Temporal and Ethnic Decompositions of Homeownership Rates:
Synthetic Cohorts Across Five Censuses

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Abstract: We perform probit-based Oaxaca-Fairlie decompositions of the change in ownership rates for four ethnic groups and three age groups over five censuses, and then construct second-order decompositions of the white/nonwhite differentials.   There is substantial heterogeneity in how Hispanic, Asian and Black households of various age cohorts converge to and diverge from their white counterparts with respect to homeownership.

1. Introduction

Homeownership is widely seen as an indicator of social well-being. It is a mechanism for wealth accumulation, and there is some evidence that it creates positive externalities through increased maintenance (Galster, 1983), increased volunteerism and citizenship (DiPasquale and Glaeser, 1999), and improved outcomes for children (Haurin, Parcels and Haurin, 2002). There is also evidence that such externalities are actually priced in the market for neighboring properties (Coulson, Hwang and Imai, 2003) which suggests that these beneficial externalities have value in the marketplace. Therefore, the fact that homeownership probabilities differ systematically across ethnic groups is cause for concern. Aggregate homeownership rates for four ethnic groups for each census (about which more later) between 1960 and 2000 is provided in Table 1[1]. The four ethnic groups are labeled, despite the inaccuracy that sometimes is inherent in such labels, as white, black, Hispanic and Asian. Three facts are evident: (1) Homeownership rates are rising for all four ethnic groups over time,with the exception of the early dip in the Hispanic rate, and the overall downward trend from 1980 to 1990 (2) the homeownership rates of black, Hispanic and Asian households lag behind that of white households; (3) the relative lagging of these three non-white groups changes over time. In 1960, Hispanics had ownership rates well above those of blacks, but by 1980 the situation was reversed, while Asian households by the same decade had moved ahead of both Hispanics and blacks.

The examination of homeownership rate differentials has long been on the research agenda of urban and housing economists and other social scientists. Early concern was with black-white homeownership differentials. Wachter and Megbolugbe (1992), Megbolugbe and Cho (1996),

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[1] It is worth noting at the outset that the data in Table 1for Hispanics in the first two decades are, we think, new to this paper, and based on recent modifications to the IPUMS data set as discussed below.

Gyourko and Linneman (1996), Gyourko, Linneman and Wachter (1999), Bostic and Surette (2001) Deng, Ross, and Wachter (2003), Painter, Gabriel and Myers (2001), Gabriel and Rosenthal (2005), Hilber and Liu (2008) and others have explored various aspects of this differential. The conditional differences between Hispanics and Anglos, and indeed differences within the Hispanic community are examined in Krivo (1996), Coulson (1999), Toussaint-Comeau and Rhine (2004), Cortes et al (2007), and Haurin and Rosenthal (2008) among others. One point of interest in that discussion is the role of immigration, a factor that plays an important role among Asian heritage households as well. Coulson (1999), Painter, Yang and Yu (2003, 2004) and Yu (2006) discuss homeownership differentials between Asian-American and other ethnic groups, as well as differences within the Asian-American communities.

These studies have confirmed some basic facts, among which are that each of the three nonwhite ethnic groups have unconditional homeownership rates that are significantly less than that of white households, as evidenced in Table 1; that Asian-American households have rates that are above those of black and Hispanic households, and that Hispanic households generally have the lowest homeownership rates of all, although the differences are sometimes negligible. Observable explanations of these rate differentials are numerous: actual income, the components of permanent income (e.g. education), wealth, age structure, family structure, immigration status and location are variously seen by the above researchers as playing a role in creating differences across ethnic groups. It is largely confirmed that these factors can explain the differences between whites, Hispanics and Asians (although this is not universally the case). However, the white-black differential does not seem to be fully explained by these observables.

Even so, these differentials are not constant over time. A number of different forces may be at work. The ability of households to obtain ownership is in part a function of the resources

available to them and the personal circumstances that make homeownership a desirable outcome. Studies generally consider such individual-specific observables such as income and demographic characteristics to measure these influences. Societal changes may also play a role; on the one hand macroeconomic circumstances and institutional changes may mitigate the role of some individual factors play in determining homeownership; or discrimination and differential treatment may have receded or accelerated over time. This can be measured at least in part by the changes in the weights the individual characteristics bring to the choice of housing tenure. In any event, the pure effect of time, in part as represented by the age distribution of blacks and whites on the one hand and Hispanics and Asians on the other has relatively shifted over the past few decades, due in large part to the increased presence of immigrants in the latter two ethnic groups, and this has certainly had an impact on their relative homeownership rates.

In this paper, we use census-based synthetic cohorts to examine the changes in homeownership rates over time. The use of synthetic cohort analysis has long been a tool in the analysis of homeownership trends and ethnic differentials, as in Myers, Megbolugbe and Lee(1998) and Myers et al (2005). We extend these analyses in various ways. In particular, for each of the public use samples from the 1960 through 2000 censuses, we stratify by both ethnic and age group and estimate probit models of homeownership for each group (a total of 5 censuses*7 age groups*4 ethnic groups=140 probit models). We then focus our attention on those cohorts for which we have a full set of five censuses, and perform Oaxaca-type decompositions (Oaxaca, 1975, Fairlie, 2002) across census-cohorts for each ethnic group. For example, we compare (in a manner similar to Myers et al (2005)), the outcomes for 20 year olds in 1960 with 30 year olds in 1970, and so on. This allows us to observe how the various roles of changes in the covariates, and the pure effect of age and time (as represented by coefficient changes) have had an impact on the progression of

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homeownership over the past forty years.   Next, using the changes due to the endowments and time, we take the difference between white and nonwhite decompositions in order to examine how and why the differential has changed over the forty years of our sample.

2. Age, Ethnicity, and Ownership Rates

Our data comes from the Integrated Public Use Microdata Series (IPUMS) sample available from the Minnesota Population Center, which consists of the usual PUMS data available from the United States Census, with certain supplemental calculations discussed below. Sample sizes are given in Table 2. We model ethnic composition in the following way. In the 1960 through 1990 census each household head is asked to identify their race and from this question we identify households as being white, black or Asian.   (We are conditioning the analysis on the formation of households themselves. On this see Haurin and Rosenthal (2007).) Those who gave other responses were eliminated from the sample as being from ethnic groups too small to effectively analyze. The only distinction that arises in the 2000 census is that in this year respondents were allowed to give answers that indicated a mixture of races. IPUMS recodes a single race variable to each of these persons. Hispanic households are identified in the 1980 through 2000 censuses using a separate question. That is, "Hispanic-ness" is separate from race. For any household which identifies itself as Hispanic, we remove that household from the White, Black or Asian sample, and recode it as Hispanic. In the 1960 and 1970 censuses the questions concerning Hispanic origins are not asked. Retrospectively these households have been identified in IPUMS as Hispanic through the use of eight criteria based on Hispanic birthplace, parental birthplace, grandparental birthplace, Spanish surname, and/or family relationship to a person with one of these characteristics (Gratton and Guttman, 2000). To the extent that we can compare our estimates of ethnic homeownership rates in

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Table 1 with previously published estimates (e.g. US Census Bureau, 2005) the numbers displayed in

Table 1 are often identical, and always very close (within one percentage point or less).

