Title: Condominium Conversions and GIS: A Policy/Planning Support System

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Abstract: Condominium conversions have gained popularity due to low interest rates, a lack of vacant residentially-zoned land, and increasing construction costs. Conversions have also been viewed as problematical because they reduce the stock of rental housing, and so are thought to have an adverse impact on lower-income households. This paper employs GIS to test a tenure choice/housing supply model which compares the cost of renting versus owning, given households' income constraints. The model is designed to predict the proportion of people who rent under various circumstances. The model can also be used to make predictions of when it becomes profitable to convert rental apartments to ownership condominiums. We apply the model to a San Francisco Bay Area community. GIS is used to show the spatial relationships between predicted values of the model (e.g., condominium conversions) and demographic characteristics of the community (e.g., income groups).

I. Introduction

In this paper we examine condominium conversions in San Francisco. We present an economic model of condominium conversions that includes both supply-side and demand-side elements. We examine the robustness and predictions of the model by implementing it using GIS.

There is a tremendous demand for affordable ownership and rental housing in California. However, affordable housing production is inadequate. According to *Locked Out 2004: California's Affordable Housing Crisis,* the lack of production, particularly the lack of rental housing production, contributes to steadily increasing home prices and rents. Inadequate housing production coupled with increased demand due to population growth and immigration has resulted in California having the most expensive housing of any state in the nation.[1] Due to the affordability crunch and changing demographics many homebuyers are purchasing smaller homes such as condominiums or other attached homes.[2] The market has responded to the demand for ownership condominiums in part

through condominium conversion, defined generally as the conversion of rental apartments to ownership condominiums.

Condominium conversions change the balance between rental and ownership housing. Therefore, they present local government with complex challenges. On one hand, condominium conversions provide a response to the strong demand for ownership housing opportunities for a growing segment of society, and they also benefit the municipality in which they occur. Condominium conversions improve the housing stock through upgrades before sales and conversions increase property values from sale of the units.[3] They may also carry other social benefits such as contributing to more stable neighborhoods where children do better in school and are less likely to get involved with crime.[4]

However, condominium conversions reduce the apartment rental inventory, thereby increasing rents. Thus, conversions limit housing options for low-income people. Additionally, there are costs, tangible and intangible, associated with tenant displacement. Tangible costs include tenant relocation assistance. Intangible costs include disruption to the life of the tenant from a forced move.

San Francisco has grappled with these challenges since 1979 when it began regulating condominium conversions.[5] Many believe that increasing access to homeownership for existing renters is an important public policy goal for San Francisco,[6] since The City has one of the most expensive housing markets in the nation for both ownership and rental housing.[7] Due to the limited supply of developable land in San Francisco, condominium conversion is viewed as an easier way to expand homeownership opportunities than new construction.[8]

San Francisco formally defines condominium conversion to mean "…. a subdivision which changes the type of ownership of real property to that defined as a Condominium project, Community Apartment project or Stock Cooperative and in which two or more condominiums, community apartments or units in a stock cooperative are newly created wholly or in substantial part within an existing structure or structures, regardless of the present or prior use of such structures and of whether substantial improvements have been made to such structures."[9] San Francisco's official policy towards condominium conversions as expressed in The City's General Plan Housing Element Policy 2.3 states that conversions should not disrupt the balance between rental and ownership units. Displaced tenants or tenants likely to be displaced should be protected to the maximum extent possible. These policies are implemented by closely evaluating conversions and limiting the number of conversions annually.[10] The City's condominium conversion process has evolved over the past 27 years into a thorough and sophisticated process.

Beginning in 1979, the County of San Francisco Board of Supervisors began regulating condominium conversions by amending the subdivision code to allow the conversion of existing rental units into condominiums if 40 percent of tenants indicated intent to purchase their unit.[11] There were some provisions for the preservation of low- and moderate-income housing; however there was no limit on the size of the building or the number of units that could convert.[12] A subsequent study of the effects of the regulations found that many tenants had been paid to sign the intent to purchase their units and that many units had been bought by investors. In addition, many converted condominium units were vacant. Due to the problems with enforcing the tenant protection provisions of the regulations and the high vacancy rate of converted units, in

