Estimation of Housing Needs
Amidst Population Growth and Change

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I. Introduction

Housing needs is a concept of central importance to state and local planning in the United States (Landis and LeGates 2000). Roughly characterized as the number and type of housing units required to accommodate a population at a given standard of housing occupancy, the formulation of a quantified estimate of housing needs requires many assumptions that intertwine normative and empirical judgments.

The overall aim of this article is to propose a needed theoretical framework and more rigorous methods for demographic component of housing needs estimates. Grounding this in the recent California experience helps to illustrate concepts with a concrete example. As demographic change continues to spread across the country, growing numbers of regions and cities can benefit from this study of the California experience.

The article begins with a broad overview of the definition of housing needs, and then focuses on the central role of population growth and change in determining future construction needs. A pivotal issue is the instability over time of the empirical relationship between population and housing, as shown by comparison of household formation and homeownership rates from 1960 to 2000. A further issue is the sharp differences registered between different age groups, races, ethnicities, and nativity groups. Although disaggregation permits projections to capitalize on observed differences between groups, it also highlights the existence of inequities and the policy goal of reducing them.

The results of a recent study conducted in California are used to illustrate these theoretical and practical issues. Analysis discloses the relative contributions of population change and housing access to overall housing needs in California. Alternative projection models are compared with regard to their empirical fit to recent trends as well as with regard to their desirability in policy terms. Concluding thoughts are then offered on the matter of how best to evaluate the demographic component of housing needs.

II. Population and Housing Needs

A. Defining Housing Needs

Housing needs estimates are a pragmatic device for shaping and implementing public policies. Substantial differences in the treatment of housing needs have occurred over time and between places (Baer 1986, Varady 1996). However, individual studies rarely discuss the alternatives from which they chose their methodology; instead, each study asserts its own implicit definition and approach.

In the United States, housing needs estimates are typically prepared for geographic areas governed by municipal or county governments, because it is local governments who control regulation of land use and new development. Although housing construction occurs in localities, the needs are often of regional or state importance. Consequently, preparation of needs estimates can be required by state government, as in California, or by the state judicial system, as in New Jersey. State and regional agencies, or even nonprofit advocacy organizations, also employ

housing needs estimates for particular subpopulations[1] as a guide for setting priorities for use of limited public funds.

A variable blend of time-series trend, market demand, and normative assumption, housing needs can be expressed in different ways. Estimates are prepared for either of two (sometimes both) essential time periods:

a) They estimate the gap or deficit by which *current* local housing conditions fall short of a normative standard; or

b) They estimate the amount, and characteristics, of new construction required to accommodate the *projected future* population growth at a particular normative standard.

Current Deficits. Current housing deficiencies are measured on two different dimensions. One dimension distinguishes between the quality of the *physical* housing stock, as indicated by such factors as age, presence of complete plumbing, and code violations, and the quality of the *fit* between households and housing, most often indicated by the ratio of housing payments to income, a measure of affordability, or the ratio of the number of persons to the number of rooms in the unit occupied, a measure of the level of crowding.

Measures of household fit are much more frequently emphasized in the U.S. than those of physical quality. There are likely two reasons for this. For one, the vast improvement of housing quality since 1940 has sharply reduced the incidence of physical problems in the stock (Clemmer and Simonson 1983). Related to this quality improvement, costs have increased, leading to a

[1] e.g., low or moderate income, elderly, large families, or single parent households.

degradation of housing affordability (Landis and LeGates 2000) and, more recently, to a growing problem of overcrowding (Myers et al 1996).

Deficiencies of housing quality, both physical and household fit, are sometimes referred to as *social housing needs*, and they are treated as descriptions of current needs. At the local government level these needs are almost always measured by data collected from the most recent census, and thus can be outdated in practice by anywhere from 2 to 12 years. Thus, even though they are conceptualized as *present* indicators of quality, these measures of social housing needs must be updated in current and future estimates. For lack of other data, it is typically assumed that the per-household incidence of social housing problems from the last census remains unchanged at later dates.

Future Construction Needs. The alternative definition is one of future *construction needs,* representing the additional number of units required to house the projected future growth in population.[2] The estimate is intended to be a credible, policy-relevant projection of future housing requirements. Credibility requires that the projections be both feasible and consistent with observed trends in market behavior and accepted theories of market supply and demand. Policy relevance requires that they be based on, or related to, meaningful normative standards regarding desired patterns of housing consumption.