We construct synthetic cohorts using the following conventions: for any given census year,

we group the household heads into one of seven age categories:

1=15 to 24 years old

2=25 to 34 years old

3=35 to 44 years old

4=45 to 54 years old

5=55 to 64 years old

6=65 to 74 years old

7=75 to 84 years old

(We ignore households headed by those over the age of 85.) For convenience, we refer to these as

20 year olds, 30 year olds, etc. and then subtract these decadal ages from the census year and refer to

the (birth) cohort accordingly. Thus, people in category 2 in 1960 would be in category 3 in 1970

and so on, and are referred to as the 1930 cohort, though their years of birth comprise

approximately a lustrum on either side of that date. These are of course synthetic cohorts, since we

do not observe the same individuals in each census.

In this paper, our focus is on the three cohorts covered by each of the five censuses. These

cohorts consist of individuals born around 1920, 1930 and 1940 (so that they were 40, 30 and 20

years old in 1960). As an initial look at the data, the unconditional homeownership rates of these

three cohorts are traced out by ethnic group in Figures 1, 2, and 3, respectively. There are five facts of interest that are discernible in these figures:

First, every cohort/ethnic group sees its homeownership rate rise over time, as the cohort ages. This is almost universally true, the only exceptions being declines for the oldest cohort (1920) when they reach 70 years old (Asian) or 80 years old (whites), and in the 1930 cohort for 70 year old Asians. Note in particular that the cohort ownership rates rise even in the 1980s, when Table 1 shows stagnation for non-white ethnic groups (Green (1990)).

Second, within every cohort, there is always and everywhere a gap between white homeownership rates and those of other ethnic groups. At no point does any ethnic group catch up with their white counterparts.

Third, there is convergence for some cohort/ethnic groups to their white counterparts, although as noted the convergence is never complete, and divergence also occurs with regularity. Some instances: the 1920 cohort, which was forty years old by the time of our first observation in 1960, exhibited rather large gaps in the black and white ownership rate. The white ownership rate was quite high (almost 70%), and the difference in rates was 34%. By 2000, aided by the recent drop in white cohort, the gap had closed to a still-large 14%. For Hispanic households of the 1920 cohort, the initial rate is relatively high (48%) but the rate of increase, compared to that of black households, is lower, so that by 2000, their ownership rate was lower than that of black households. Nevertheless the white-Hispanic gap slightly narrowed from 21 to 18 percentage points. Similarly, Asian households start at a 50% homeownership rate, hit a high of 67% in their 60s, but this then falls to about 57% by the year 2000 so that the gap in 2000 is greater than it was in 1960. So while the homeownership rate of Black and Hispanic members of this cohort converge to the white ownership rate that of Asian households diverges.

The 1930 cohort is (obviously) younger than the 1920 cohort, and we first observe them in the 1960 census at 30 years of age. Observe that in Figure 2 the relative youth of this cohort in 1930 means that the initial increases in homeownership rates are larger than those observed for 40 year olds at that time. This is true for all four groups, but less so for Hispanics. And except for Asians in 2000 there is monotonically increasing rates for all decades and groups. The white - non-white differentials decrease over time, but only gradually, and the gaps in 2000 are only slightly less than those which existed in 1960. Noting that the three non-white rates are almost identical in 2000, the gap for Asians narrows from 24 to 20 percentage points, for blacks from 21 to 20 points, and for Hispanics there is actually a slight increase from 19 to 20 percentage points.

Turning now to the 1940 cohort, Figure 3 displays the homeownership trends for the four groups. What is most striking about this figure is the rapid rise in homeownership rates between 1960 and 1970, as befits the younger ages of this group at that time. Equally striking is the fact that the white increase was much greater than those of other groups[2]. The white increase was from 23% to 54% (31 percentage points); the corresponding Asian change was from 12% to 26% (14 percentage points), while the ownership rate for both black and Hispanic households increased by about 18 percentage points. Thus all three nonwhite groups lost ground in that initial decade. Some of this ground was made up in succeeding decades and it is appropriate on account of the massive changes that took place in the 1960s to compare the ending gap in 2000 to what the gap was in 1970. For example the Asian-white gap in 1960 was 10 percentage points, but this had ballooned to 26 percentage points in 1970, and shrank back to 13 percentage points in 2000. For Hispanics, the corresponding gaps are 9, 22, and 20 percentage points, so that initial increase in the gap when the two groups are in their 20s basically remains. We find similar gaps for blacks vs whites (13, 26 and

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[2]Other young cohorts exhibit this same trend. For example a comparison of 20 year olds in 1990 and 30 year olds in 2000, leads to a similar white non-white differentials in the growth rate of the homeownership rate.

22 percentage points).   The long run gaps in homeownership rates begin around the age of 30 and

do not significantly retreat after that.

Although looking at the changes in homeownership across cohorts is useful, it does not use

all of the information available to us in the micro census data. We next introduce a technique which

uses a Oaxaca-type decomposition across time to determine how the homeownership rate within

each cohort has changed with respect to the determinants of homeownership and time

3. Decomposition

For each individual observation our basic formulation is this:

$$P_{ijkt} = X_{ijkt}\beta_{jkt} + v_{ijkt} \tag{1}$$

where

$i=1\dots n$ indexes the individual observations in sample j,k,t

j indexes ethnic group (white, black, Hispanic, Asian)

k indexes age group (20s, 30s, 40s, 50s, 60s, 70s)

t indexes census decade (1960, 1970, 1980, 1990, 2000)

P is a binary variable which equals one if the subscripted observation is a homeowner, and zero

otherwise. X is a vector of sociodemographic variables thought to influence the household

homeownership decision, β is a vector of parameters and v is an error term. The indexes on the

parameter vector β indicate that we stratify the samples by age, ethnicity, and time. For each sample

we assume that v is normally distributed with zero mean and constant (within the sample) variance.

We have in mind the usual structure which suggests a latent variable P* that represents the net value

of ownership over renting. This value is unobserved, while the choice indicator, P, is observed.