1982 the Board of Supervisors placed a moratorium on condominium conversions to address the problems with the existing regulations.[13] Soon thereafter the Board adopted an updated condominium ordinance incorporating two key features, 1) large complexes built for rental housing and occupied by tenants could not convert, and 2) condominium conversions were limited to owner-occupied buildings of six units or less and to only 200 applications (i.e., buildings) per year.[14]

A lottery system has been designed to allocate approvals for condominium conversion in San Francisco. Lottery tickets are sold annually for a fee of $150.00 per building with only one lottery ticket for each building for first year applicants. Only owners with a letter of authorization, signed affidavits from all building owners, and a grant deed are allowed to purchase tickets. Additionally, participants must certify that no eviction of a senior, disabled person, or catastrophically ill tenant has occurred.[15] On lottery day (usually in February), the first 200 units drawn are eligible to apply for conversion that year. The additional participants are wait-listed. Losing properties may reapply and buy additional tickets for each year proof is provided of being wait-listed.[16] To get a sense of the strong demand for condominium conversions, in 2006, over 400 properties were wait-listed containing over 800 units.[17]

II. Literature Review

There is a vast literature on the demand for housing and the supply of housing. Our review focuses only on those contributions that are most significant in understanding the demand for and supply of condominium conversions.

First, we will examine some determinants of demand for owner-occupied housing. Racial and ethnic composition is particularly important in determining homeownership

rates. Studies have shown that, holding other factors constant, households of Chinese ancestry have higher homeownership rates, and households of African American ancestry have lower homeownership rates than the average.[18]

The supply side factors that affect housing include construction costs, availability of residentially zoned land, public policy regarding conversions, and the restricted supply of entry level homes. High construction costs lower the level of new construction, thereby constraining the housing stock of an area.[19].The availability of residentially zoned land influences the supply of housing. Growth management ordinances, development impact fees, and preferences of local government for fiscally lucrative commercial development act to limit the housing opportunities within a jurisdiction.[20] These regulations significantly reduce the supply of rental housing.[21] This results in pressure to provide owner-occupied housing through condominium conversions. Local public policy in the form of condominium conversion ordinances influences the rate of conversion activity.[22]

III. Model

The economic model of condominium conversions is based on the expected advantage of the individualized ownership compared with either renting or tenancy-in-common. Because of the peculiarities of the San Francisco ordinance governing condominium conversions, no extant model exactly fits the situation, but elements of previously published models are incorporated in ours.

Individualized ownership provides several advantages: the property right has a survivorship, but perhaps more importantly, the property right provides the possibility of more control over the space occupied. Both these considerations mean that the asset value of individualized ownership is greater than the asset value of tenancy-in-common.[23]

We can refer to the difference between these values as the "individualized property right premium."

If the individualized property right premium is sufficiently large, then all tenants-in-common will favor changing the ownership structure to individualized ownership. The individualized property right premium must be greater than the costs of conversion. These costs of conversion may include modifications to the structure to make individualized units possible (e.g., separate metering of gas and electricity). However, in the San Francisco case, it is likely that the costs of conversion are more closely tied to two circumstances:

a.) City-imposed fees for conversions;

b.) Costs associated with code compliance for properties that are accepted for conversion

The size of the individualized property right premium depends on several factors:

a.) the age of the prospective owner; the older the owner, the shorter is the time horizon, and, thus, the greater is the focus on disposal of assets;

b.) individual preferences concerning disposal of assets to beneficiaries;

c.) the value of the real property relative to total assets; the greater is the value of real property to total assets, the more valuable will be the possibility of directing the asset to survivors;

The comparison of individualized ownership vs. renting is more fully developed in the literature. The focus is on a comparison of the user cost of housing for each tenure type. Renting is a stream of payments over the term of the rent tenure. From the landlord's point of view this stream of payments is an asset. From the renter's point of

view, the stream of payments is a liability. Ownership likewise involves a stream of payments from the owner's perspective – usually in the form of mortgage payments. These payments go toward an asset that has one crucial distinguishing characteristic compared to the stream of rental payments: the right to sell the property.

Comparison of these streams of payments is complicated by tax considerations. Mortgage interest payments on the primary owner-occupied residence are tax-deductible. Likewise, costs incurred in maintaining a rental property are tax deductible, and rental property owners may receive investment tax credits. These tax considerations mean that the streams of payments of rents and mortgages must account for the tax considerations for the demand-side of the owner-occupied market (mortgage interest deductibility) and for the supply-side of the rental property market (tax treatment of costs and investment credits).