In practice, future construction is estimated for the population as a whole by a simple translation. Traditionally, the projected population is divided by a current or extrapolated

[2] Construction needs should also include an allowance for the number of housing units lost through casualty, demolition or mergers and, if vacancy rates are judged to be abnormally low, the number of new units required to make up the deficit. This paper considers only the household growth component of construction needs.

average household size (persons per household).[3] An alternative method which has been widely adopted utilizes separate factors for each age group in the population (Myers 1988). Headship rates, defined as the ratio of householders (formerly termed household heads) per population in each alternative age group, are multiplied by future population numbers in each age group to generate the projected numbers of households expected to be formed by each age group. As will be discussed, there is considerable uncertainty about what set of headship rates to employ for projected periods.

Joining Existing and Future Needs. Traditionally, the construction needs approach has simply addressed the total housing stock, combining middle and higher income sectors along with the lower income sector. A common approach adopted in recent years to integrate social and future construction needs has been to specify the share of new units required to be produced in different price brackets or for affordability to different income groups.[4] This practice has been employed prominently in the states of California, New Jersey, and Florida (State of California 1988, Calavita et al. 1997, Noll et al. 1997). This method assumes that key distributions, such as the ratios of renters to owners and lower income to middle income households, remain constant in the future at the same level as observed in the last census. The distributions from the last census are simply applied to the total projected future households in order to allocate social needs in the future.

Homeownership Goals. In addition to total and social housing needs, goals for homeownership are of great policy interest. Increasing the number of households who own their

[3]For example, a future population of 10,000 people housed at 2.5 persons per household equals 4,000 housing units expected to be occupied; if the current housing stock is 3,000 units then the construction need is 1,000 units.
[4] One lesson Varady (1996) drew from his study of housing plans in Great Britain was that housing needs needed to be defined for the entire market and not just for the disadvantaged sector.

own homes has been a cornerstone of American housing policy for over half a century. Homeownership has economic and social benefits for owner households as well as civic benefits for the communities in which they live (Green and White 1997, McCarthy et al., 2001). Moreover, as a practical matter in a market economy, production of new housing units requires an expansion of the capacity to own and finance a larger stock of housing units. Future needs for ownership and financial capacity are largely determined by the tenure of the required housing units, whether owned or rented. Inputs of land, materials, and labor also differ markedly for owned and rental units. For these reasons, projections of housing needs usually separately detail the increases in renter and owner occupancies and housing stocks.

B. Population Projections for Housing Needs

The fundamental driver that generates estimates of future housing needs is projected population growth. In principle, a great many factors could drive future needs, including projected employment growth, housing market projections, political initiatives, or other factors. For a variety of reasons, however, population projections have been universally adopted as the basis for housing needs projections. One advantage is that people and housing units are so closely linked. Perhaps more important, population projections are widely available and in fact are the most common means by which state and local governments quantify the future for all planning purposes.

Institutional Reliance. Population projections have been highly institutionalized, and projections of housing needs based on those projections have an inherent credibility. The most widely used population projections in the United States are those of federal and state agencies, e.g., the U.S. Bureau of the Census (1996), California State Department of Finance (1998), and

Texas State Data Center (2000), which have employed cohort-component methods to project the population by age, sex, and race or Hispanic origin. More recently, to meet rising demands for information on the foreign-born population, the U.S. Census Bureau (2000) issued its first projections of the U.S. population by nativity (i.e., foreign-born or native-born) as well age, race, and ethnicity. One of the authors of this paper has further extended the accounting of immigration status to disaggregate period of arrival (and, implicitly, duration of residence in the U.S.) of the foreign-born population in projections for the U.S. and California (Pitkin and Simmons 1996 and Pitkin 2000).[5]

Accuracy Through Disaggregation. As will be shown in the next section, pronounced differences exist with regard to housing consumption by age, race, ethnicity, nativity, and duration of residence. Whenever the populations of various demographic strata are growing at different rates, projections of housing needs which incorporate the past differences in per capita headship and home ownership rates between the strata are likely to be more accurate than projections based on rates for all strata combined. The existence of suitably disaggregated population projections facilitates the incorporation of these differences into housing needs projections.

Proxy for Income. Economic theory emphasizes income as the factor most directly determining housing consumption. Indeed, mortgage brokers and landlords both know that a certain level of income is required for buyers and tenants to qualify for a given price or rent level of housing. Unfortunately, projections of income are not consistently available or sufficiently reliable for use in housing needs estimates. In any event, the possible inclusion of income does

[5] Once the population of past arrival cohorts is determined for a base period, the projected populations of arrival cohorts are determined by the same migration and mortality components used in the Census Bureau's recent projections.

not necessarily raise the reliability or credibility of housing needs projections. Average income is closely correlated with age, race, and ethnicity, factors addressed in population projections. As long as income projections are tied indirectly to ethnicity, race, and age, and housing is related to income level, then of demographic changes serve as a good proxy for changes in average income. Moreover, income actually has much less effect on the current housing of older households than on young households who are newly making housing decisions.[6] In this respect, demographic projections possibly serve better than income projections without demographic detail. Thus income may be useful as a policy instrument without adding to the reliability of the projections.