Thus we estimate the parameters of the model using a probit estimator. We then decompose the

model, in the style of Oaxaca (1973) with two easy to implement differences. First, because of the

nonlinearity of the probit model we use the decomposition method discussed in Fairlie (2002) . The

second is that while Oaxaca decompositions are typically employed across ethnicity groups, we use

them to track changes within ethnic groups over time. Specifically, we break down the change in the

cohort-ethnic group ownership rate into two components. Let P-hat indicate the average predicted

value for a given sample and set of parameters:

$$\hat{P}(X_{j,k,t},\beta_{j,k,t}) = \frac{1}{n}\sum_{i=1}^{n} F(X_{i,j,k,t}\beta_{j,k,t})$$

(2)

where F(.) is the cumulative distribution function of the normal density, i.e. the estimated probability

of homeownership for the given observation, and n is understood to depend on the particular

sample. Since the coefficients are specific to that particular sample, this average fitted value is going

to be almost identical to the actual homeownership rate in the sample. We note that (letting the unit

of measurement for t and k be decades):

(3)

$$\hat{P}(X_{j,k,t},\beta_{j,k,t}) - \hat{P}(X_{j,k-1,t-1},\beta_{j,k-1,t-1}) =$$
$$[\hat{P}(X_{j,k,t},\beta_{j,k,t}) - \hat{P}(X_{j,k,t},\beta_{j,k,t-1})] + [\hat{P}(X_{j,k,t},\beta_{j,k,t-1}) - \hat{P}(X_{j,k,t-1},\beta_{j,k,t-1})]$$
$$= r(j,k,t) + e(j,k,t)$$

which decomposes the change in homeownership rate for a particular ethnic group-cohort into two terms. The second bracketed term captures how a change in the X variables between decade t-1 and t, given period t-1's coefficient affected the homeownership rate. Thus if the societal conditions that impact homeownership remained constant, this term measures how the change in the cohort's endowments of X would have changed their ownership rate. Thus this term is often denoted the *endowment* effect *(e(j,k,t))*. The first term is based on the temporal differences in the β's (using the values of X from decade t as weights) and is occasionally referred to as the unexplained, or residual *(r(j,k,t))* portion of the overall change, simply because the reasons behind the changes in the parameters are not identified. As can be easily seen, and discussed in Fairlie (2002), the nonlinearity of the probit model merely requires that we not identify the change in the mean (the left hand side of (3)) with the difference in fitted values evaluated at the means (as would be the case in a linear model).

The choice of regressors, X, follows from the literature on that which uses Census Bureau data to examine housing decisions (see the references above). Household income is included in the regression to account for current income, *HINCOME.* The variable *HINCOME* was not available for every census; in particular the 1960 and 1970 censuses did not report household income, but did have a measure of personal income. Therefore, for those two early censuses, we add all of the personal income measures for members of the same household to compute a measure of household income comparable to that from the later censuses.

Goodman (1988) and the subsequent literature has noted that current income may not be the most relevant indicator of resources for the homeownership decision. Lifetime or permanent income is perhaps even more important, and so we include indicators of this, particularly measures of educational attainment. The dummy variable *COLLEGE* indicates whether the household head

has attained 4 or more years of college and *HSCHOOL* is a categorical variable which indicates whether an individual has graduated high school or has had less then three years of college education. The omitted educational variable indicates whether an individual has less then 12 years of education. With the inclusion of these (and other permanent income measures below) the coefficient on *HINCOME* measures the effect of (orthogonal) transitory income.

Family characteristics also play important roles in predicting tenure choice. Note that since we stratify the samples by age, this variable is not included in the specification. Other demographic characteristics that are retained in the model include the binary variable *MALE* and the number of children, *NCHILD,* as well as marital status indicators *MARRIED*, *SINGLE*, and *DIVORCED*. Note that here the omitted variable is *WIDOWS*.

The importance of location in determining tenure choice, leads us to include several variables which proxy for different housing prices and living expenses, as well as recent growth in areas of the country. These variables help control for regional housing price differences and tenure preferences because we do not include house prices in the regressions. A variable for *NORTH*, *SOUTH*, and *WEST* are included in the model, with *MIDWEST* being the omitted variable for the set of regional variables. Similarly, households living in the *CENTER* of the city are prone to different homeownership costs then those household living in the surrounding area. Since we find it beyond the scope of this paper to create constant-quality price indexes for both renters and owner-occupiers across all housing markets and five census years, the market-level indicator variables serve in this capacity. The endowment effect will thus include market factors to the extent that these indicators control for regional housing market variables. However, suppose that between 1970 and 1980 households are moving from Sacramento to Los Angeles, and on that account have lower propensities for ownership. Assuming that the West binary was negative, the lower ownership

recorded by households in the West in 1980 will cause that coefficient to become negative, and the impact of this change will be recorded in the residual effect. In sum, interregional housing price differences are recorded in the endowment effect, while intraregional are part of the residual effect. Our sense is that the former are by far the more important.

The final group of variables included in the regression is meant to account for the effect of being foreign born on tenure choice. *IMMIGRANT* is a dummy variable constructed by defining an immigrant as person not being born in the U.S. The degree of assimilation into the U.S. are captured by *YRSUSA2* and *CITIZEN*. In addition, the *YRSUSA2* variable indicating how long a person has been in the U.S. and is 0 if they are not an immigrant. *CITIZEN* is a dummy variable taking on a 1 if an individual is a citizen. However, the 1960 Census did not have *YRSUSA2* or *CITIZEN* and were omitted from the regression. Table 3 gives an example of the probit regressions, in this case Asian-American household from the 1920 cohort, at the time of the 1960 census. While this is a relatively small cohort, the pseudo-R^2 from this regression is approximately 15%. The signs of the coefficients are exactly as expected: income, the number of children, and the level of education have positive impacts on the probability of homeownership, while single marital status, being an immigrant, or living in the central city all have negative impacts (though in this particular sample not all of these coefficients are significant at the usual levels). These results are quite typical of the 140 probit regressions in our sample.

3. Results

To provide an example of the decompositions, we take as an example synthetic cohort the same group discussed immediately above, Asian-Americans who were in the 35-44 age group in 1960. In 1960 their homeownership rate was 50.3%, in 1970 this group of 45-54-year olds had a rate of 64.5% , an increase of 14.2 percentage points. Between 1960 and 1970 both the

characteristics of the group changed, as well as the impact that those characteristics had on the ownership probability (that is, the changes in the coefficients). If only the characteristics had changed, and the coefficients had stayed at their 1960 levels, their homeownership rate would have been 55.6%. Thus 5.3 of the 14.2 percentage point change was due to the endowment effect, with the remaining 8.9% due to the effect of the coefficient changes .

Table 4 reports these calculations and gives the history of this cohort as it moves through the five census decades. As can be seen, for this particular cohort, the endowment effect is relatively weak in predicting changes in homeownership rates over the lives of cohort members. In the first two decades (from age thirty to forty and then from age forty to fifty) the change in the ownership rate was positive, and the endowment effect was indeed in the same direction, but in both cases small relative to the actual change which occurred. However, the residual effect was much larger due to the combined effects of age and time. As the cohort ages into its sixties and seventies, their homeownership rate drops. The endowment effect, however predicts a change in the opposite direction. Therefore it would appear to be the case that the residual effect is again more important in explaining exactly what happened.

