being of the wide variation in housing prices that they must face as they are moved around the country. Both systems fail to achieve that goal. Two questions thus arise. First, why did the Department of Defense not propose an ideal system of housing allowances, one designed to offset exactly the effects of price variation? Second, does the new price-based system offer a clear advantage over the old expenditure-based system?

WHY NOT USE AN IDEAL SYSTEM?

The ideal approach to calculating housing allowances focuses on the well-being, or welfare, of typical service members as they move from one area to another. Hence, it might be called a *welfare-based* approach. The approach does not make members equally well off regardless of where they are assigned because housing prices are not the only thing that affects their well-being (see Box 3). It does, however, shield them

BOX 3.
AMENITIES, THE PRICE OF HOUSING, AND WELL-BEING

Why is housing more expensive in some areas of the country than in others? There are many reasons for the differences in housing prices, but certainly one of the more important is that people find some locations more appealing than others. They are attracted by the amenities that some places offer—a pleasant climate or recreational opportunities, for example—and are put off by the unattractive features of others. Where land is scarce, attractive amenities lead to high land prices and thus high prices for housing. For most goods, transportation costs are the main explanation of price differences; for housing and the land that it sits on, transportation costs are essentially infinite, so prices adjust to equalize local supply and demand. Other things being equal, differences in housing prices represent the amounts that people are willing to pay, at the margin, to live in different locations.

The welfare-based approach to setting housing allowances that is described in this paper does not consider what gives rise to differences in housing prices. As a result, it cannot be said to make service members equally well-off wherever they are assigned. People in the military probably share the preferences of the general populace for living in some areas rather than in others, although perhaps not to the same degree or they would not have elected to be part of an organization that makes their locational decisions for them. People with a strong liking for sunny beaches, for example, probably would not choose a career in the Army, whereas those who like to ski might not choose the Navy. To the extent that they do share the general preferences about where to live, however, military people will prefer to live in areas where housing is expensive rather than where it is cheap—assuming, that is, that they do not have to worry about the price of housing. The welfare-based approach insulates them from the effects of housing price variations, letting them enjoy attractive locations without having to pay the full cost.

from the effects that variations in housing prices would otherwise have on their standard of living.

Why did DoD suggest a price-based rather than a welfare-based approach to calculating allowances? One factor that apparently affected the decision is that the theoretical justification for the way in which welfare-based allowances are calculated can be difficult to understand. Indeed, even the formula describing the calculation is somewhat complex; it could not easily be described in legislation. (Appendix A illustrates it graphically.) Thus, the new provisions would have had to set out the welfare-based approach in quite general terms. DoD's calculations of the allowances would probably have looked rather mysterious, both to service members and to outside observers, the output of some "black box" into which DoD pushed various data.

A second factor that would have made it difficult for DoD to adopt a welfare-based approach is that the approach requires, as inputs to the calculations, both data on housing prices and information on how service members adjust their consumption of housing when its price changes or when their income changes. That information is much more extensive than what is required by the other two approaches described

earlier. Allowances under the price-based approach depend only on housing prices and not on how service members respond to those prices. Under the old expenditure-based system, allowances depended on how members responded to price variation only through the effect of those responses on their housing expenditures, which DoD could easily observe.

The information about how service members respond that the welfare-based approach requires can be summarized in one or two parameters for each pay-grade and dependency-status group. Although the parameters can be estimated from available data, practical difficulties make it hard to obtain precise figures (see Appendix B). The Congressional Budget Office estimated the parameters to draw qualitative conclusions about how the old and new systems compare with the ideal, for which purpose the estimation problems can safely be ignored. Any attempt to use those estimates as the basis for setting allowance rates, however, could provoke legitimate criticism.

EXPENDITURE-BASED AND PRICE-BASED ALLOWANCES COMPARED WITH THE IDEAL

The ideal allowances that are the outcome of a welfare-based approach depend on how service members respond to variations in housing prices and in their income. Consequently, so does the answer to the question, Is a price-based approach superior to an expenditure-based approach? It is not possible to demonstrate on the basis of economic theory alone that price-based allowances will always be better. Nonetheless, data on the spending patterns of service members under the old system suggest that the ideal allowances are likely to be much closer to the allowances under a price-based system than to those generated by the old expenditure-based approach. Price-based allowances come close enough to the ideal, in fact, that the extra effort involved in implementing a welfare-based system would probably not seem worthwhile. Moreover, those conclusions hold even in the face of substantial errors in the estimates of service members' responsiveness on which the conclusions are based.

How Responsive Is Demand to Changes in Prices and Income?

It is possible to discuss people's responsiveness to price and income changes in general terms without introducing numbers or the terminology of economists. But determining which approach to calculating housing allowances is best requires more exact descriptions. A common way to characterize the relationship between the price of a good and the quantity that people choose to consume is in terms of the price elasticity of demand. The ordinary price elasticity gives, roughly, the percentage

change in the quantity of a good consumed in response to a 1 percent increase in price, assuming that the person's income is unchanged. Thus, if the price elasticity of demand for housing is -0.6, then service members who are transferred from a given area to one where housing prices are higher by 10 percent would tend to reduce their housing consumption by about 6 percent.[1]

The income elasticity of demand describes people's response to variations in their income, such as that caused by a variable housing allowance. Like the price elasticity, the income elasticity indicates the relationship between percentage changes. An income elasticity for housing of 0.8, for example, implies that service members who received a 10 percent increase in income would spend roughly 8 percent more on housing, other things being equal. Members who were initially devoting 30 percent of their income to housing—a common fraction in the junior enlisted pay grades—would spend $24 more on housing for every $100 of additional housing allowance.

What are the elasticities of demand for housing? In the most thorough theoretical examination of DoD's housing allowance program, Frank Camm surveyed the relevant empirical literature.[2] For the price elasticity, he reported that estimates ranged from -0.5 to -1.0. For the income elasticity, the range was 0.5 to 1.0.

CBO analyzed data on the housing expenditures of members with dependents under the old expenditure-based system. The results suggest that the price elasticity of demand for housing among service personnel is at the bottom end of Camm's range (see Appendix B).[3] Depending on the pay grade, CBO's estimates range from about -0.4 to about -0.6. CBO did not estimate the income elasticity.

The estimated elasticities show a consistent pattern within both the enlisted and officer pay grades: the higher the pay grade, the greater the adjustments people make in the quantity of housing they consume in response to price variations. A higher pay grade means a higher income, so the result suggests that people with more income have greater ability than people with less income to substitute between housing and other goods. A highly paid service member, for example, might choose

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1. The relationship is exact if both price and quantity are expressed in logarithms. That is, the change in the logarithm of quantity is equal to the elasticity times the change in the logarithm of prices. Of course, the actual relationship may be more complex, but the assumption that the elasticity is constant over the relevant range of price variation is convenient and at least plausible.

2. Frank Camm, *Housing Demand and Department of Defense Policy on Housing Allowances*, R-3865-FMP (Santa Monica, Calif.: RAND, 1990), pp. 38-40.

3. CBO did not examine the spending patterns of service members without dependents. Those members account for only about 20 percent of all military personnel in the United States who receive housing allowances.

a house with a swimming pool in a location where housing prices were low. Where prices were high, he or she might instead choose a smaller house and either join a swim club or take more vacations. A lower-paid service member might not have those choices and have only a limited scope for varying the quantity of housing he or she consumes.

The finding that people in the higher pay grades respond more to differences in housing prices than do people in the lower grades has important implications. The more the people in a group respond to higher prices by reducing the quantity of housing they consume, the less their housing expenditures vary with prices.[4] For that reason, the change from the old expenditure-based system to a price-based approach should have the greatest effect on the housing allowances of service members in the higher pay grades.

The Pattern of Allowances: One Example

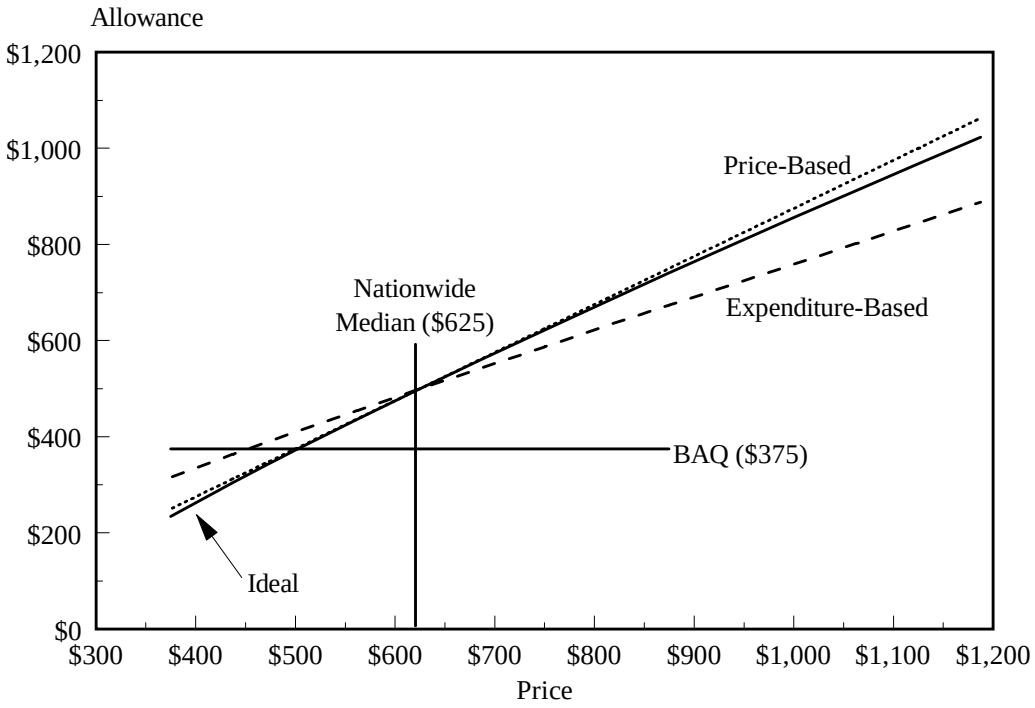
The general nature of the relationships among allowances under the three approaches—expenditure-, price-, and welfare-based—can be seen by drawing on the same numerical example used earlier. Again, it is based on the behavior of married service members in pay grade E-4, who appear to be less responsive to price changes than higher-paid members. (The next section looks at the full range of pay grades.) As before, the example assumes that each system uses the same reference housing cost of $625, which represents the median expenditure under the old system, and that each system offers the same 80 percent coverage of the reference cost.[5]