III. Temporal Instability and Demographic Differences

Changes over time and with population size are both central to housing needs. Housing needs are related to population, either directly, on a per capita basis, or indirectly, on a per household basis. Projections of housing needs are based on a population projection, along with specific assumptions about the relationship between population size and the number of housing units that it will occupy. Past changes are the only evidence we have for setting expectations for future changes in the relationship of housing needs to population. Even though much of the following discussion addresses empirical regularities in the past relationship between population and housing, estimates of housing needs are also shaped by policy desires to elevate the housing standards of the population. The analytic use of the observed differences between groups and changes over time unavoidably raises questions of policy.

[6] In particular, due to patterns of residential mobility, households over age 45 often selected their current residence a decade or more earlier based on their income at that time, and so their current income becomes less directly linked to their current residence as they age in place.

A. Life Cycle Profiles of Household Formation and Homeownership

There are large differences in the propensity of adults in various age groups to head, or form, separate households (or be a "householder"). These variations in the ratio of household heads per capita, or "headship rate," have persisted for over a century and are associated with changes over the life cycle: In late adolescence, people begin to leave their parental homes; in their early twenties, increasing numbers form separate households as incomes rise and families are formed; thereafter, the fraction heading households rises gradually until old age, and eventually begins to decline as people move in with children or into group homes. In 2000, in California, the headship rate at age 15 to 24 years was 11.1 percent and it reached a peak of 63.1 percent for those in the 75 to 84 year age category. (See Figure 1, top line.) Per capita rates of homeownership vary with age for the same life-cycle reasons as headship, though they are lower and rise more gradually in early adulthood.[7] Homeownership is always lower than headship because it is a subset (the remainder of householders being renters). (Figure 1, lower line.)

Instability. Although age-specific household headship and ownership rates have persisted for decades, they have not been constant. In California, for example, headship rates at most ages increased between 1960 and 1980, but the next two decades saw declines in early adulthood while rates continued to increase for the older population (Figure 2). Similar but even larger shifts are observed with regard to homeownership rates. Fluctuations in the ratios of housing to population undercut the credibility of projections of housing needs that assume future

[7] A *per capita* measure offers a distinct advantage over the more usual *per household* measure of home ownership (the fraction of households which are home owners). While the latter rate can increase due to a reduction in the denominator, such as a decline in renter households through doubling up or homelessness, the former measure can only increase if the number of owner households rises. Changes in the per capita measure therefore have an

stability in these rates. If the rates have changed in the past, shouldn't they be expected also to change in the future? Moreover, there persists an urgent policy question about what set of rates is even *desirable*: should we plan to accommodate the most recent rates, the highest recent rates (implying greater housing well-being), the lowest recent rates (implying lower supply requirements), or whatever trend is extrapolated for the future?

Efforts to build credible methods for projecting future housing needs have led to a search for underlying regularities in the data on past housing consumption. Patterns that have been consistent in the past might reasonably be expected to persist in the future and therefore be used to reduce the uncertainty of projections. By making the choice of certain rates seem more reasonable, past regularities can also help focus debate over what is normatively desired. Our approach is to identify past differences in rates across demographic characteristics beyond age and then see whether these differences help to account for recent changes in aggregate headship and homeownership rates.

B. Race and Ethnicity

Race and ethnicity pose a particular opportunity, and dilemma, for housing needs analysis. Race and ethnicity are salient dimensions that have long been associated with differences in housing occupancy, and, in fact, there have been marked differences between both the household headship and homeownership rates of different race/ethnic groups in California.

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unambiguous normative interpretation. In addition, the per capita measure of homeownership can be directly applied to population projections to yield homeowner projections.

The headship rates, by age, for the four major race/ethnic groups[8] in California in 1990 are shown in Figure 3. Among Asians, headship rates do not exceed 50% in any age group and are especially low among the elderly. Hispanics have the second lowest set of headship rates in 1990, falling about 10 percentage points below the black rates and 5 percentage points below white rates. These household formation differences reflect cultural differences in marital behavior, family structure, and care for the elderly as well as household resources as well as the effects of market segmentation.