Figures 4, 5, and 6 present these temporal decompositions for the 1920, 1930 and 1940 cohorts respectively. In each of these figures, the change in the ownership rate from 1970 through 2000 for the ethnic-cohorts (notated with triangles) are given, along with the two components of the decomposition (with the endowment effect marked with squares and the residual effect with diamonds). Recall that in dating these observations, e.g. 1970, we are discussing the change in that observation from the previous decade's census, e.g. 1960. In examining these figures five facts stand out:

1. As was clear in the foregoing Figures 1, 2 and 3, the rate of change for all ethnic groups in all cohorts declines over time. This is least true for the youngest cohort; Figure 6 shows that for all three non-white groups the rate of change rose from 1970 to 1980 as those groups converged to the white members of that cohort, who attained a higher degree of ownership in the previous decade. (There were also increases in the rate of change for 1930 cohort Hispanics in that same decade).

2. For all cohorts, ethnic groups and time periods, the endowment effect explains relatively little of the ownership rate change observed in the data. Indeed, in 1970 and 1980 the endowment effect is almost universally very small, so that given the large ownership changes that took place, such changes can be almost completely attributed to the residual effect, which for those decades track the actual changes quite well.

3. Conversely, growth in ownership stalls in 1990, but somewhat paradoxically the endowment effect climbs significantly for all ethnic groups and cohorts. Given the improvement by all ethnic groups in those characteristics that contribute to the endowment effect, the ownership rate would have been expected to have been much higher than it actually was. This coincides to a certain extent with the analysis of Green (1996) although he does place emphasis on the increase in the relative proportion of households who are unmarried as a source of ownership declines. But within household types he finds that changes in demographic characteristics during the 1980s were conducive to increased ownership. The fact that ownership universally fell short of the implied increase implies that the cause of the shortfall was not due to age or ethnic group considerations but rather macroeconomic conditions. In Green's view this was largely the increased user cost of housing during this period.

4. The endowment effects for 2000 are always smaller than those for 1990. This is natural since the coefficients for the 1990 regressions (on which the 2000 endowment effects are based) would be based on 1990 behavior which, as noted just above, did not meet ownership expectations.

5. In examining Figures 4, 5, and 6, for differences across ethnic groups, few hard and fast facts stand out. It does seem as if there is some commonality among Asian and Hispanic households, that the rise in the endowment effects and fall in actual ownership rate changes in 1990 are more dramatic than those of white and black households for all three cohorts. But the visual display does not provide fine enough detail to make any further statement.

The next step, therefore, is to quantify the differences across ethnic groups by examining the sources of homeownership gaps between whites and nonwhite groups. We take advantage of the fact that for every cohort/time period the white ownership rate is greater than each of the corresponding nonwhite groups. Then, the white- nonwhite ethnic differentials are constructed by using the fact that the change in the gap between white homeownership rates and that of some other ethnic group, is easily rewritten as the difference in the endowment effect and the difference in the residual between the two groups:

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\begin{aligned}
&[\hat{P}(X_{white,k,t},\beta_{white,k,t}) - \hat{P}(X_{jkt},\beta_{jkt})] - [\hat{P}(X_{white,k-1,t-1},\beta_{white,k-1,t-1}) - \hat{P}(X_{j,k-1,t-1},\beta_{j,k-1,t-1})] \\
&= [\hat{P}(X_{white,k,t},\beta_{white,k,t}) - \hat{P}(X_{white,k-1,t-1},\beta_{white,k-1,t-1})] - [\hat{P}(X_{jkt},\beta_{jkt}) - \hat{P}(X_{j,k-1,t-1},\beta_{j,k-1,t-1})] \ (4) \\
&= [e(white,k,t) + r(white,k,t)] - [e(j,k,t) + r(j,k,t)] \\
&= [e(white,k,t) - e(j,k,t)] + [r(white,k,t) - r(j,k,t)]
\end{aligned}
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We perform this calculation for each of the non-white ethnic groups in the 1920, 1930 and 1940 cohorts. The results are displayed in Tables 5, 6, and 7. The first entry is the differential in the endowment effect, the second entry is the differential in the residual effect. Since the white homeownership rate is always greatest among the groups in that census and age group, a negative number indicates *convergence* to the white homeownership rate.

It is convenient to work backwards through time. This is because the most striking result is that in both 1990 and 2000, for all three ethnic groups, and all three cohorts, the endowment effect is negative and the residual effect is positive. (The sole exception is the black 1920 cohort in 1990 and 2000 which also had a negative residual effect.) This implies that over the two decades 1980 through 2000, nonwhites acquired those demographic characteristics which were conducive to homeownership at a rate greater than their white counterparts. Whether they actually did converge toward the white ownership rate in this time period depended therefore on the size of the relative residual effect. For example, Table 7 shows that the 1940 Hispanic cohort had a cumulative relative endowment effect in the 1980s and 1990s of almost 16 percentage point. During those decades, the gap between this group and their white counterparts would have closed by this amount, if the only thing that mattered were the characteristics of those groups. But this was not the case. The corresponding residual effect was close to 12 percent, resulting in a net closure of about 4 percentage points, congruent with Figure 3. This is the case with most of the cohorts, that the relative endowment effect is greater in absolute value than the relative residual effect, indicating overall convergence.

This is particularly so in the 1980s. (The 1990 relative residual effect is only "large" in the above sense, for the oldest Asian cohort.) This can be contrasted with the above discussion of

Figures 4, 5, and 6. In that context the residual effect is far more important in the determination of cohort ownership rate changes than is the endowment effect; it was suggested earlier that the endowment effect was particularly unfit to explain the stagnation in ownership rates that took place during the 1980s. Noting that the *relative* residual effects during this decade are small, it suggests that the changes in coefficients for all ethnic groups and cohorts were relatively similar and that whatever macroeconomic factors caused the overall ownership rate to stagnate, they were somewhat common to all these groups. Returning to Green's analysis of the 1980s, it suggests that the user cost changes that may have been at least partially responsible for ownership stagnation were a burden across all groups, which seems sensible.