Roughly speaking, the choice model of renter vs. owner involves a comparison of the discounted present value of the stream of payments associated with each tenure type. The household will choose the tenure type that corresponds to the lowest user cost of housing. However, straightforward comparison of the discounted present values of the streams of payments does not account for some important considerations. Most significant are imperfections in capital markets: people cannot borrow unlimited sums of money; they cannot even borrow sums of money they might credibly repay. Due to the problems of moral hazard and adverse selection, limitations are placed on borrowing in the form of downpayments, income qualification, credit histories, etc.

Households will gravitate toward the rental tenure type if:

a.) they have lower income;

b.) they have poorer credit histories;

c.) the household size is smaller (no or few children);

d.) the household is younger – mobility is more important;

e.) the household belongs to a particular ethnic group; some ethnic groups emphasize the cultural value of ownership more than others.

The San Francisco lottery means that all these considerations must be viewed through the lens of uncertainty. The *expected value* of the streams of payments (accounting for tax and other considerations) is the significant factor. Furthermore, there is a *transactions cost* associated with the filing of paperwork and the need to meet all the bureaucratic requirements for applying for conversion.

More formally, the tenure choice (demand-side) model looks like this.[24] We assume that households maximize a function, U, called *utility* that represents their satisfaction based upon consumption of goods and services. We assume that the function depends on consumption in two periods (U_1 and U_2) – period 1 ("today") and period 2 ("tomorrow"). The arguments of the function depend on the period in question, and on whether the household is an owner or a renter. For period 1 the household chooses between consumption of housing services (h) and consumption of a composite good representing all non-housing consumption (x). For period 2, utility depends on income (which depends to some extent on choices made in period 1 as described below).

In terms of the utility function we can represent Period 1 and Period 2 utility as:

(1) $U_1(x,h) + U_2(w)$

where x is non-housing consumption, h is the amount of housing services consumed, and w is period 2 income.

We assume (simplifying the model of Henderson and Ioannides) that the *units* of housing consumed are always the same (each household consumes one unit of housing whether renter or owner), but renters and owners consume housing with different *intensities*.

The intensity of consumption, denoted u, is chosen by the household. It has two aspects. First, the greater the intensity of consumption, the more satisfaction the household derives from a unit of housing. Second, the greater the intensity of consumption, the greater is the cost. These costs may be borne entirely by the household, in the case of owner-occupied housing, or they may be borne only partly by the household in the case of rental housing.

The consumption of housing services is given by $F(u)$, where $F'>0$ and $F''<0$. In contrast to Henderson and Ioannides, we assume that renters and owners have different intensity consumption functions for the same unit of housing, in addition to having different cost functions for consumption of housing. The rationale for this assumption is that different ownership statuses allow for different uses of the same space, and therefore for different satisfaction levels from the same unit of housing.[25] Individual owners can modify their units at will. Tenants in common have a more adulterated property right in the individual unit, and we assume that they derive less housing services from the same unit. Renters have no property rights in the unit, and can make few or no modifications to make the unit generate more housing services. These different degrees of housing services generated by the same unit can be represented by different functions F. For

example, let F_{own} represent the owner-occupiers intensity function, and let F_{rent} represent the renters intensity function.

Households are assumed to maximize utility over period 1 and period 2, subject to constraints or side conditions. The constraints differ, depending on whether the household is a renter or an owner.

Costs associated with housing differ by intensity of use and tenure status. Generally, more intense use generates greater cost. Furthermore, we assume, following Henderson and Ioannides, that the greater the property right the higher the cost.[26] Let T denote the non-pecuniary cost of housing. Let T_{own} indicate the cost for owners and T_{rent} indicate the cost for renters. We assume $T'>0$ and $T''\geq 0$. Furthermore, $T_{own}>T_{rent}$.

The constraints faced by households differ depending on whether the household is an owner or a renter. For owner-occupiers, the constraint in Period 1 is:

$$(2.1) \quad y_1 = x + P + S$$

where y_1 is period 1 income, P is the price of housing, and S is savings. Period 2 total income for the owner occupier is:

$$(2.2) \quad w = y_2 + E_g P + S(1+r) - T_{own}(u)$$

where y_2 is period 2 earned income, E_g is expected growth of the asset value of owner-occupied housing and r is the rate of interest.