To the extent that behavioral differences between different groups are compounded by demographic compositional changes that place greater weight on one group or another as time passes, disaggregation by race and ethnicity can lead to more credible projections of housing needs. For California, differences in headship rates imply for example that as Hispanics and Asians become a larger share of the population, total housing consumption and needs are expected to grow more slowly than would otherwise be expected because these populations form fewer households per capita than do the predominantly native-born White and Black, non-Hispanic, populations. Thus the intent of disaggregation by race is to estimate more precisely the total amount of housing needs but not to ratify racial differences as targeted quotas.

C. Nativity and Duration of Residence in the United States

More recently, the large, sustained increase in the number of immigrants, particularly in California, has called attention to differences in housing occupancy between the native and foreign-born populations. By 2000, the foreign-born population comprised over a quarter of all

[8] The four groups consist of Hispanics or Latinos and the non-Hispanic portion of whites, blacks or African-Americans, and Asian and Pacific Islanders.

Californians, and many observers reported that newly-arrived immigrants tended to double up in shared housing much more than the native-born population of similar age and ethnic origin. Analysts of national housing trends have also recognized the importance of nativity (Masnick and Di 2000).[9]

Immigration poses a more complex challenge for housing needs analysis than does race. Not only are the new arrivals often of different races than the U.S. white majority population, but the housing behavior of immigrants changes dramatically the longer they reside in the U.S. This within-group temporal change is greater than typically observed for native-born populations.

Patterns observed for California in 1990[10] are clearly illustrative. Per capita *headship* rates for the foreign-born, with negligible exceptions, were lower than the rates for their native-born peers of the same ethnic groups, as can be seen in Figure 4. The native-foreign differences are much wider at older ages and greater for those who had arrived in the U.S. during the prior decade than for those who had arrived earlier. Below age 35, where the great majority of population of recent immigrants are found, however, the only substantial difference was for those Hispanics age 25 to 34 who had arrived in the prior decade and whose headship rate was one-fifth lower than the rate for native-born Hispanics of the same age. [11]

The profile of differences by nativity in per capita rates of homeownership in 1990 was broadly similar to the differences in observed household headship rates. However, the differences by duration among immigrants and between foreign- and native-born were larger

[9]National projections of households and tenure "must necessarily look at differences between native-born and foreign-born residents."

[10] Comparable data for analysis from the 2000 census will not be available until late in 2002.

[11] Relatively little research has been conducted on household headship among immigrant populations. However, a study of residential overcrowding by Myers and Lee (1996) sheds indirect light on headship rates, because overcrowding is inversely related to headship. Using data from the 1980 and 1990 censuses, Myers and Lee find significant variation by length of residence in the U.S. and argue for use of a "double-cohort" method based on both birth and arrival (immigration) cohorts.

than for headship. (See Figure 5.) It should be noted in particular that the large populations of recently arrived Hispanic and Asian immigrants age 25 to 34 were substantially less likely to be homeowners than either native-born or longer-resident immigrants of the same age.[12]

To summarize, these differences were greatest at older ages but at younger ages appear too small to have contributed greatly to the overall declines in per capita headship and homeownership between 1980 and 1990 or between 1990 and 2000. However, the differences are large enough when combined with the sharp increases in the volume of new immigrants over the last three decades to require an accounting of the foreign-born population's duration of residence in the United States through a refined longitudinal analysis.

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D. Components of Change in California Housing Consumption, 1980-1990

Some part of the past changes in the numbers of households, home owners, and renter households are due to the changing composition or mix of the population that places greater weight over time on one subgroup or another. Another part of these changes are due to changing rates of headship or homeownership within all the specific demographic subgroups. It is important to know the relative size of these components of past changes. If the bulk of the changes can be explained by population mix, then population projections alone are a sound basis for projecting housing changes. However, if the changing rates of headship and homeownership are major contributors, then analysts will need to pay greater attention to selecting the right set of rates for estimating future needs.

[12] In a pioneering econometric study of immigrants in Australia, Bourassa (1994) estimates that ownership rates increased by 1.7 percentage points for each additional year of residence in the country. McArdle and Masnick focus on 1980 to 1990 census trends in ownership by immigrants who arrived in the U.S. during the 1970s. Myers, Megbolugbe, and Lee (1998) employ a statistical model of immigrants to the U.S. to estimate the trajectories of distinct immigrant and birth cohorts between the same two censuses. After adjusting for income and price effects

The most recent available data for California comes from the changes between the censuses of 1980 and 1990, since the full data needed for this analysis are not yet available from the 2000 census. Using these data we estimated the direct effects of changes in the composition of the population by race, nativity, and duration of U.S. residence on total headship and home homeownership rates.