This is echoed in other studies which focus more on ethnic differentials. In the case of Hispanics, Wachter and Megbolugbe (1992) calculate what might be called static relative endowment and residual effects. These are the more typical Oaxaca decompositions of ethnic differentials in a single cross section, in their case the 1989 American Housing Survey. In that paper they find that the vast majority (about 80%) of the homeownership shortfall of Hispanics relative to whites is due to endowment effects, but that 20% is still due to residual effects,. However, Coulson (1999), using the 1996 Current Population Survey, finds that this residual is substantially reduced, echoing results in Megbolube and Cho (1996)[3]. In their summary of the extant research on ownership trends of Hispanics, Cortes, Herbert, Wilson and Clay (2007) note that during the 1990s the ownership gap between Hispanics and whites closed, but "[d]espite the homeownership gains made by Hispanics during the 1990s, the homeownership gap in 2000 was even larger than it was in 1980." Tables 5, 6, and 7 shed some light on these trends. For all three cohorts, the endowment effect was between negative 8 and 10 percentage points. Thus if the factors that translate demographic and related

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[3] Megbolugbe and Cho measure housing demand, rather than homeownership per se, and note that the static residual effect is quite small for the Hispanic-White gap.

characteristics into homeownership decisions had remained constant for Hispanics and whites, the gap would have closed by that amount. However they did not remain constant and the residual effect removed between 5 and 9 percentage points of that gain. The sum of the two effects was negative, indicating that Hispanics of these cohorts did close the ownership gap, but the relative gains were strongest in the oldest cohorts. The changes in the coefficients had the least effect on them. The effects were similar in the 2000 census, Hispanics making relative gains in those characteristics which translate into ownership, but falling back due to the residual effect. This time the age effect is reversed; the relative gains were largest for the youngest of our three cohort, which is of interest because this cohort is already 50 years old, and in prime ownership years. Note that combining the 1990 and 2000 endowment effects shows that the ownership gap could have closed by 12 to 16 percentage points on the basis of demographic changes alone. The stagnation in the overall relative ownership gap observed by Cortes et al, and observed in our Table 1 is clearly due to white households in younger (1950 and moving forward) household obtaining ownership more quickly than Hispanics, the same phenomenon observed in older cohorts (and see footnote 2).

For Asian households, the story is fairly similar-- that is to say, negative endowment effects (indicating convergence) and positive residual effects. The difference is that the absolute values of the latter more often exceed those of the former, indicating a small net divergence over those two decades. Thus the relative increase in the overall gap over the two decades, as displayed in Table 1, is seen to be driven by factors not related to the demographic characteristics of that group but rather to changes in the homeownership environment. Of particular interest, with respect to the experiences of Asian and Hispanic groups, is the evident non-role of immigration. As noted above, immigration is a covariate in our probit regressions. If the nonconvergence of these two groups were due to the fact that recent immigrants generally are not homebuyers (Coulson 1999), this

would therefore manifest itself in a positive endowment effect; the observables that translate into homeownership would be getting worse. But this is not the case. We examine this more closely elsewhere in our current research program.

For black households over the same two decades, there is again a similarity in that the endowment effects are negative for all cohorts. But moreover, we have noted a difference is that for the oldest (1920) cohort of black households, the residual effects are also negative. Examining Figure 4, we see that the convergence between black and white ownership for this cohort is quite substantial, although because the gap in 1980 was huge, it was by no means closed by the time of the 2000 census. Previous literature that examined ownership gaps in the 1980s and 1990s (e.g. Wachter and Megbolugbe, 1992; Gyourko and Linneman (1996) found that both static endowment and residual effects were required to explain the ownership gap between whites and blacks. Progress in explaining the residual gap was made by focusing on factors not previously included in the endowment gap, such as wealth (Gyourko, Linneman and Wachter , 1996; Hilber and Liu; 2008), credit constraints (Gabriel and Rosenthal, 2005), and location (Deng, Ross and Wachter, 2003; Hilber and Liu, 2008)[4], so much so that these factors may completely eliminate the residual effect (Hilbert and Liu, 2008). To the extent that this is the case, we may surmise that such factors are responsible for the convergence of residual effects by the most senior of cohorts and the divergence of the younger two.

What is equally interesting is that this 1920 black cohort had equally strong convergence in both the endowment and residual components before 1980. The 1930 cohort also exhibited convergence of residual effects . Collins and Margo (2001), who perform decompositions that are

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[4] Krivo (1996) and Coulson (1999) focus on the impact of location on the endowment gap between whites and hispanics and whites and Asians

similar to ours[5], also note that residual effects indicate convergence before 1980 and attribute it to fair housing legislation and similar civil rights initiatives: They note "if post-1960 fair housing policies improved home ownership prospects for blacks, we might expect to see the legislative imprint in the residual component of the 1960–1980 decompositions in Table 6. Our finding, for example, that a substantial portion of the narrowing of the racial gap in homeownership between 1960 and 1980 was due to an improvement in the relative position of blacks in the residual distribution".

What our cohort analysis reveals beyond this statement is that such legislative measures (if they are the source of the residual effect) only accrued to black households that were most ready to step into ownership in the 1960s and 1970s. Thus for the 1920 cohort the residual effect was nearly 6 percentage points in the 1960s and 2.5 percentage points in the 1970s. For the 1930 cohort, it was correspondingly less: 1 percentage point in the 1960s and nearly 5 in the 1970s. And for the youngest group, Table 7 shows that the residual effect was, to the contrary, a source of divergence in both the 1960s and 1970s. The endowment effect also indicates divergence for this group during these two decades.

We have already noted that much of the divergence between whites and non-whites occurs in the first age decade of our analysis. This is true for all three ethnic groups and Table 7 shows that both residual and endowment effects have explanatory power for this phenomenon. But even older cohorts do not exhibit much in the way of convergent residual effects. There is much less extant literature on Hispanic and Asian homeownership trends in these early decade, but if the convergent residual effect for older black cohorts was due to the evolution of civil rights and fair housing policies, it is interesting to note that this evolution did not redound to Hispanic households as well.

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[5] Collins and Margo (2001) concentrate on white-black ownership differentials and use a longer panel, going back to the earliest censuses of the 20th century. They do not stratify their samples by cohort, however.

The only example of convergence in the Hispanic results is for the 1930 cohort in the 1970s and even then it is quite small. Any convergence of Hispanic households is entirely due to endowment effects.

Finally for Asians, the 1960 -1980 period is one of mixed results. Similar to black households, the two older cohorts have negative residual effects; this may cast doubt on the civil rights explanation proffered for black cohorts to the extent that Asian households were not a focus of such efforts.

4. Conclusions and Further research

There are seven overriding conclusions from this data exploration

(1)The homeownership rates obtained by white households over the past 40 years are never matched by any contemporaneous nonwhite cohort. There are always homeownership gaps.

(2) Homeownership generally increases over time for all cohorts and groups, except for those cohorts reaching old age.

(3) The changes in ethnic-cohort homeownership rates are largely due not to changes in household variables, but to changes in how those variables translate into ownership.

(4) The gaps between white and corresponding nonwhite cohorts does not exhibit large changes over time, but a general rule is that such convergence that does exist takes place as households age. White cohort ownership rates are more divergent for those in their 20s and 30s.