For renters period 1 income is given by:

(3.1) $y_1 = x + R + S$

Period 2 total income is given by

(3.2) $w = y_2 + S(1+r) - T_{rent}(u)$

The general difference between owners and renters can now be understood from these different arguments of the utility function and different constraints. Ownership has the benefit of generating more housing services for a given level of intensity from the same housing unit, but generally carries with it greater costs. In period 1, owners pay the price P, which generally would be higher than the rent R paid by renters. On the other hand, in period 2 owners must bear greater costs, T_{own}, compared to renters' costs, T_{rent}. Renters potentially carry forward to period 2 greater savings, because they have greater residual income to devote either to non-housing consumption or savings (assuming $P>R$). However, renters cannot realize capital gains, E_gP (nor do they risk capital losses in the case where $E_g<1$).

Owners (respectively renters) maximize utility given in (1) subject to expressions (2.1) and (2.2) (respectively, (3.1) and (3.2)) by choosing u and S. The optimal intensity and savings of owners (respectively, renters) are designated u^*_{own} and S^*_{own} (respectively, u^*_{rent} and S^*_{rent}). Henderson and Ioannides consider the case where F_{own} equals F_{rent} and $T_{own}>T_{rent}$. They derive the result (among others) that the intensity of use is greater for

renters (because incomplete markets prevent renters from being charged the full cost associated with the intensity of their use of the housing unit).

We consider the case where $F_{own}>F_{rent}$ and $T_{own}>T_{rent}$. We denote the optimal intensity and savings when owning (respectively, when renting) as u^*_{own} and S^*_{own} (respectively, u^*_{rent} and S^*_{rent}). Substituting the optimal intensity and savings when owning into the utility function (1) above (with the appropriate function F) gives the realized or indirect utility when owning.

$$(4) \qquad V_{own} = U_1(y_1 - P - S^*_{own}, F_{own}(u^*_{own})) + U_2(y_2 + P + (1+r)S^*_{own})$$

Similarly, substituting the optimal intensity and savings when renting into the utility function (1) above (with the appropriate function F) gives the realized or indirect utility when renting.

$$(5) \qquad V_{rent} = U_1(y_1 - P - S^*_{rent}, F_{rent}(u^*_{rent})) + U_2(y_2 + P + (1+r)S^*_{rent})$$

The difference in indirect or realized utilities,

$$(6) \qquad \Delta V = V_{own} - V_{rent},$$

determines whether the household will desire to rent or to own. If expression (6) is positive, the household desires to own (at the current housing asset prices, P, and rents, R) given the household's income stream y_1 and y_2. If expression (6) is negative, the

household desires to rent (at the current housing asset prices, P, and rents, R) given the household's income stream y_1 and y_2. Whether (6) is positive or negative determines the demand for ownership and rental housing by that household. Generally, ΔV depends on the household's income stream and the parameters that characterize the utility function. We assume that ΔV is an increasing function of the first period income.[27]

To determine prices and rents, we must consider the supply side of the ownership and the rental housing markets. Generally, the literature has considered the long-run equilibrium relationship between the ownership and rental housing markets.[28]

The long run equilibrium condition states the relationship that must obtain between the price on the ownership market and the price on the rental market. Rental housing and owner-occupied housing are substitutes in consumption (that is, they are substitutes from the point of view of demanders). Rental housing and owner-occupied housing are also substitutes in investment (that is, they are substitutes from the point of view of suppliers). The long run equilibrium condition means that the price of the asset must equal the discounted present value of the stream of payments derived from that asset. If the asset returns a fixed amount R and lasts forever, this relationship will be[29]

(7) $P = R/r$.

If the asset has a finite life or if the stream of returns varies over time, the long run relationship between prices and rents will be more complicated. An important additional complication concerns expectations about future prices and future rents. Housing markets in particular may be subject to price bubbles. This means that there may be substantial

deviation from the long run equilibrium relationship between prices and rents.[30] Nonetheless, a relationship like (7) is an important benchmark.

The short run equilibrium condition determines the price of owner-occupied housing and the rent based on equating the quantities demanded on each of these markets with the quantities supplied in the short run. The difference between the short run equilibrium and the long run equilibrium concerns the adjustment of supply. In the long run, quantities supplied on the owner-occupied market and quantities supplied on the rental market reflect adjustments made by investors so that returns to each type of investment are equalized. In the short run, such equalization of returns may not occur.