We found that some of the declines in overall headship and homeownership rates during the 1980-1990 period can be accounted for by shifts in the demographic mix of the population, but the bulk of the declines cannot. For overall headship rates, the effect of changes in race-nativity composition was minus 1.4 percent, changes in headship rates for specific subgroups minus 5.8 percent, and the interaction of the two effects lowered the average a further .4 percent. (Figure 6.) For overall homeownership rates, the effect of changes in race-nativity composition was minus 2.6 percent, changes in homeownership rates for specific subgroups minus 5.2 percent, and the interaction of the two effects lowered the average a further .3 percent. (Figure 6.)

Thus, changes in the composition of the population have had modest negative effects on the numbers of both total and owner households, and declines in headship and homeownership rates *within* age-race-nativity groups have had substantially larger effects. This implies that there would be considerable enhancement to the credibility of projections if they could also incorporate any past consistency in the *trends* in headship and homeownership rates over time, in addition to the effects of shifts in the composition of the population.

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that alter the probability of homeownership, they find substantial effects persist for both differences between arrival cohorts and increased consumption with growing duration since immigration.

IV. Dynamics, Cohorts, Policy Goals

Alternative empirical approaches, or specifications, can be used to model changes in per capita household formation and homeownership rates over time. The choice of approach not only determines which empirical regularities are to be carried forward in the projections, it implicitly affects the policy standard. In the case of California in the coming decades, alternative approaches lead to quite different projections and standards for housing needs.

To see the differences between the different methods, we consider past changes in per capita household headship and homeownership rates for native-born whites in California at different ages (Figure 7). By focusing on the population that is both non-Hispanic white and born in the U.S., we eliminate changes caused by shifts in the immigrant or racial composition of the population. These plots are otherwise similar to those in Figure 2 for the entire population but exclude the year 2000 because data on nativity by race are not available at time of writing. They show the same across-the-board increases from 1960 to 1980, followed by declines at ages below 45 in the 1980-1990 decade while the rates over age 75 continued to increase. There are indications from 2000 census data on the entire population (in Figure 2) that many of the 1980-1990 trends continued during the 1990s.

Thus there has been considerable continuity of change in per capita headship and homeownership rates from decade to decade. These rates have not fluctuated randomly up and down. Rather there were across-the-age-range increases from 1960 to 1970 and again from 1970

to 1980.[13] Since then, the pattern has been of continued increases for the older population and declines for younger adults.

A. Assumption of Fixed Rates in the Future

The simplest assumption for projections, that rates will remain fixed in the future at their last observed value, in effect ignores the regularity of these trends over time. It has a clear interpretation for projecting housing needs: *future generations will attain the same standard of housing (household formation and homeownership) at each age as was achieved by the generation who was that age as of the previous census.*

Prior to 1980, the implication of this assumption for housing goals was also fairly clear. In view of the sustained increases in headship and homeownership, the backward-looking fixed-rate standard was regularly exceeded in the subsequent decade and was therefore conservative, particularly with regard to homeownership rates (see Figure 7). Its implications for overall housing goals in the post-1980 regime are not obvious because of divergent changes at different ages.

There has been, however, a generational pattern in the post-1980 changes in headship and homeownership rates. For cohorts younger than age 45 in 1990, there were declines in both headship and homeownership rates, while for those over age 65, there were increases in both rates. Such generational regularities provide the rationale for an alternative assumption and standard for projecting housing needs.

B. Cohort Dynamic Rates

[13] In fact, the same pattern of changes in headship rates goes back at least to the 1950 Census.

Generational differences in housing patterns (headship and homeownership) can be carried forward over time and at the same time allow for normal life-course changes as each generation ages. This is accomplished through use of dynamic cohort rates.[14]

In this formulation, the life-cycle *changes* in headship rates are calibrated, for example, to the difference between the headship rate for 65 to 74 year-olds in the 2000 census, say, and the rate for 55 to 64 year olds in the 1990 census. This difference measures the actual change in average headship rate made by a particular group of individuals, or birth cohort, over the 1990s.[15] For purposes of projection into the future, this difference is used to project, say, the headship rate of 65 to 74 year-olds in 2010 starting from the actual rate for 55 to 64-year olds in 2000. In this way, any differences in headship rates between the generation who were 55 to 64 year olds in 1990 and the generation who were that age in 2000 will be carried forward through the life cycle.

In the cohort dynamic model of housing, analogous changes in rates are calculated and applied separately for all ages and race-ethnic classes. An inter-census cohort model for projecting household formation and homeownership was first proposed and implemented for the U.S. by Pitkin and Masnick (1986).