(5) In the two decades 1980-2000, nonwhite households exhibited substantial convergence of endowment effects. Those household characteristics that translate into homeownership were

acquired by nonwhite households at a faster rate than white households. If this had been all there

was to homeownership increases, the gaps between white and nonwhite cohorts would have closed

10 to 15 percentage points over the 20 years. The residual effect cancelled out much of these gains.

(6) In the 1960 to 1980 period, the results strongly differed across cohorts and races; for older

blacks, there was convergence due to both endowment and residual effects. We speculate, along

with Collins and Margo (2001) that this was due to civil rights, but the cohort analysis indicates that

this had no impact on younger black households. The results are similar for Asians (although the

convergent endowment effect was not observed for the oldest cohort). The residual effects do not

indicate convergence for Hispanics at any age during this period.

Considerations such as this bring us to our future research. There are two obvious

dimensions that we can pursue. The first is to extend the cohort analysis, in particular to more

recent groups, in order to obtain more evidence on the change in gaps between ages 20 and 30. The

other line of research is to break down both the endowment and residual effects to see which

variables and coefficients are important to changes in homeownership rates and gaps. The relative

impact of immigration on Asian and Hispanic cohorts would be important in this regard.

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	1960	1970	1980	1990	2000
Asian	0.44	0.49	0.53	0.52	0.53
Hispanic	0.45	0.43	0.44	0.42	0.46
Black	0.38	0.42	0.45	0.44	0.46
White	0.65	0.66	0.69	0.69	0.72
Aggregate	0.62	0.63	0.65	0.64	0.66

Table 1: US Census estimates of homeownership rates by ethnic group and census

Year	IPUMS Sample Name	Household Observations
1960	1960 general sample	529,984
1970	1970 1% Form 1 State	634,475
1980	1980 1% Metro	804,615
1990	1990 1%	918,782
2000	2000 1% Census sample	1,054,797

Table 2: Sample Descriptions

Variable	Coefficient
	(t-ratio)
HHINCOME	1.73E-07
	(1.370)
COLLEGW	0.656
	(2.630)
HSCHOOL	0.162
	(1.090)
NCHILD	0.070
	(1.890)
MARRIED	0.130
	(0.420)
SINGLE	-1.391
	(-3.670)
DIVORCED	-0.902
	(-2.460)
MALE	-0.041
	(-0.150)
CENTER	-0.274
	(-2.030)
NORTH	-1.114
	(-3.390)
SOUTH	-0.281
	(-0.670)
WEST	-0.495
	(-1.820)
IMMIGRANT	-0.078
	(-0.590)
CONSTANT	0.518
	(1.300)

Table 3: Probit coefficients and t-statistics from a regression of a homeownership binary on the indicated variables. The sample is of Asian-American households born around 1920, at the time of the 1960 census. Variable explanations in the text

Year	Age	Ownership Rate	Predicted Rate	Change in Rate	Endowment Effect	Residual Effect
1960	40	50.30%				
1970	50	64.54%	55.60%	14.2%	5.3%	8.9%
1980	60	67.21%	65.20%	2.7%	0.70%	2.0%
1990	70	61.13%	73.35%	-6.1%	6.1%	-12.2%
2000	80	57.27%	65.09%	-3.8%	4.0%	-7.8%

Table 4: Temporal Oaxaca decomposition of Asian-Americans born 1920

Ethnic Group			
Year	Asian	Black	Hispanic
1970	0.0028	-0.0100	0.0072
	-0.0761	-0.0589	0.0042
1980	0.1119	-0.0301	-0.0168
	-0.0922	-0.0249	0.0202
1990	-0.0538	-0.0409	-0.0860
	0.1123	-0.0007	0.0498
2000	-0.0460	-0.0161	-0.0233
	0.0613	-0.0168	0.0095

Table 5: Ethnic decomposition of the temporal Oaxaca decomposition, 1920 cohort. The first entry is the difference in the endowment effects between white households and the indicated ethnic group. The second is the difference in the residual effect.

	Ethnic Group		
Year	Asian	Black	Hispanic
1970	-0.0372	0.0204	0.0393
	-0.0212	-0.0107	0.0564
1980	0.0474	-0.0266	-0.0325
	-0.0834	-0.0477	-0.0195
1990	-0.0883	-0.0495	-0.0958
	0.0843	0.0224	0.0715
2000	-0.0563	-0.0174	-0.0276
	0.1121	0.0005	0.0205

Table 6: Ethnic decomposition of the
temporal Oaxaca decomposition, 1930 cohort.
See note above.

Ethnic Group			
Year	Asian	Black	Hispanic
1970	0.0346	0.0541	0.0610
	0.1366	0.0699	0.0758
1980	-0.0330	0.0037	-0.0208
	-0.0868	0.0252	0.0498
1990	-0.1129	-0.0760	-0.0979
	0.0798	0.0229	0.0872
2000	-0.0850	-0.0295	-0.0616
	0.0945	0.0156	0.0297

Table 7: Ethnic decomposition of the temporal Oaxaca decomposition, 1940 cohort. See note above.
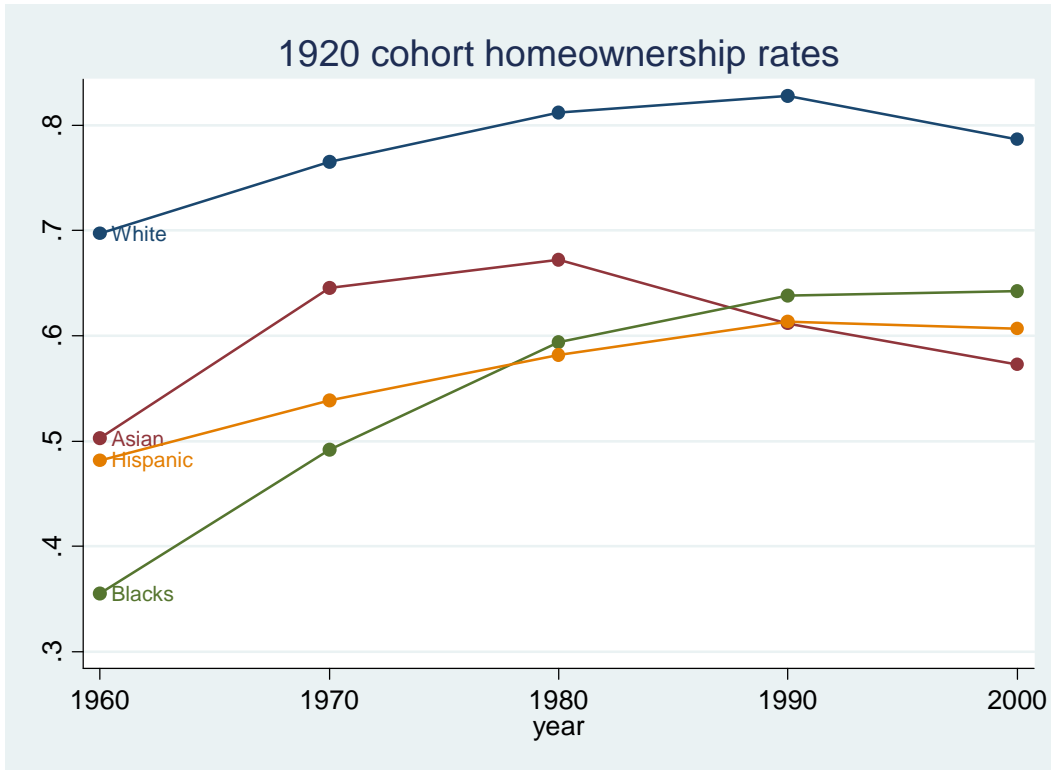
Figure 1: Homeownership rates, by ethnic group, 1920 cohort