Price-based allowances would nearly match the ideal allowances over the full range of housing prices that service members face—a sharp contrast with expenditure-based allowances (see Figure 4). In areas where prices were 50 percent to 70 percent above the median, price-based allowances would be too high by only about $15 to $25, or roughly 2 percent to 3 percent. Expenditure-based allowances for those areas would fall short of the ideal by $80 to $110. Thus, married E-4s in those high-price areas should expect to see a considerable increase in their housing allowances. Fewer than one in 10, however, actually face prices that high.

4. If the price elasticity was less than -1, expenditures would vary inversely with prices.

5. Changing to a price-based system from the old expenditure-based system should not require any substantial changes in coverage rates. Rough calculations suggest that the new system would have about the same budgetary cost as the old system if the coverage rate was unchanged and if all of the reference costs were the same as in the old system.

FIGURE 4. RELATIONSHIP BETWEEN HOUSING ALLOWANCES AND HOUSING PRICES UNDER ALTERNATIVE APPROACHES TO CALCULATING ALLOWANCES



SOURCE: Congressional Budget Office.

NOTES: All allowances are based on a reference area where the price of housing is $625 per unit (the nationwide median) and the total housing allowance is $500. Under the expenditure-based approach, the allowance compensates for the difference in the housing expenditures of typical members relative to expenditures in the reference area. In the price-based system, the allowance compensates for the difference in the price of a standard unit of housing relative to the price of that unit in the reference area. Under the ideal (welfare-based) approach, the allowance offsets the effect on the well-being of typical members that results from differences in the price of housing relative to the reference area.

.

CBO simulated the results of the three approaches to calculating allowances on the basis of the estimated price responsiveness of a person in pay grade E-4 who has dependents.

BAQ = basic allowance for quarters.

Where prices are low, the expenditure-based approach yields much larger overpayments than the price-based approach, compared with the ideal. About one person in five among married E-4s lives in an area where the expenditure-based allowance is too large by 10 percent or more; for about one in 20 of such service members, the allowance is too large by about 15 percent to 30 percent. In contrast, price-based allowances for areas where prices are low would rarely exceed the ideal by more than about 5 percent. The new price-based system should not yield large

dollar changes in the allowances for those areas, however, because the percentage changes apply to a relatively low base level.

Not only are price-based allowances closer to the ideal across the board than are expenditure-based allowances but they have a more attractive pattern of errors. The expenditure-based approach generates large shortfalls or overpayments quite rapidly as prices diverge from the median. Price-based allowances, by contrast, differ from the ideal by only a few dollars for the vast majority of personnel.

In terms of the total pay of typical married E-4s, the errors in the allowances under a price-based system—compared with the ideal allowances—would be less than 1 percent in most areas and no more than 2 percent in any area. The expenditure-based approach, by contrast, yielded errors of 2 percent or more for roughly one-third of those personnel.

Adopting a price-based housing allowance without eliminating the separate minimum allowance—the basic allowance for quarters—would dramatically increase the number of service members whose total housing allowance exceeded the amount that the formula indicates (see the line labeled BAQ in Figure 4). Under the old allowance system, which roughly followed the pure expenditure-based approach reflected in the figure, about 6 percent of married personnel in grade E-4 lived in areas where housing costs were so low that typical out-of-pocket costs were smaller than the system intended. Under the new price-based system, that fraction could have risen to 20 percent if the separate minimum allowance had not been eliminated.

Comparisons for All Pay Grades

The shortcomings of the expenditure-based approach are even more apparent for people in the senior ranks than for junior enlisted personnel. As discussed earlier, senior people appear to adjust the quantity of housing they consume more than do junior personnel in response to differences in prices. That means that their spending on housing—and thus their allowances under the old system—vary less. As a result, the percentage difference between the old expenditure-based allowances and the ideal allowances increases steadily as one rises through the ranks, for both officers and enlisted personnel (see Table 3).

Problems with the old allowance system have usually been described in terms of the difficulties faced by junior personnel, but the results in Table 3 indicate that the introduction of price-based allowances will have the greatest effect on the allowances of more senior personnel. In fact, the two views are not inconsistent because people in the junior ranks spend a larger portion of their income on housing than do higher-ranking people. As a result, when the percentage differences in

TABLE 3. COMPARING IDEAL HOUSING ALLOWANCES AND ALLOWANCES UNDER OTHER APPROACHES, BY PAY GRADE AND HOUSING PRICE
(As a percentage of the ideal)

	Difference Between Expenditure-Based and Ideal Allowances		Difference Between Price-Based and Ideal Allowances	
Pay Grade	Housing Price Is 25 Percent Below Median	Housing Price Is 60 Percent Above Median	Housing Price Is 25 Percent Below Median	Housing Price Is 60 Percent Above Median
E-1	12.8	-12.1	1.4	2.1
E-2	11.6	-11.0	1.3	1.9
E-3	13.2	-12.4	1.5	2.2
E-4	13.7	-12.8	1.5	2.3
E-5	15.4	-14.1	1.7	2.5
E-6	15.4	-14.1	1.7	2.6
E-7	15.9	-14.4	1.8	2.7
E-8	18.2	-16.2	2.1	3.1
E-9	19.6	-17.2	2.3	3.4
O-1	12.7	-11.9	1.4	2.2
O-2	13.8	-12.7	1.6	2.4
O-3	16.4	-14.7	1.9	2.9
O-4	19.2	-16.8	2.3	3.3
O-5	23.0	-19.5	2.7	4.0
O-6	26.3	-21.8	3.2	4.5

SOURCE: Congressional Budget Office.

NOTES: All data are for service members with dependents.

Under the expenditure-based approach, the allowance compensates for the difference in the housing expenditures of typical service members relative to a reference area where typical expenditures are equal to the nationwide median. In the price-based system, the allowance compensates for the difference in the price of a standard unit of housing relative to its price in the same reference area. For this table, CBO assumes that the standard unit is chosen so that its price in the reference area is equal to typical expenditures there. Under the ideal (welfare-based) approach, the allowance offsets the effect on the well-being of typical members that results from differences in the price of housing relative to the reference area. Allowances in the reference area are assumed to be the same under each approach.

For the expenditure-based approach, the allowances in the lower- and higher-price areas are based on the fitted values for expenditures from the regressions of expenditures on prices (both in logarithms). For the ideal approach, the allowances are based on estimates of income-compensated price elasticities of demand derived from the same regressions.

allowances are expressed relative to income, the "errors" in allowances produced by both the expenditure-based and price-based approaches are roughly the same for all pay grades. In high-price areas, the underpayments under the old approach ranged from about 3.2 percent to 5.1 percent of regular military compensation (ignoring the tax advantage). In low-price areas, the overpayments ranged from about 2.2 percent to 2.9 percent.

The results in Table 3 reflect the specific estimates of price elasticities developed for this paper. The general conclusion, however—that a price-based approach will yield allowances much closer to the ideal, compared with the old expenditure-based approach—does not depend strongly on those values (see Box 4). Thus, DoD can implement the new system without worrying that the basic approach might be less effective than the old in protecting service members from the effects of variations in housing prices.

DoD'S CHOICE OF THE STANDARD UNIT CAN AFFECT THE PERFORMANCE OF A PRICE-BASED SYSTEM

All of the earlier discussion, as well as the conclusion that price-based allowances closely approximate the ideal, rests on a simple assumption about how DoD will select a standard housing unit for each group, the unit for which it will collect price data in each military housing area. The assumption is that the standard unit will be whatever a typical member of the group, stationed in an area where housing prices are about at the nationwide average, actually chooses to rent. For example, if the typical married E-4 who is stationed at Fort Carson (where prices are about average) rents a two-bedroom apartment with 800 square feet of living space, the allowance for married E-4s will differ from area to area according to the difference in the price of that same two-bedroom, 800-square-foot unit.