This formulation describes the recent diverging trends in the headship and homeownership rates of younger and older population in California in a credible, consistent manner based on the different conditions that the generations encountered when they entered the housing market. Since 1980, in California, those cohorts coming of age and entering the market in California, the second half of the Baby Boom generation, have encountered higher housing

[14] This method has been explicated in a series of articles, and contrasts have been fully elaborated with the alternative model of fixed rates (e.g., Pitkin and Myers 1994, Myers 1999).
[15] It is a net change and may be slightly affected by mortality and interstate migration between censuses.

costs than the previous generation, and, as a result, their rates of headship and homeownership have been below those who entered the market in the more affordable 1960s and 1970s. By contrast, the recent continued increases among the elderly (over 65) are in large measure a legacy of the successive increases in middle age (45 to 64) in the 1960s and 1970s. See especially the pattern of changes in homeownership in the lower panel of Figure 7. Cohort models embed an assumption that past advantages or disadvantages in statuses tend to persist as a cohort ages along trajectories that are higher or lower than its successors.

The cohort model has a clear interpretation for projecting housing needs: *each future generation will progress toward a higher (or lower) standard of housing (household formation and homeownership) at the same net rate (i.e., with similar slopes) as the generation passing between the same ages in the two previous censuses; generational differences are maintained as each cohort tracks on different levels that reflect past advantages or disadvantages.*

Because most of the foreign-born population does not enter the housing market when they come of age but instead in the period after they immigrate, the cohort model must be modified for the foreign-born population. Their housing patterns are instead shaped by the market conditions that prevail in the period when they first enter the market. For immigrants who arrive as adults, this period is determined not by when they come of age but by their date of entry in the U.S. The large differences between the headship (and homeownership) rates of recent and less recent immigrants seen in Figures 4 and 5 indicate the importance of this period in immigrants' housing careers. To meet this need, a "double-cohort" model, specifying both birth and period of arrival, of immigrants' housing was specified by Myers and Lee (1996) and further developed by Myers, Megbolugbe and Lee (1998).

C. Trended Age Rates

A third empirical approach has been used to model changes in per capita household formation over time and can also be applied to homeownership rates. In this alternative, *age group* rates from past censuses, or surveys, are trended forward.

This approach, proposed by Siegel (1972), has been used by the U.S. Census Bureau (e.g., 1996) to project headship rates and households for the U.S.[16]. When it was developed, *i.e.* before 1980, headship rates had been rising at all ages and intergenerational differences of the kind we have recently seen had not yet emerged. If applied to California in the post-1990 period, and calibrated to the 1980-1990 changes, this model would imply a continuation of the diverging trends by younger age groups toward lower rates of headship and homeownership and by older age groups toward higher rates (unless future changes are arbitrarily scaled back). This contrasts with the cohort approach, in which increases among the elderly are inherently limited to those cohorts which are already on higher trajectories of headship or homeownership than their predecessors. Furthermore, generational differences, which are especially strong in homeownership, would be blurred.

For these reasons, the method of trended age rates is less credible than either the fixed rate or cohort alternatives. Moreover, projections based on this method lack a clear normative interpretation other than maintaining an arbitrary measure of past progress.

This leaves us with two alternative methods for future housing needs that need to be considered. While they have different normative interpretations as bases for future housing needs, both are necessarily empirical compromises between theory, the availability of data, and the requirements of policy-making. A choice between them must in part hinge on their specific

[16] The Census Bureau model now uses quarterly headship rates from the CPS instead of decennial census data.

implications for projected housing needs and goals. We therefore now consider alternate projections for California based on these two methods.

V. Alternative Forecast Models for California

The above concepts all came to the fore in a study of housing needs commissioned by the State of California. Subsequent reflection on the results of this study has brought to light conflicts between empirical regularities and policy desires for the future. In this study, alternative methods used to project housing occupancy rates were applied to the 1990-2000 period before the housing results of census 2000 were known, and so we can evaluate how well the alternatives fit the observed changes. Comparisons can also be made to the projections of California housing needs by other scholars.

Three alternative methods were employed and are briefly identified as follows:

Alternative A — fixed rates of housing occupancy (1990 base) within each detailed demographic group;

Alternative B — cohort rates based on the record of 1980-90 trajectories and estimated 1990 and 2000 launching points; and

Alternative C — a mixed model of cohort rates averaged with constant rates.

A. Alternative A—Fixed Rates

The projections based on Alternative A assume that future residents will be housed in the same manner as was observed for specific demographic groups in 1990. Demographic groups are defined by the four major race-ethnic groups, by age group, and by immigrant status (native-born, or immigrant arrivals before 1960, or in the1960s, 1970s, 1980s, 1990s, or 2000s). The 1990 rates are held constant in the future by assuming that for future residents housing consumption will depend solely on their race, age and immigrant status. For example, the housing patterns of new Hispanic immigrants age 35-44 in 2000 will look like those of the same age group who were new immigrants in 1990.