1930 cohort homeownership rates

Figure 2

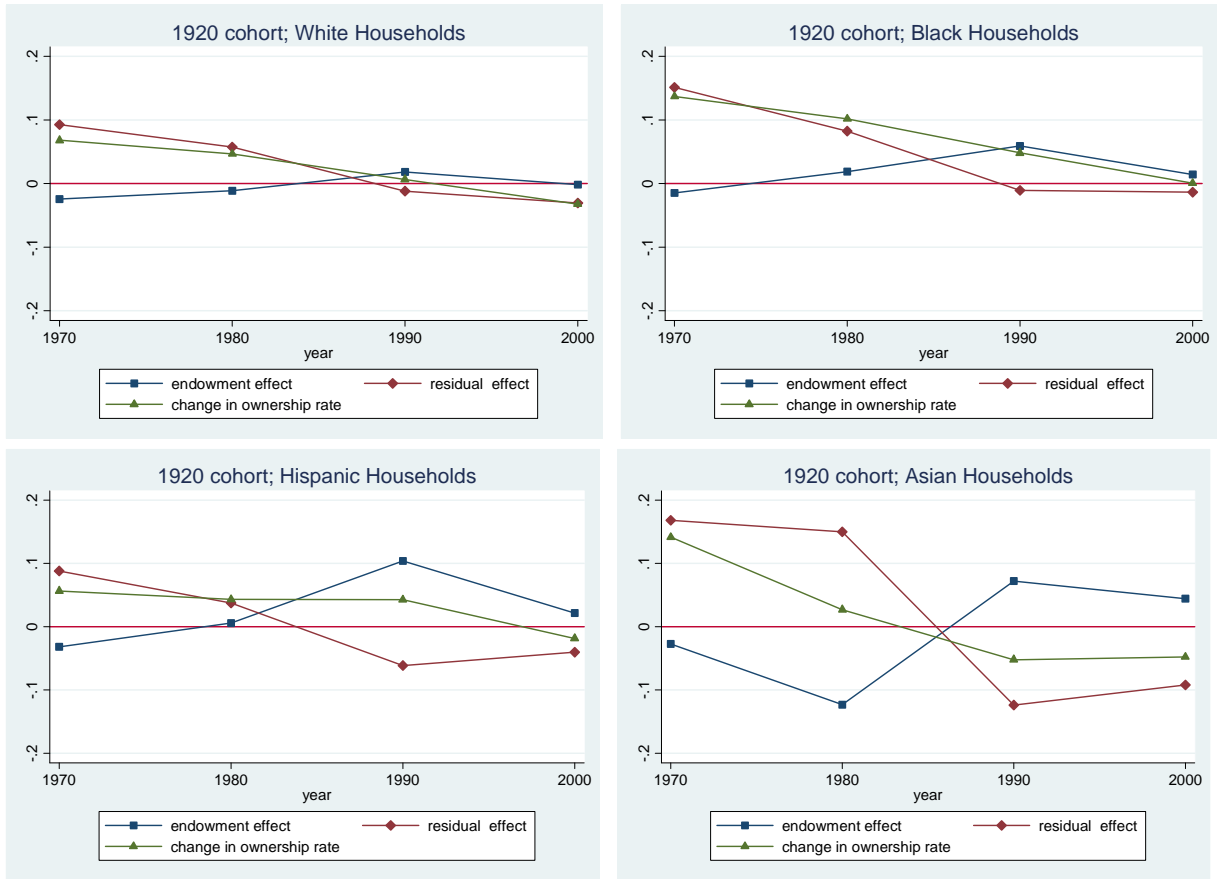1940 cohort homeownership rates
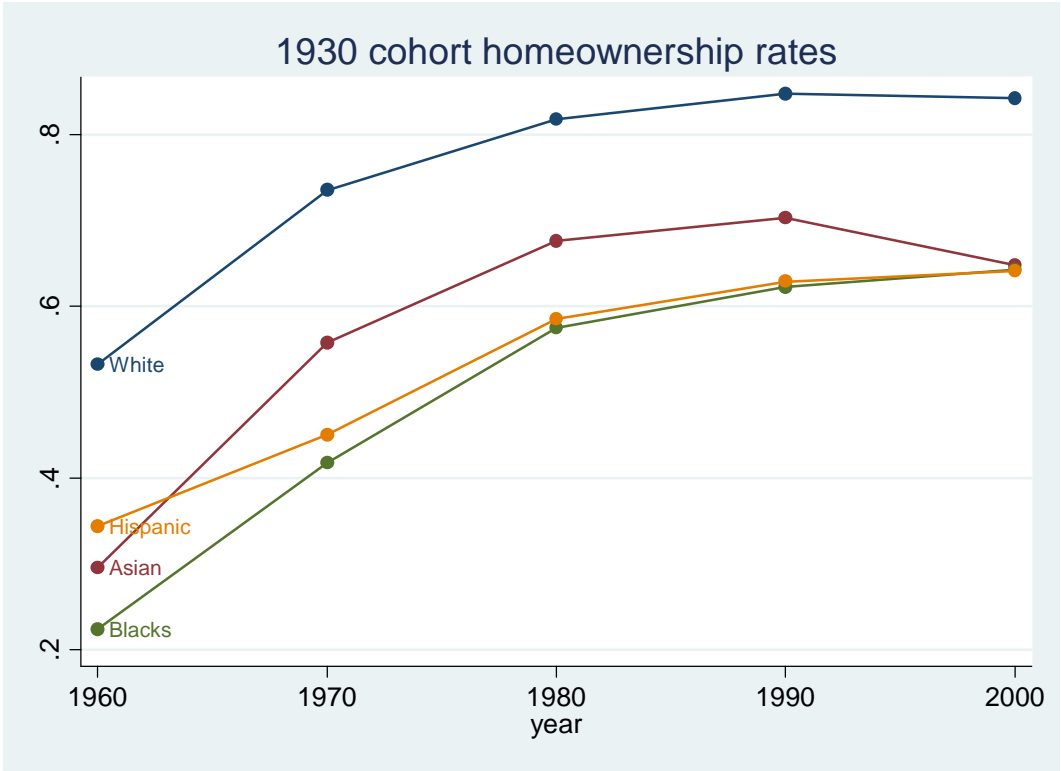
Figure 3