The new provisions set a different criterion for selecting the standard unit for each group: "the costs of adequate housing for civilians with comparable income levels." The criterion apparently was intended to ensure that the allowances going to service members in the lower pay grades, along with the amount that they are expected to cover from other sources, would be sufficient to pay for decent housing. Thus, if DoD determined that married E-4s needed 1,000 square feet of living space rather than 800, the allowance at Fort Carson (and elsewhere) would be based on the price of a 1,000-square-foot apartment instead of the price of the smaller unit that those members actually chose to rent.

If DoD selects standard units for the various groups that do not match service members' housing choices, two consequences will emerge that may not have been

BOX 4.
SENSITIVITY OF CBO'S RESULTS TO ASSUMED PRICE ELASTICITIES

The general conclusion that a price-based approach will yield allowances that are much closer to the ideal than the old expenditure-based approach produced is not greatly affected by the values that an analyst assumes for the income-compensated demand elasticities of military personnel. There are reasons to suspect that the estimates given earlier in the text could be either higher or lower than the true elasticities (see Appendix B). If the true values were lower than the estimates—consistent with one source of possible bias—then the ideal allowances would be somewhat higher than those underlying the comparisons in Table 3. But the changes in the ideal allowances would only be about 1 percent or less, even for elasticities that are only three-quarters as large as the estimates (see the table below). That finding holds both for areas where housing prices are well above the median and areas where they are well below.

Elasticities that were substantially higher than the estimates would not change the general conclusion either. If the true elasticities were half again as large as the estimates, the ideal allowances would fall by about 2 percent at most. That is, instead of the current allowance for an O-6 being 21.8 percent too low compared with the ideal in areas where prices were well above the median, it would only be about 19.7 percent too low.

CHANGE IN IDEAL ALLOWANCES IF ACTUAL ELASTICITIES OF DEMAND ARE HIGHER OR LOWER THAN ESTIMATED (In percent)

	Elasticity = 0.75 × Estimate		Elasticity = 1.5 × Estimate	
Pay Grade	Housing Price Is 25 Percent Below Median	Housing Price Is 60 Percent Above Median	Housing Price Is 25 Percent Below Median	Housing Price Is 60 Percent Above Median
E-1	0.4	0.5	-0.7	-1.0
E-2	0.3	0.5	-0.7	-0.9
E-3	0.4	0.5	-0.8	-1.1
E-4	0.4	0.6	-0.8	-1.1
E-5	0.4	0.6	-0.9	-1.2
E-6	0.4	0.6	-0.9	-1.2
E-7	0.5	0.7	-0.9	-1.3
E-8	0.5	0.8	-1.1	-1.5
E-9	0.6	0.8	-1.2	-1.6
O-1	0.4	0.5	-0.7	-1.0
O-2	0.4	0.6	-0.8	-1.1
O-3	0.5	0.7	-1.0	-1.4
O-4	0.6	0.8	-1.2	-1.6
O-5	0.7	1.0	-1.4	-1.9
O-6	0.8	1.1	-1.7	-2.1

SOURCE: Congressional Budget Office.

considered when the new provisions were drafted. The more obvious result is that the allowances will not cover the same fraction of members' average housing expenses for all groups. If the average coverage rate is 80 percent, for example, groups for which the average cost of the standard unit exceeds members' average expenditures will have more than 80 percent of their expenses covered; groups for which the average cost of the standard unit is less than their typical expenditures will have less than 80 percent of their expenses covered. That outcome may not be apparent unless DoD continues to collect, and report, information on actual expenses.

More subtle than the effect on coverage rates will be the tendency of a mismatch between the standard units and members' choices to distort the relative allowances among areas of the country. Consider the situation described above, for example, in which DoD selected as the standard unit for married E-4s a larger apartment than the one a typical member of that group would choose to rent when assigned to an area where housing prices were about average for the nation. In that case, compensating members for the differences among areas in the price of that larger unit would tend to make them better off in areas where housing was expensive compared with areas where it was inexpensive. For another group, DoD might select a standard unit that represented a quantity of housing that was less than what service members typically consumed. Those personnel would tend to be worse off in areas where housing was expensive than where it was inexpensive. In both instances, the new price-based system would not compare as well with the ideal system as the results reported earlier suggest.

The poorer performance of the price-based system when it is linked to the price of a housing unit that does not match what typical service members actually choose stems from the way that the new system attempts to serve two conflicting goals. On the one hand, it seeks to tie the housing allowances for members of the military to some external measure of the appropriate quantity of housing for people with their income levels. On the other hand, it tries to protect members from changes in their well-being as they are transferred among areas of the country that have widely varying housing prices. Using the quantity of housing (and its associated price) that derives from the first objective to set the relative levels of allowances among areas would keep DoD from reaping the full benefits offered by its new price-based system.

A slight modification in the way DoD calculates the allowances would improve the ability of the new system to protect members from changes in their well-being without affecting the link to an appropriate quantity of housing. First, the department would decide on the average allowance nationwide, on the basis of its assessment of the cost of "adequate housing." In the current example, that would make the average allowance $600. Second, DoD would determine the housing expenditures of a typical service member receiving the average allowance and facing

average housing prices (as at Fort Carson), and the type of housing unit those expenditures paid for. To distinguish it from the standard unit above, call it the *actual unit*. Next, DoD would measure the price of the actual unit—what it cost to rent—in each military housing area. Finally, the department would set the allowance for each area at the average allowance plus the difference between the local price of the actual unit and the nationwide average price of the unit.

CHAPTER IV

IMPLEMENTING A PRICE-BASED APPROACH: THE PROBLEM OF ESTIMATING PRICES

The ability of a price-based housing allowance to reduce inequities depends crucially on how accurately the index of prices that is used reflects the prices that members of the military face in each area of the country. This section examines two candidate price indexes that the Department of Defense was considering as it developed its proposal for the new price-based allowance system. The examination includes a comparison of the candidate indexes with a set of prices derived from data on service members' housing expenditures. The results suggest that the candidate indexes may misstate the prices that service members encounter in certain areas, sometimes by 10 percent or more. Thus, refinements in one or both of those indexes may be necessary if DoD is not to replace the old set of systematic inequities—allowances that are too low where housing prices are high and too high where prices are low—with a different set of more random inequities.

DERIVING HOUSING PRICES FROM MILITARY DATA

Critics of the old system have noted that basing housing allowances on what service members spend for housing leads to systematic inequities. That valid criticism does not mean, however, that expenditure data cannot provide information about the prices that members face in different areas of the country. A person's expenditure for housing is simply the quantity of housing services that the person chooses multiplied by the price of housing. If one knows how people adjust the quantity they purchase in response to variations in prices, one can deduce relative prices in different areas from the data on spending.

Estimates of relative prices derived from spending data are not only highly specific to the military population but under certain conditions can also account implicitly for all the dimensions of housing quantity. That includes the crucial dimension of location—how close the person's housing is to his or her duty location—with which external price indexes appear to have such difficulty. Moreover, using spending data to derive prices allows a separate set of price estimates to be produced for each military pay grade—again, specific to the housing choices that service members in that grade make. The method of deriving prices can run into problems, however, in locales where idiosyncrasies in the housing market constrain members' choices.

The idea of estimating housing prices from expenditure data is not new. Frank Camm, in a 1990 RAND report, suggested the plan as "the simplest method of estimating differences in the price of housing."[1] DoD cited Camm's work in arguing for a price-based allowance, although it made no mention of this option for estimating prices.

The relative prices in two areas are related to spending through a simple equation:

$$\ln (P_1/P_0) = \frac{\ln (E_1/E_0)}{(1+\varepsilon)},$$

where

P_i = price in area *i*,
E_i = expenditures in area *i*, and
ε = price elasticity of demand.

The price elasticity of demand could be an assumed value taken from studies of civilian housing choices, but estimates based on military data have the advantage of being specific both to the military environment and to individual pay grades. In addition, those estimates incorporate the effect on members' spending of the income that the allowance provides, which an elasticity derived from external sources would not. (The elasticities would have to be reestimated, of course, if DoD changed the parameters of the allowance program—for example, after the new allowance was implemented.)

The formula above gives prices relative to the price in some base area. Although the choice of a base area is essentially arbitrary and does not affect the results, the obvious choice is the locale in which members' expenditures match the nationwide median. In the numerical example used earlier, that area was Fort Carson, where the typical service member spent $625 a month on housing. Her spending at Schofield Barracks—$1,055—combined with the estimated elasticity of -0.29 for an E-4, implies a price at that location of $1,307. At Fort Polk, the implied price is $381. Both implied prices are quite close to the prices assumed in the example.[2]

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1. See Frank Camm, *Housing Demand and Department of Defense Policy on Housing Allowances*, R-3865-FMP (Santa Monica, Calif.: RAND, 1990), p. 22.

2. The spending levels shown for the expenditure-based approach in Table 2 were not derived directly from the estimated elasticity. Rather, they were generated by an equation that describes the operation of the expenditure-based system. Parameters in that equation include the income-compensated price elasticity, the income elasticity, the share of housing expenditures in the member's total spending in the base area, and the fraction of housing expenditures in the base area that is covered by the allowance. Thus, the ability of the simple equation above to yield prices close to those assumed in the example is an indication that the approach can yield reasonably accurate price estimates.