By holding 1990 rates constant Alternative A fails to reflect the downturn of housing consumption that has been underway in California since 1980, as shown above. For this reason it likely over predicts household formation in the 1990s and yields very high projections of future occupied housing. In addition, the constant rates method is not able to account for the continuity of future housing occupancy with the prior levels achieved by the same people in the prior decade. For example, a generation starting out at lower levels of headship and homeownership in 1990 is unlikely to leap in 10 years to the higher level of those who were 10 years older in 1990. The continuity in their housing careers is better captured by the cohort methods described next.

B. Alternative B—Cohort Dynamic Rates

Under Alternative B, a cohort model was constructed that replicates the 1980-1990 net *changes* in headship and homeownership rates for cohorts. Each cohort's rates are projected forward by appending these net changes to its initial, 1990, rates of headship and home homeownership. The size of the increments to be added by a cohort replicates the net changes

recorded by that earlier cohort who passed through the same *age span* (e.g., 35 to 44 to 45 to 54) in the 1980-1990 decade. For cohorts of immigrants, the increments repeat the 1980-1990 net changes by the immigrant cohort who passed through the same age and duration of residence interval (e.g., passing from age 35 to 44 with 10 to 19 years of US residence to age 45 to 54 with 20 to 29 years of residence). Each cohort's future rates of headship and homeownership thus reflect their initial 1990 rates and the changes made by earlier cohorts at the same age and duration of residence between 1980 and 1990.

Projections by this method of *foreshadowed cohort increments* are most reliable for cohorts with established trajectories in the housing market (Pitkin and Myers 1994). For groups who we cannot yet observe—those entering adulthood after 1990 or arriving in the US after 1990—we assume that the pattern of previous new entrants will simply be repeated, including not only the increments but also the starting levels for the trajectories.

A comparison of the findings from the alternative methods can be illustrated with regard to homeownership in the case of one specific population group: non-Hispanic whites who are native-born. Per capita homeownership rates are displayed in three alternative graphs in Figure 8, pertaining to the constant rates and cohort methods, as well as a third, mixed model. For consistency, all three graphs are arranged in cohort format. This means we do not show separate lines for 1990, 2000, etc. Instead, we display the trajectories of different birth cohorts (the oldest born 1886-95 and the youngest born 1976-85), showing their projected level of homeownership as they pass through different age groups across decades. The first segment in each trajectory pertains to 1980-90, the second to 1990-2000, third to 2000-10, and fourth to 2010-20.

The relative strength of Alternative B is that it carries forward the cohorts' housing careers in a fashion that is more consistent with the observed past (1980-1990). The corresponding weakness of Alternative A is evident in the discontinuities observed for each cohort's expected trajectories. At younger ages we see that the newer cohorts would require rapid, unprecedented increases in homeownership to close the gap from their lower starting levels in 1990. Conversely, elderly cohorts would need to reverse earlier upward climbs to match the lower homeownership rates implied by the constant model.

The major deficiency of the cohort alternative in this period is its policy implications, because it preserves both cohorts' lower initial levels and smaller increments of both headship and homeownership. It projects the lagging achievements of newer cohorts as permanent and without chance for catch-up through accelerated progress in future years. Thus, Alternative B yields the lowest projections of our alternatives, and to set these housing numbers as policy goals is to ratify and endorse the declines of the recent decade. It may not be desirable to embrace such pessimistic forecast targets for policy purposes.

C. Alternative C—Mixed Model

The projections based on Alternative C offer a balance between those of Alternative A (constant rates) and Alternative B (cohort rates). The mixed model of Alternative C averages the projections of the other two methods. The resulting forecast targets allow for some catch-up from the cohort levels, closing half the difference between cohort forecast and age group expectations based on 1990 constant rates. They imply that cohorts will close half the gap between themselves and their predecessors. This is shown in the right panel of Figure 8, where the cohorts retain much of their parallel form seen in the cohort alternative, but with much

smaller gaps between cohorts. Those gaps are closed in this alternative projection by steeper increases of young cohorts in the second segment (1990-2000) of their trajectories. (For example, compare homeownership achievements at age 35-44 for the cohort and mixed models.) The mixed model does not move California's residents all the way to the housing occupancy levels enjoyed in 1990, but it does allow for some catching up with earlier generations.

The overall strength of this alternative for this period is that it embeds the empirical regularities described by the cohort projections while avoiding the pessimistic policy assumption that previous low achievement will be followed by slow progress. For policy purposes, it is clearly preferable to select housing needs estimates that enhance the housing well-being of California residents.

To be credible, however, the needs estimates must also be seen as consistent with past and foreseeable future capacity for housing production.