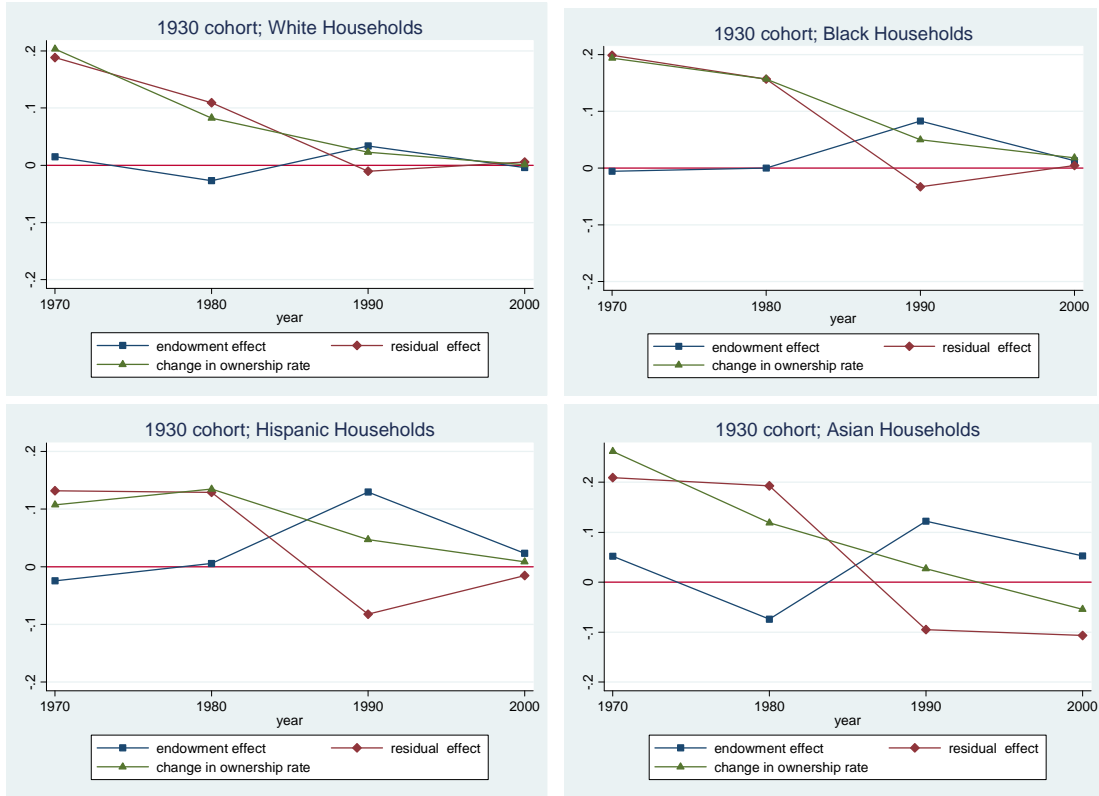Figure 4: Change in ownership rates (drate) and endowment effect (endeff) by ethnic group, 1920 cohort
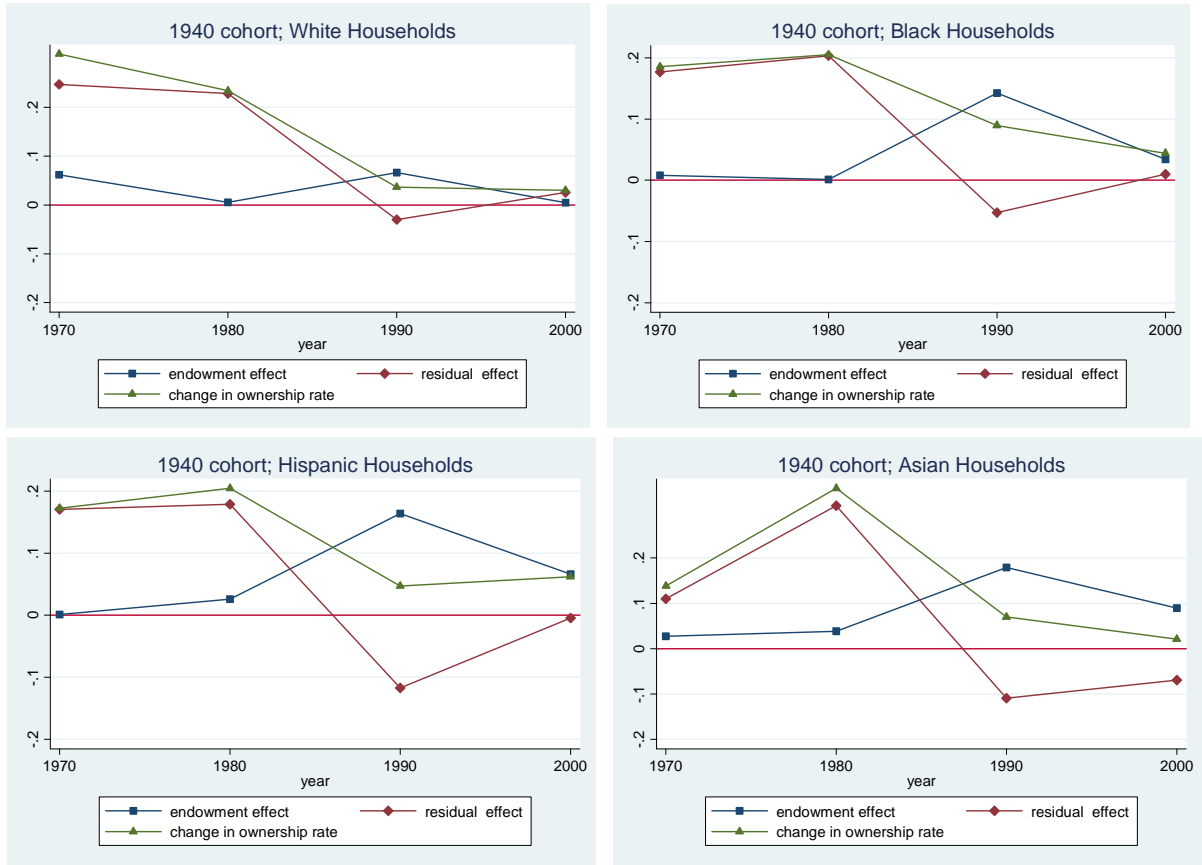
Figure 5

Figure 6 -1940 Cohort