Several potential problems argue against relying on prices that have been derived from the expenditures that service members report as the only direct source of price information. Two problems are probably most significant: derived prices may be poor for some areas where local idiosyncrasies in the housing market are important, and inaccurate price elasticities will affect the derived prices most strongly in areas where prices are well above or below the average. In addition, the technique of deriving prices from members' expenditures depends on the assumption that members do not exercise significant choice over their assignments. To the extent that people do have some choice in their assignments—those with large families, for example, might try to live in areas where housing prices are low—the estimated price elasticities, and the prices derived from them, can reflect those choices. Nonetheless, the method provides a useful check of the accuracy of other price data, helping to pinpoint locales where other approaches might yield serious errors.

HOW WELL DO EXISTING PRICE INDEXES FIT THE MILITARY?

Ascribing a price to housing is particularly difficult because the housing that people consume varies in so many dimensions. As noted earlier, the term "quantity of housing" is a convenient simplification that actually represents a set of quantities of the services provided by the many different goods that people consume when they occupy a housing unit. Similarly, the "price" is something that could never be directly observed in practice, since measuring it would require specifying in precise detail the quantities of all the underlying goods and then determining the cost of the specified housing unit in each area of the country where service members were assigned. Thus, any practical measure of housing prices throughout the country must embody compromises that could affect its suitability for use in the military's housing allowance program.

Comparing Alternatives

The price index selected for use in setting military housing allowances might be expected to satisfy three general criteria. First, does it measure the price of a fixed set of housing characteristics in each military housing area? Second, is the set of characteristics on which the index focuses one that is applicable to the population of military personnel? Third, whatever the index's theoretical characteristics as measured by the first two criteria, how do its prices compare with the prices implied by the housing expenditures of service members?

The most recent DoD study of housing allowances, conducted as part of the Seventh Quadrennial Review of Military Compensation, focused on two candidate price indexes. One is produced by the Department of Housing and Urban

Development, which regularly estimates what it calls fair market rents for rental units with various numbers of bedrooms. HUD uses those estimates in its administration of federal housing subsidies. The second index was produced under contract to the QRMC by Runzheimer International, a private cost-of-living consultant. Runzheimer provided price data for a representative sample of military housing areas.[3] In developing its proposal for the new price-based allowance system, DoD again examined those two sources of data on housing prices.

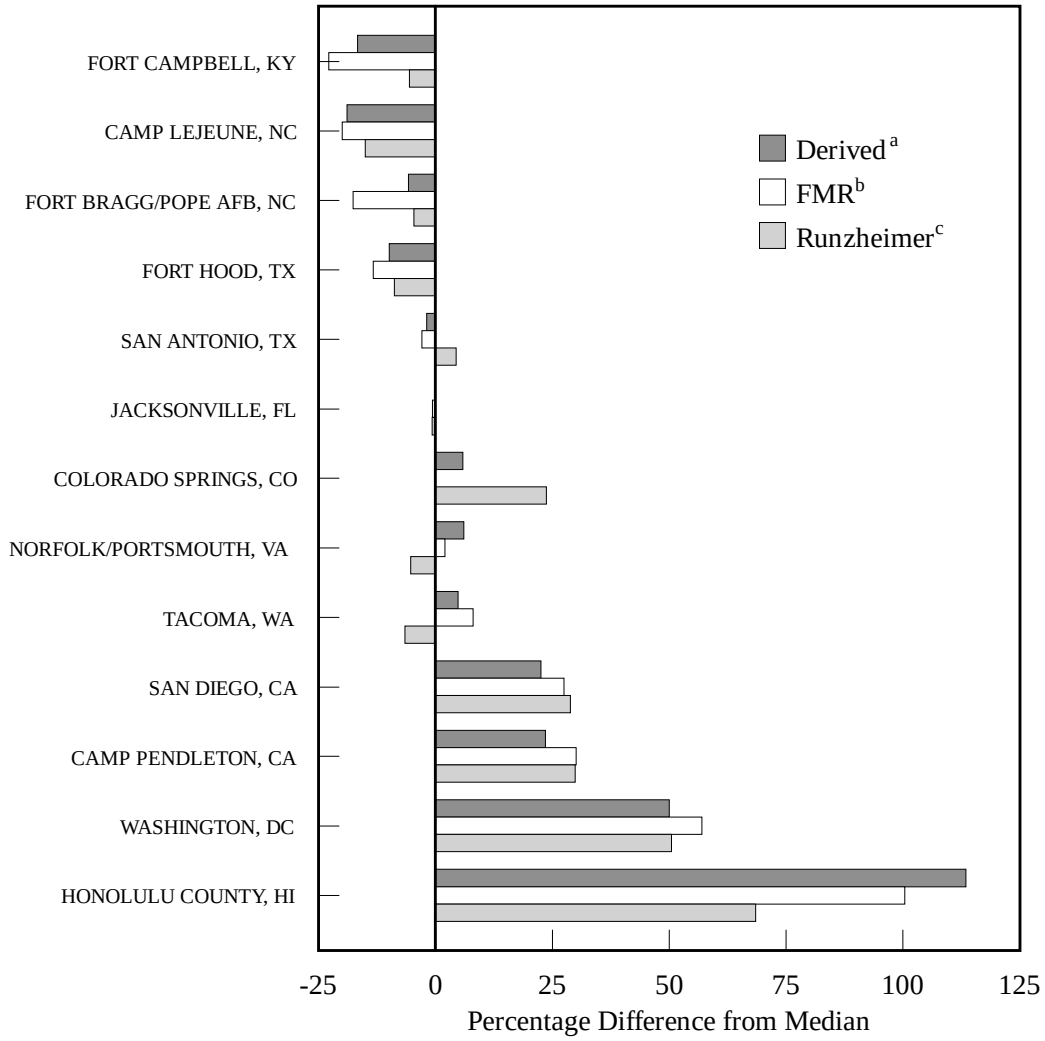
Neither of the price indexes considered by the Seventh QRMC satisfies all three criteria. The HUD fair market rents do not measure the price of housing with a fixed set of characteristics; after discarding the small number of units that do not meet minimum quality standards, they hold constant only the number of bedrooms. The FMR indexes measure the price at a given percentile point in the distribution of prices for units with the given number of bedrooms. The FMR indexes also do not reflect an important characteristic of the housing that military members tend to occupy: proximity to military installations. Instead, they give equal weight to prices throughout a county and, in their readily available form, aggregate counties into metropolitan areas. Because of the limitations of the FMR data, the QRMC concluded that a private firm such as Runzheimer would be a better source of price data. Runzheimer, the QRMC reasoned, could focus its data collection more closely than HUD does on the specific housing characteristics applicable to military personnel, including location.

Neither of the candidate price indexes consistently matches the set of prices derived from the housing expenditures of military personnel by using the price elasticities that CBO estimated, which suggests that both may have problems measuring the prices that members actually encounter in some areas. For a sample of military housing areas with large military populations, the two indexes and the derived prices (for members with dependents in pay grade E-4) agree fairly closely for a majority of the areas (see Figure 5).[4] For Fort Campbell, Kentucky, and Colorado Springs, Colorado, however, the Runzheimer index indicates that prices are considerably higher, relative to the nationwide median, than suggested by either the derived prices or the FMR index. The difference in Colorado Springs between the Runzheimer price and the derived price—almost 17 percent—could translate into a difference in the housing allowance for a married E-4 of more than $100 a month. For the Fort Bragg, North Carolina, area, the FMR index is out of line with the

3. For more information on both sets of data, see Department of Defense, Seventh Quadrennial Review of Military Compensation, *Allowances: Major Topical Summary (MTS) 3* (August 1992), Chapter 4. A more complete discussion of data sources appears in Department of Defense, *Joint Service Housing Allowance Study* (November 1991).

4. The same general conclusions emerge from a comparison of prices based on data for pay grade O-3, although of course the precise pattern is somewhat different.

FIGURE 5. ALTERNATIVE MEASURES OF PRICES FOR A SAMPLE OF MILITARY HOUSING AREAS WITH LARGE MILITARY POPULATIONS



SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: The military housing areas shown above have the largest populations of service members in pay grade E-4 who have dependents.

a. Prices developed by applying an estimated price elasticity of demand to data on service members' expenditures. Data are for members with dependents in pay grade E-4.

b. The fair market rent for a two-bedroom apartment, reported by the Department of Housing and Urban Development.

c. Price data supplied to DoD by Runzheimer International.

others, indicating that housing prices are about 13 percent lower than the derived prices suggest.

The greatest differences—symptomatic of the problem that DoD may have in obtaining accurate prices for some areas—appear for Honolulu County, Hawaii, which encompasses the entire island of Oahu. In 1996, the total housing allowance (basic allowance for housing plus variable housing allowance) for a married E-4 in that area was $942. A system of price-based allowances using the derived prices and linked to a standard unit with the same average price as the median expenditure nationwide would have set the allowance at nearly $1,230. Using FMR prices, the allowance would have been about $1,150. The Runzheimer data, however, indicated that the existing allowance for Honolulu—one of the highest-price areas in the country—was just about right.