D. Actual and Expected Trends in Occupied Housing

Forecasts of housing needs are prepared by combining information on population trends with information on housing occupancy patterns. The components are symmetrically detailed, specifying both population groups and their housing occupancy by age, race-ethnicity, and immigrant status. The housing occupancy rate (headship or homeownership) for each specific population group is then multiplied by the projected number of people in that group to yield the number of forecasted households or homeowners. This paper has focused on choosing the right

occupancy rates. Also needed is the construction of population projections detailed by age, race-ethnicity, and immigrant status[17].

The alternative housing needs projections can be compared to past trends in the growth of occupied housing. Actual growth in occupied housing declined markedly in California between the 1980s and 1990s (Table 1). This decline reflected a slowing of population growth and an even greater decline in housing construction. Termed "the Great Housing Collapse" (Myers and Park, forthcoming), construction levels remained at their lowest post-war levels for several consecutive years. Part of the shortfall in construction was covered by a drawdown of rental vacancies, with the result that California's rental vacancy rate in 2000 was 3.7%, far below both the national average of 6.8% and the target of 6% desired by the State of California.

When the three alternative housing projection models are applied to population growth from 1990 to 2000, the results for Alternative C, the mixed model, come very close to matching the observed growth in total occupied housing. As expected, the other Alternatives are either much higher or lower. The projection results vary substantially, however, in their ability to match observed growth in owner- and renter-occupied housing. Alternative C overestimates growth in homeowners and therefore underestimates growth in renters (Table 1). The cohort model, Alternative B, yields estimates much closer to the observed growth in homeowners but substantially underestimates renters (because it underestimated total household formations).

The three projection alternatives for the coming decade, 2000-2010, share one agreement. All three foresee substantial increases in growth relative to actual growth in the 1990s, Alternative A by 99.7%, Alternative B by 38.5%, and Alternative C by 69.1% (calculated from

[17] For our purposes, customized projections of California's population (Pitkin 2000) by nativity were produced by a model that was first developed in 1996 to project the national population for the Fannie Mae Foundation Immigration Research Project (Pitkin and Simmons 1996). The complete data for the new population projections are available, with documentation, at http://www.usc.edu/sppd/futures.

Table 1). All three imply that housing construction in California will need to increase sharply in the coming decade.

Other housing forecasts in California have come to similar conclusions, although with significant differences. A study conducted by John Landis for the California Department of Housing and Community Development (2000) foresaw need for 2,200,000 additional housing units between 2000 and 2010 (94.1% greater growth than in the 1990s), a figure very close to that produced by our constant rates (Alternative A) model. The middle alternative forecast by the Center for the Continuing Study of the California Economy (Levy 2001) yielded anticipated increase in growth of 1,950,000 occupied housing units, a 75.7% increase from 1990s growth, close to our Alternative C.

VI. Conclusion

Housing needs estimates are merely advisory in almost every instance in the United States, because most housing is privately produced and there is little ability to command compliance by either builders or local governments. Accordingly, it is important that estimates of needs be seen as credible and feasible to achieve. The more realistic they are, the easier it is to secure respect for the process and gain local compliance. Therefore, the normative element of housing needs must be constrained by market and fiscal realities. Although it might be desirable to declare high household formations, and, for that matter, high homeownership, for every group, excessively high estimates of housing needs would be dismissed as unrealistic. At the same time, the needs estimates should aspire to goals of improving housing conditions, not merely extrapolating declines that may be under way. This has several implications for the housing needs estimation process.

The California case provides an excellent illustration, because both its population and housing occupancy patterns are rapidly changing. The results indicate that both changes in population composition and in consumption rates within population subgroups greatly alter trends in household formation and homeownership and must therefore be factored into projections of housing needs.

This article has made explicit the choices to be made when constructing housing needs estimates based on prospective population growth. Our analysis of the housing trends in California has demonstrated the usefulness of detailed disaggregation of the population not only by race-ethnicity and age, but also by nativity and duration of residence in the U.S. Changes in population composition can greatly alter the trend in housing consumption, but changes in consumption rates within population subgroups also alter the long-term outlook. Both of these dimensions of the population must be taken into consideration.

Choice of rates for household formation and homeownership embeds both empirical and normative assumptions. This study has uncovered housing consumption trends that undercut the long-standard assumption of fixed rates and call for a dynamic method that incorporates cohort differences. Our projections for California allow for such trends via dynamic, cohort effects. The cohort framework provides the most credible basis for projecting rates because it builds in the accumulated trajectory of housing careers, but we also believe that catch-up moving toward the higher standard of previous decades is also warranted. The California experience offers a dramatic example of the challenges posed to the housing needs estimation process.

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