In addition to the problem with Honolulu County, the Runzheimer index seems to have particular difficulty in assessing prices in some areas where military installations dominate the local economy. The index suggests, for example, that housing prices are about average around Fort Riley, Kansas, and Fort Rucker, Alabama, as well as in Pensacola, Florida (the site of a large Navy base). Military personnel, in contrast, appear to find housing prices in those areas to be relatively low. That discrepancy suggests that further refinement of the Runzheimer index would be particularly valuable for such locales.

In defense of the Runzheimer data, the set of prices examined for this paper were simply those that Runzheimer could supply to DoD quickly and at low cost. If DoD selects the Runzheimer firm to supply price data for setting allowances, as it apparently intends to do, those data will undoubtedly be more carefully tailored to the specific needs of the housing allowance program.

Location, Location, Location

Perhaps the most difficult issue that DoD must resolve as it develops its measures of housing prices is how to deal with location, the realtor's catchword determinant of housing prices. A price survey may view two apartments as identical if they are the same size and in a similar condition; yet if one is located where crime is more prevalent, is farther from the service member's duty location, or is served by poorer schools (if the member has children), then it certainly represents a lesser "quantity" of housing. The true price of housing in the area where the less desirable apartment is located could be higher than in the location of the more desirable apartment even if the better apartment rented for a greater amount.

The dilemma facing DoD can be illustrated by reflecting on just one aspect of location: distance from the military installation. Consider two generally similar cities, with similar housing prices, in both of which prices generally fall the farther one lives from the city center. In one, a small military base is located near the center of town; in the other, a similar base is 20 miles out, where housing is cheaper. In the first city, the typical service member commutes 30 minutes each way to and from the base and pays $800 a month in rent. In the second city, the typical member lives right outside the base and pays $700 a month for a slightly larger apartment. The question is, What are the relative prices that military personnel face at the two locations?

Three approaches to measuring prices could come up with three very different answers. One approach—dictated, perhaps, by a desire to rely on data that are readily available—is to calculate the average price for each metropolitan area. That approach might show an average price of $800 for both cities and thus yield an identical housing allowance in the two areas. A second approach is to measure prices in the specific neighborhoods where military personnel live in each city. (DoD apparently plans to ask Runzheimer to look at prices in the postal ZIP-code areas where most service members reside.) On the basis of a standard unit equal in size to what the service member in the second city chooses, that approach might show prices of $820 and $700 and indicate that the allowances should differ by $120.

A third approach to measuring prices would account implicitly for the different quantities of housing—reflecting both size and commuting times—that service members chose in the two cities. Using an estimated price elasticity of demand, it might translate the $100 difference in spending into a difference of $150 in prices. The extra $30, relative to the second approach, could be interpreted either as the implicit amount that service members in the first city pay in the form of a longer commute or as the reduced quantity of housing that they consume when the commute is factored in as an aspect of the quantity of housing.

Which approach is most accurate? The simple example suggests that the last has a clear advantage, but in a real-world situation in which people's choices are more limited, the strategy of deriving prices from expenditure data may yield misleading indications. The second approach of focusing on prices in the areas where people choose to live tends to miss one important element of housing quantity for military personnel—distance from the base. If it was not applied too blindly, however, the approach could include controls for other elements of quantity, such as the general quality of the neighborhood, and might attempt to adjust for distance. Even the first method might come closest to describing price differences accurately in some situations that would fool the others.

Measuring housing prices is difficult because the good called housing varies in many dimensions. When service members move from a locale where housing is cheap to one where it is expensive, they may cut back on any of those dimensions: they may choose a smaller unit, less modern appointments, a neighborhood with more crime, or a longer commute, to cite just a few examples. DoD cannot hope to measure the price of a fixed bundle of characteristics; it must ignore some of them and simply accept the choices that its personnel make. Indeed, the expenditure-based approach to setting allowances, which ignores all the dimensions of housing quantity, differs only in degree from any practical price-based system. In general, the more that is held fixed in measuring prices, the more those prices will capture the true variation among areas.

Any reasonable approach to estimating the housing prices that members of the military encounter should be able to describe the broad pattern of prices fairly well, but each approach is likely to deal poorly with certain situations. Thus, DoD may want to supplement the data from its preferred approach with other information to highlight localities where the basic approach is not adequate. As noted above, the department apparently plans to rely on the second approach described here, measuring prices in the ZIP-code areas within each MHA where some set fraction of military personnel live. In general, that approach might be expected to yield a price that lies between those of the other two approaches, both of which are relatively costless to implement. DoD's method should capture more of the variation in prices than the first approach but less than the third, which implicitly accounts for all of the dimensions of housing quantity. For locales in which the price that DoD's approach yields is not between the other two or in which the three approaches give widely differing answers, a careful examination of the locality would be warranted.

How Many Sets of Prices?

The discussion thus far has assumed that DoD need only develop one set of prices. The new provisions establishing a price-based allowance system, however, require a separate set for each pay grade and dependency status—nearly 50 different groups.[5] Actually collecting separate price data for each group would be a massive and probably quite expensive undertaking.

In practice, DoD (or the contractor it hires) may be willing to assume that the prices of different types of units differ by constant proportionality factors in all areas. Suppose, for example, that the department had developed prices for the standard unit

5. DoD calculates separate housing allowance rates for seven officer grades (flag officers are lumped together), three grades that apply to officers with four or more years of enlisted service, five warrant officer grades, and nine enlisted grades. For each of the 24 grades, DoD calculates a different rate for personnel who have dependents and for those who do not.

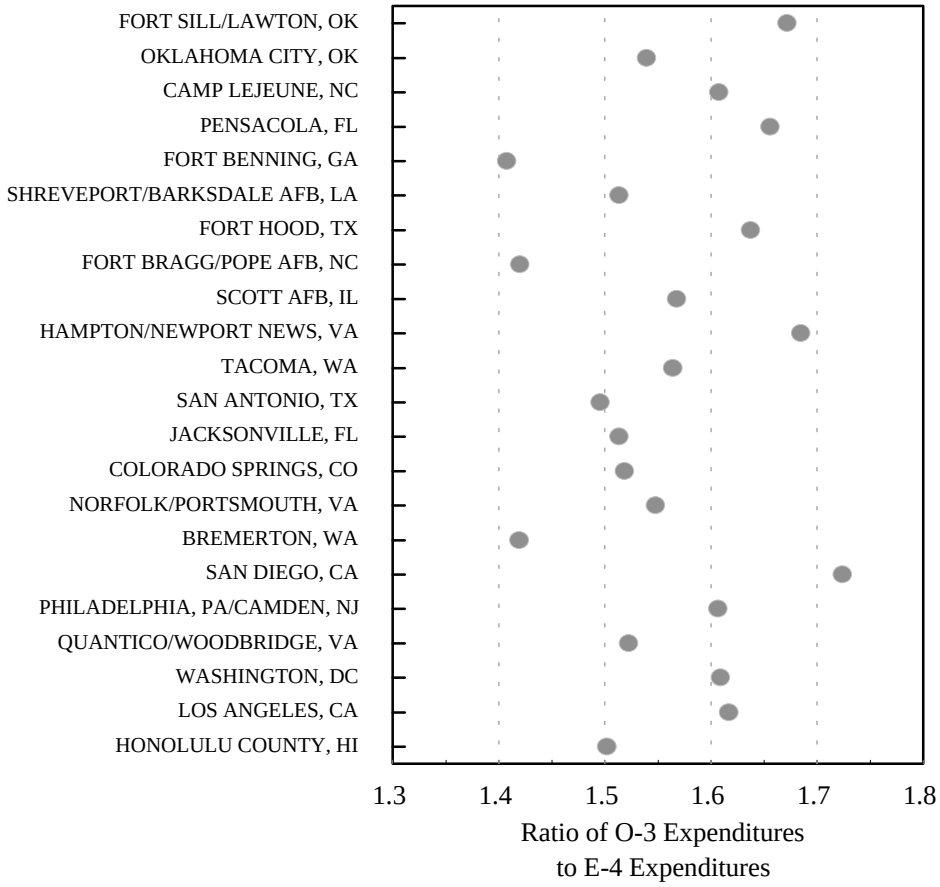
that it had chosen for the group of married personnel in pay grade E-4 and found that the average price nationwide was $700. In sampling a few well-selected areas, it might find that the standard unit for another group (married personnel in grade E-6, for example) generally rented for 10 percent more. It could then simply inflate the initial set of prices by 10 percent everywhere to derive a set of prices for the second group.

There may be limits to how far the assumption of proportionality can reasonably be carried. Data on the housing expenditures of married personnel in an enlisted and an officer pay grade—E-4 and O-3, respectively—suggest that groups may face different relative prices in various areas (see Figure 6). In the Hampton/Newport News area of Virginia, for example, where housing prices are about average, the typical O-3 spent nearly 70 percent more than the typical E-4. The difference was the same at Fort Sill, Oklahoma, where prices are rather low, but at Fort Benning, Georgia—another low-price area—the difference was only 40 percent. E-4s in Bremerton, Washington, spent nearly as much on housing as their counterparts in San Diego, California, whereas O-3s spent considerably more in San Diego than in Bremerton.

The apparent differences in relative prices may result from local idiosyncrasies in the housing market or from some other factor. All of the areas shown in Figure 6 have large military populations, so random fluctuations alone are not the explanation.[6] DoD may want to examine the reasons for the differences as it develops procedures for the new allowance system.

6. The spending data in every area shown were derived from the survey responses of at least 60 members in each grade.

FIGURE 6. COMPARISON OF HOUSING EXPENDITURES FOR SERVICE MEMBERS IN PAY GRADES O-3 AND E-4, FOR SELECTED MILITARY HOUSING AREAS



SOURCE: Congressional Budget Office based on Department of Defense data.

NOTES: Data are for service members with dependents.

The selected military housing areas consist of all those with at least 60 survey respondents in pay grade O-3. Two areas, Wright-Patterson Air Force Base, Ohio, and Monterey, California, were excluded because they had fewer than 60 respondents in pay grade E-4. The areas are ordered by the expenditures of E-4s, with the lowest-cost area at the top.

Expenditure data are unadjusted local medians for renters from the survey of service members used for setting 1996 rates under the variable housing allowance program.

CHAPTER V
CONCLUSIONS

In 1997, the Department of Defense proposed, and the Congress enacted, a new system for calculating housing allowances for military personnel. The new system will base allowances on the local prices of standard housing units rather than on the amount that service members choose to spend on housing in each location where they are stationed. The new approach should markedly improve the ability of the allowance program to offset the effect of varying housing prices on the well-being of service members.

It may have seemed obvious when the new system was being considered that it would constitute a major improvement, but that result was not inevitable. Neither the old nor the new approach quite matches the allowances of an ideal system, one that exactly offsets the effect of different housing prices on the well-being of a typical service member. Which approach comes closer depends on how members adjust their consumption of housing in response to variations in the price of housing and in their income; economic theory alone cannot prove that a price-based system is superior. Nonetheless, on the basis of the responses observed for service members under the old system, the new price-based system appears to have the potential to come very close to the ideal. Moreover, that conclusion would hold even if the estimated relationships on which it is based incorporated substantial errors.

The full potential for improvement that a price-based system offers may not be realized. Two problems remain. The first is one that the designers of the new system were well aware of: measuring housing prices accurately can be difficult. The second problem they apparently did not see: for price-based allowances to achieve their goal of insulating service members from the effects of price variation, the set of prices used in setting the allowances for a particular group of members must be based on what an average person in the group actually spends on housing rather than on some arbitrary standard. DoD can try to deal with the first problem as it develops procedures for implementing the new system. Addressing the second problem, however, will require legislative action.

Measuring housing prices is difficult because the good called housing varies along many dimensions. DoD cannot hope to measure the price of a fixed bundle of characteristics; it must ignore some of them and accept the choices that members make. In general, that simply means that the prices it measures will understate, to some extent, the true variation among locales. For some areas, however, local idiosyncrasies in the housing market can make some of the factors that DoD ignores

quite telling and cause its price measure to seriously misstate what service members face. For that reason, blind reliance on a single approach to measuring housing prices may be a mistake; instead, the use of alternative measures can be an effective check on the accuracy of DoD's preferred approach. Among the alternatives, the method of deriving prices from the expenditures that service members report is both easy and inexpensive.

New legislation could improve the operation of the price-based allowance system by giving it separate tools for addressing its two principal objectives: (1) offering an appropriate average level of allowance for each pay-grade and dependency-status group in the military and (2) varying the allowance among geographic areas to protect service members from the effects of local variations in the price of housing. The language in the new provisions that describes how DoD should determine locality-specific housing allowances tries to achieve both goals simultaneously. It sets the average level of the allowance as a given fraction of the average price of a standard unit and the differences among areas as equal to the differences in the price of that same unit. That procedure worked under the old system, in which the standard unit was implicitly defined in terms of average housing expenditures—the "national median housing cost." In the new system, it will not work well for any group for which DoD chooses a standard unit that has an average price substantially higher or lower than the average spending for the group.

Placing the two functions of the new allowance system in separate provisions of the law would allow the system to achieve both of its goals. One provision could instruct DoD to fix the average allowance for a group at a given fraction of the average cost of "adequate housing" for that group. A second provision could specify that the allowance for a group in any particular area should equal the average allowance plus the difference between the local cost (or price) of housing for that group and the nationwide average cost. Nothing would require that the "average cost" of the second provision be the same as that of the first. The procedure might seem circular—first determine the average allowance and then determine the individual rates that go into the average—but it would be workable nonetheless.

The military housing allowance is a major component of income for the majority of married service members who cannot be accommodated in military family housing, and for those single members who are eligible to live in private housing. Well designed and well implemented, the system of locality-specific housing allowances can ensure that military personnel and their families neither suffer a loss in their standard of living when they are assigned to places where housing is expensive nor gain inordinately when they go where housing is inexpensive. The old expenditure-based approach to setting allowances fell well short of that goal. The new price-based system should come much closer.

APPENDIX A

CALCULATING WELFARE-BASED ALLOWANCES

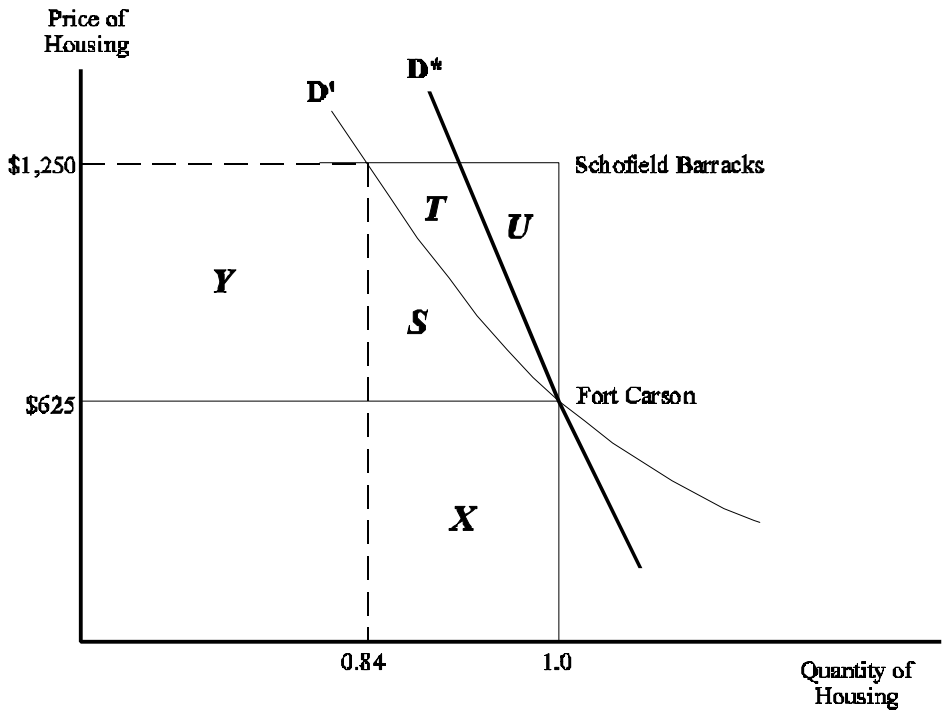
As Chapter III discusses, an ideal approach to setting military housing allowances would exactly offset the effects of variations in housing prices on the well-being of service members as they were transferred among areas of the country. This appendix explains graphically how welfare-based allowances can be calculated. A discussion of why the allowances achieve their objective can be found elsewhere.[1]

Welfare-based allowances depend on a form of demand called income-compensated demand. That form is what would be observed if, as prices varied, a person's income also varied so that he or she was equally well-off regardless of the price of housing. In general, the income-compensated demand curve is steeper than the ordinary demand curve; that is, if people get more income when they face higher housing prices, then they will not reduce their consumption of housing by as much as they would if their income did not increase. An economist would say that income-compensated demand is less *elastic* than ordinary demand. The compensated demand curve is also steeper than the demand curve that would be observed under the old expenditure-based system because that program did not fully offset the effects of price variation.

To see how welfare-based allowances are calculated, consider the example used in the main text. When the service member in that example is sent from Fort Carson to Schofield Barracks, the effect of the higher price can be offset if the allowance at Schofield is greater by an amount equal to the area to the left of the income-compensated demand curve and between the two prices (see Figure A-1). D* denotes the income-compensated curve, and D' is the demand curve that is observed under the old expenditure-based approach. The allowance should be greater, then, by the area $Y + S + T$. The price-based approach adds to that the area marked U. The expenditure-based approach increases the allowance by only $Y - X$. The price-based allowance is always too great, the expenditure-based allowance always too small.

1. See, for example, Frank Camm, *Housing Demand and Department of Defense Policy on Housing Allowances*, R-3865-FMP (Santa Monica, Calif.: RAND, 1990), and Department of Defense, Seventh Quadrennial Review of Military Compensation, *Allowances: Major Topical Summary (MTS) 3* (August 1992), Appendix R. A more thorough theoretical discussion appears in Frank Camm, *Consumer Surplus, Demand Functions, and Policy Analysis*, R-3048-RC (Santa Monica, Calif.: RAND, June 1983).

FIGURE A-1. DIFFERENCES BETWEEN IDEAL HOUSING ALLOWANCES AND THE ALLOWANCES UNDER ALTERNATIVE APPROACHES FOR A LOCALITY WHERE HOUSING PRICES ARE HIGH

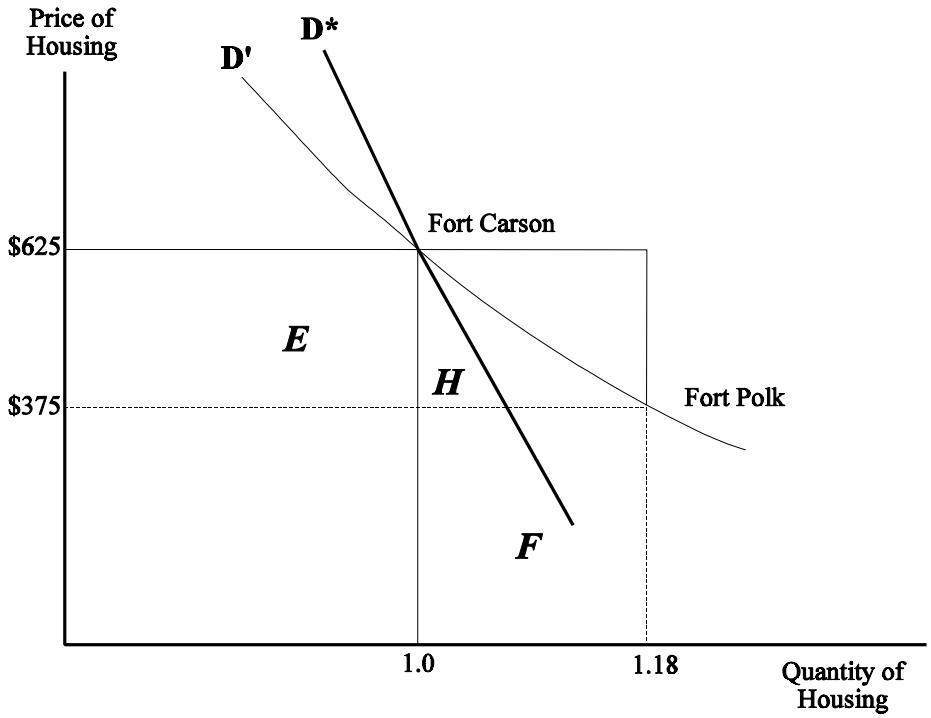


SOURCE: Congressional Budget Office.

NOTES: D' = observed demand curve under an expenditure-based approach to calculating allowances.
D* = income-compensated demand curve, which would be observed if the allowances exactly offset the effect on service members' well-being of prices higher or lower than at Fort Carson.

At Fort Polk, where prices are lower, the welfare-based allowance would be smaller than either the expenditure-based or price-based allowances. For the move from Fort Carson, a welfare-based allowance would drop by the area $E + H$ (see Figure A-2). A price-based allowance, in contrast, would fall by E; an expenditure-based allowance would drop only by $E - F$.

FIGURE A-2. DIFFERENCES BETWEEN IDEAL HOUSING ALLOWANCES AND THE ALLOWANCES UNDER ALTERNATIVE APPROACHES FOR A LOCALITY WHERE HOUSING PRICES ARE LOW



SOURCE: Congressional Budget Office.

NOTES: D' = observed demand curve under an expenditure-based approach to calculating allowances.
D* = income-compensated demand curve, which would be observed if the allowances exactly offset the effect on service members' well-being of prices higher or lower than at Fort Carson.

APPENDIX B

ESTIMATING PRICE ELASTICITIES OF DEMAND FROM MILITARY DATA

Estimates of how service members respond to variations in the price of housing play two major roles in this paper's examination of the military housing allowance program. First, the income-compensated price elasticity of demand is a key determinant of the allowances under a welfare-based approach, a system that exactly offsets the effect of variations in prices on the well-being of service members. Those allowances provide a benchmark against which to assess the allowances under the old expenditure-based approach and the new price-based approach. Second, estimates of the relationships between housing prices and housing expenditures under the old program allow one to derive predicted prices from the expenditure data. The derived prices serve as a check of the accuracy of price measures developed from nonmilitary sources.

This appendix discusses some of the issues involved in estimating price responsiveness from the available military data and the procedures that the Congressional Budget Office (CBO) used to produce its estimates. It begins by examining the main reasons for deriving estimates from military data rather than relying on studies of civilian behavior. It then describes CBO's estimation procedures. Finally, it discusses the limitations of those procedures and identifies methods that a more thorough study might use to overcome them.

WHY USE MILITARY DATA?

Estimating price elasticities of demand for housing from military data offers three main advantages. The first, and most obvious, is that the estimates are specific to military personnel and even to individual pay grades. People in the military, who are transferred frequently, may well respond differently to price variation than people who are making longer-term decisions. They might be expected, for example, to consume a relatively constant quantity of housing despite the price differences that they encounter as they move among locations. That is, they might tend to exhibit a lower (in absolute value) price elasticity of demand than nonmilitary households. As Frank Camm notes, they will also tend to make the transition to owner-occupied housing later in their lives.[1] In addition, they could well exhibit different responses to price variation at different points in their careers, which would have important

1. Frank Camm, *Housing Demand and Department of Defense Policy on Housing Allowances*, R-3865-FMP (Santa Monica, Calif.: RAND, September 1990).

implications for the issue of what groups of military personnel would be most affected by the switch from an expenditure-based to a price-based housing allowance system.

A second advantage of using military data is that, in some respects, the military would seem to provide nearly ideal conditions for estimating the price elasticity—people with essentially identical incomes are assigned more or less randomly to areas with differing housing prices.[2] That situation helps to overcome the problem that many studies have of separating price and income effects. It is possible, however, that estimating a price elasticity separately for each pay grade and dependency status is not sufficient to hold income constant because military households may have other sources of income, most notably the earnings of service members' spouses (see the later discussion).

A final advantage of using data on military households, which might seem at first to be a drawback, is that their choices are affected by the existing program of variable housing allowances. That means that any price elasticity estimated by a straightforward procedure will not be the ordinary price elasticity of demand. Rather, the estimate will tend to reflect more the elasticity of the income-compensated demand curve.

Income-compensated demand is what would be observed if, as prices varied, a person's income also varied so that he or she was equally well-off. The old allowance program did not quite accomplish that, but it came fairly close. That result is an advantage because, as Chapter III discusses, the income-compensated elasticity is actually of more interest in evaluating alternative allowance programs than is the ordinary elasticity. The two are related through a simple equation:

$$\xi = \varepsilon + \sigma\eta \ ,$$

where

ξ = price elasticity of the income-compensated demand curve,
ε = price elasticity of the ordinary demand curve,
σ = share of housing in total expenditures, and
η = income elasticity of demand.

Because that equation involves the income elasticity as well as the ordinary price elasticity, getting to the desired parameter ξ by using outside studies requires

2. The assumption that assignments are random is crucial to interpreting the pattern of service members' housing expenditures as reflecting only a response to price and income variations. A further study might examine whether the assignment systems of the various services allow personnel who particularly want more housing than the average for their pay grade—because they have large families, perhaps—to show up disproportionately in areas where housing is inexpensive.

combining estimates of two separate parameters. On the basis of the range of estimates that Camm reports for the income elasticity and the ordinary price elasticity, the income-compensated elasticity could span a wide range of values.

DATA AND METHODS

CBO adopted a simple approach to estimate the responsiveness of married service members to price variation. A simple approach was consistent with a need for qualitative conclusions only and with the finding, discussed in Chapter III, that those conclusions do not depend strongly on precise quantitative results. For each of the nine enlisted pay grades and for six officer grades (O-1 through O-6), CBO estimated equations of the form

$$\ln(E_i) = \alpha + \beta \ln(P_i) + \mu_i ,$$

where

E_i = housing expenditures for the group in military housing area *i*,
P_i = price of housing in area *i*,
μ_i = random disturbance term for area *i*,
α, β = parameters to be estimated.

The term "ln" denotes natural logarithms.

Estimation was by weighted least squares, using the relevant populations as weights. Unweighted regressions, however, produced very similar results.

CBO measured expenditures by the figures that the Department of Defense (DoD) calls local median housing costs. As noted in Chapter II, DoD adjusts the raw survey data on service members' spending in deriving those figures. The price data were the Department of Housing and Urban Development's fair market rents for two-bedroom apartments, as reported by DoD for its military housing areas. Because the same price data were used for all pay grades, CBO's procedure implicitly assumed that the prices relevant to the decisions of people in each of the various pay grades differed by fixed factors of proportionality in all housing areas. All data were for calendar year 1992.

The parameter β gives the observed elasticity of expenditures with respect to prices. The elasticity of quantity with respect to prices—the observed "price elasticity"—is $\gamma = \beta - 1$.[3]

As noted above, the observed elasticities are not ordinary price elasticities, which assume a constant income, nor are they income-compensated elasticities. They are not ordinary elasticities because the housing expenditures of service members would have been affected by the program of variable housing allowances that was in place in 1992. The program did not offer the full variation in members' incomes that would be required to generate income-compensated demand curves, but it came fairly close. Thus, the income-compensated elasticities might be expected to be somewhat smaller (in absolute value) than the observed elasticities.

To see how the observed price elasticity is related to the true elasticity, note that the equation above omits service members' income. The full equation (dropping the subscripts and the error term for simplicity) is

$$\ln(E) = \alpha' + \beta' \ln(P) + \eta \ln(Y), \text{ or}$$

$$\ln(Q) = \alpha' + \varepsilon \ln(P) + \eta \ln(Y),$$

where

Q = quantity of housing,
Y = income,
$\varepsilon = \beta' - 1$ = ordinary price elasticity of demand for housing, and
η = income elasticity of demand for housing.

The second equation results from subtracting $\ln(P)$ from both sides, noting that $\ln(E) = \ln(PQ) = \ln(P) + \ln(Q)$.

The equations that include Y cannot be estimated directly because Y does not vary independently. Rather, Y depends—under the old expenditure-based allowance program—on E and thus indirectly on P. (Y may also vary because of spousal earnings, as the discussion below notes.) Differentiating with respect to the price of housing yields

$$\frac{d\ln(Q)}{d\ln(P)} = \gamma = \varepsilon + \eta \frac{d\ln(Y)}{d\ln(P)}.$$

3. Expenditure equals price times quantity. If Q denotes the quantity of housing chosen, then

$\ln(PQ) = \alpha + \beta \ln(P)$,
$\ln(P) + \ln(Q) = \alpha + \beta \ln(P)$, and
$\ln(Q) = \alpha + (\beta - 1)\ln(P)$.

The observed price elasticity (γ) captures both the direct effect of prices on housing consumption and the indirect effect through the change in income that results from the effect of the housing allowance program. The problem, then, is to determine the magnitude of the income effect:

$$\frac{d\ln(Y)}{d\ln(P)} = \frac{P}{Y}\frac{dY}{dP}$$

$$= \sigma \frac{P}{E}\frac{dE}{dP}$$

$$= \sigma\beta = \sigma(\gamma + 1),$$

where $\sigma = E \div Y$ is the fraction of income spent on housing.

Solving the equation for the ordinary price elasticity (ε) and the income-compensated elasticity (ξ) gives

$$\varepsilon = \gamma - \eta\sigma(\gamma + 1) = \gamma(1 - \eta\sigma) - \eta\sigma, \text{ and}$$

$$\xi = \varepsilon + \eta\sigma = \gamma(1 - \eta\sigma).$$

The last equation indicates that the true income-compensated elasticities are slightly smaller, in absolute value, than the observed price elasticities. Assuming, for example, that the income elasticity is 0.75, and evaluating the equation at the median ratio of housing expenditures to military income for each pay grade, the income-compensated elasticity for an E-4 is smaller than the observed elasticity by about 23 percent (see Table B-1). For the higher pay grades, in which people typically spend a smaller fraction of their income on housing, the adjustments to the observed elasticities are smaller.

LIMITATIONS AND EXTENSIONS

The estimates of price elasticities based on service members' housing expenditures are subject to at least three sources of possible bias—factors that would tend to make the estimates higher or lower than the true elasticities. Two of the biases should tend to operate in opposite directions; the third should primarily affect the estimates for the higher pay grades. Further study could develop approaches that would reduce such biases.

TABLE B-1. OBSERVED ELASTICITIES OF DEMAND, FRACTION OF INCOME SPENT ON HOUSING, AND IMPLIED INCOME-COMPENSATED ELASTICITIES, BY PAY GRADE

Pay Grade	Observed Elasticity of Demand[a]	Median Ratio of Housing Expenditures to Military Income	Income-Compensated Elasticity[b]
E-1	-0.28	0.325	-0.21
E-2	-0.25	0.298	-0.19
E-3	-0.28	0.304	-0.22
E-4	-0.29	0.304	-0.23
E-5	-0.33	0.301	-0.25
E-6	-0.33	0.281	-0.26
E-7	-0.34	0.265	-0.27
E-8	-0.38	0.254	-0.31
E-9	-0.41	0.231	-0.34
O-1	-0.27	0.282	-0.21
O-2	-0.29	0.261	-0.24
O-3	-0.34	0.225	-0.29
O-4	-0.40	0.227	-0.33
O-5	-0.47	0.203	-0.40
O-6	-0.53	0.195	-0.45

SOURCE: Congressional Budget Office.

a. Observed elasticities are the estimated parameters from a weighted least-squares regression of housing expenditures on housing prices, both expressed in natural logarithms.

b. The income-compensated elasticity is equal to the observed elasticity times $(1 - \eta\sigma)$, where η is the income elasticity of demand and σ is the fraction of income spent on housing. All income-compensated elasticities are based on an assumed $\eta = 0.75$.

Errors in Measuring Prices

Two types of bias could arise from errors in measuring prices. As discussed in Chapter IV, the data on fair market rents may not accurately measure housing prices for some areas, relative to the nationwide average. Errors that are essentially random—that is, equally likely to be either positive or negative and to occur in areas of high and low prices—give rise to the classical errors-in-measurement bias. Random errors bias the parameter estimate toward zero. That result applies to the elasticity of expenditures with respect to prices; the implied elasticity of housing quantity, which is equal to the expenditure elasticity minus one, would tend to overstate (in absolute value) the true price elasticity.

CBO applied an alternative estimation technique, designed to eliminate the bias arising from random errors in the price data, to the data for one pay grade and got a result very close to the original estimate. Nonetheless, errors-in-measurement bias must remain a concern.

Systematic errors in the price data are a second possibility, especially for the higher pay grades. The nationwide average for the price data—the estimates of fair market rents for two-bedroom apartments—was about equal to the average spending by personnel in grade E-3. Thus, the data might be expected to correctly identify the relative prices that those personnel faced in all areas of the country (apart from any random errors). CBO's estimation method implicitly assumes that personnel in other pay grades face the same relative prices; that is, if an E-3 who rents a two-bedroom apartment in Colorado has to pay twice as much in Hawaii for the same unit, then an O-4 who chooses a three-bedroom townhouse in Colorado would also have to pay twice as much for that unit in Hawaii.

How systematic errors in measuring prices affect the estimated elasticities depends on what form the errors take. Suppose, for example, that in percentage terms, prices for more expensive units tend to exhibit less variation among areas than do prices for less expensive units. In that case, the elasticities that CBO estimated would tend to understate the true responsiveness of personnel in the higher pay grades to variations in housing prices. Such a result would tend to upset the conclusion that those personnel would be more affected than personnel in lower grades by the change to the new price-based allowance system.

As DoD develops sets of price measures for the new allowance system, it should be able to reduce the incidence of both random and systematic errors. Thus, new estimates of price elasticities based on those data should tend to be more accurate, although the direct connection between the price measure and housing allowances could create a problem for such an analysis.

Errors in Measuring Income

The earnings that the spouses of service members bring into the household could affect the estimated price elasticities in two ways. First, to the extent that the total household income of service members was greater than their military pay alone, the adjustments described above that converted the observed elasticities into income-compensated elasticities would be too large. Second, if members' spouses tended to earn more where housing prices were high, which seems likely, then the observed elasticity would capture the effect of their income on housing expenditures as well as the direct effects of prices and of the allowance program.

The impact on the income-compensated elasticity of using the wrong value for the fraction of household income devoted to housing is likely to be rather small. Consider the example of the E-4 discussed earlier, for whom the income-compensated elasticity was estimated to be lower (in absolute value) than the observed elasticity by 23 percent. If in fact the average earnings of the spouses of E-4s—including those who do not work outside the home—were as great as the service member's military income, the adjustment to the observed elasticity would be only half as large. That would result, however, in only a small difference in the income-compensated elasticity—instead of -0.23 (as in Table B-1), it would be -0.26. A difference of that magnitude would have no effect on the conclusions of this paper.

The effect of ignoring the possible relationship between housing prices and spouses' earnings could be more substantial, and at least two arguments support the view that the spouses of service members may earn more, on average, where housing prices are high than where they are low. First, spouses may find it easier to obtain employment in urban areas compared with rural areas, and at higher wages. Because housing prices tend to be higher in urban areas, those tendencies would create a positive relationship between total household income and housing prices. Second, under the old allowance system, military households may have used the spouse's employment as a means to offset the tendency of the system to make them better off in areas where housing was inexpensive and worse off where housing was expensive. In areas where housing prices were high, spouses would have been more likely to seek employment—in locales where prices were low, less likely.

If housing prices and spousal income are positively related, the estimated income-compensated elasticity is likely to be lower in absolute value than the true level. Some of the reductions in housing consumption that service members would tend to make when they were sent to an area of high housing prices would be offset by increased consumption as a result of higher household income. That offset could bias the estimate of the ordinary price elasticity, which would capture both effects. In addition, the connection between spousal income and housing prices could affect the relationship between the ordinary and the income-compensated price elasticities.

Adding spousal income to the equation that explains housing expenditures would not be overly difficult, but it would introduce new complications. The Department of Defense has asked about spouses' earnings in some of its periodic surveys of service members, so the required data are at least potentially available. Complications would arise, however, because the employment decisions that spouses make may be affected by factors that also affect housing choices independently of the price of housing. Larger families, for example, may require both larger housing units and more spousal earnings. Thus, the attempt to add household income to the housing equation could turn into a major study of household decisionmaking in the military context.