Indeed, the fact that investors cannot adjust the investment type at will (because there is a San Francisco ordinance that prohibits such changes) suggests that the long run equilibrium condition will not be achieved. That there are applications for conversion that are not granted suggests that in many cases the price-rent configuration would make conversion advantageous. If there is no expectation of price appreciation (that is, assuming $E_g = 1$ in our model) then the ratio of owner-occupied price to rent must be greater in the short run equilibrium than in the long run equilibrium (as we discuss below).

In the short run, the price of owner-occupied housing is determined by the supply of owner-occupied units, and by factors affecting the demand for owner-occupied units – in particular income. Given our assumption that ΔV is increasing in income, we expect owner-occupiers to have higher income than renters (which is substantiated by the data). If the owner-occupied market and the rental market are in short run equilibrium, but not in long run equilibrium, and if the adjustment would be toward more owner-occupied

housing, then the ratio $(P*r)/R$ implied by expression (7) would be greater than if long run equilibrium obtained.[31]

IV. Data

Data used in this analysis are drawn from three sources, 1) United States Census Bureau 2) San Francisco Enterprise GIS website, and 3) San Francisco Department of Public Works. The data provide detailed information about the characteristics of the population and housing stock as well as the amount and location of condominium conversions applications (both successful and unsuccessful). The majority of the data was obtained for the year 2000 for all block groups in San Francisco County unless otherwise noted.

Census 2000 Summary File 3 (SF3) was used to obtain detailed housing data. The data contains information about housing stock characteristics such as number of units within each structure as well as value and gross rent. Since San Francisco only permits conversions of buildings with six units or less, buildings with 2 to 6 units are targeted in our analysis.

The San Francisco Enterprise GIS website was used for downloading GIS layers for use in project maps. GIS layers obtained include The City's geographic features such as streets, water bodies, and public buildings. Characteristics of the population such as race and income were also downloaded as layers and mapped.

The San Francisco Department of Public Works provided extensive information about the number and location of condominium conversion applications throughout The City. Data was provided for the years 1999 to 2006 for all active and recorded condominium conversions.

Demand side variables used in this analysis include median income, percent Asian, and percent African American as well as the price-to-rent ratio. The interest rate used in calculations was obtained from the Federal Home Loan Bank Board. Supply side variables used in the analysis include the percent of housing units that are rental, the percentage of housing units between 2-6 and the amount of recorded condominium conversions.

Median household income within the block group and the percentage Asian or African American are included as demand side variables used to predict the likelihood that inhabitants of various block groups will be attracted to owner-occupied housing, and hence, be more likely to attempt condominium conversion. According to the cited literature, the higher the median household income and the higher the percentage Asian, the more likely is the household to attempt condominium conversion. The lower the median household income and the higher the percentage African American, the lower is the likelihood of the household to attempt condominium conversion. Income status and racial propensities for homeownership is supported by the literature.

The price to rent ratio is expressed as: $[(P*r)/12]/R$ where P = value of owner occupied house; R = rent; r = interest rate. Price and rent data was obtained from the US Census 2000 SF3. The mortgage interest rate for December 1999 was obtained from the Federal Home Loan Bank Board. The higher the price to rent ratio, the more favorable of an option is homeownership, thus contributing to the demand for condominium conversions.

The percentage of rental housing units that are in critical range (2-6 unit buildings) in each block group is used to determine the amount of buildings that will meet the City's

initial requirements for condominium conversion. As previously discussed, the City only allows building of six units or less to convert. Actual condominium conversion applications, both proposed and completed conversions, are used to calibrate the model.

V. Empirical Methods

We created GIS layers for price-to-rent ratio, median income, percent Asian, and percent African American by block groups for the County of San Francisco. We geocoded the addresses of all condominium conversions for the years 2000 and 2001. We created map overlays of the condominium conversions with layers representing the four main variables of interest (price-to-rent ratio, median income, percent Asian, and percent African American).

VI. Results

The results displayed by the GIS maps are consistent with the main predictions of the condominium conversion model. The ethnic variables considered (especially percent Asian) do not appear to be strongly associated with condominium conversions. We discuss possible explanations for this below. Four layers including the variables price-to-rent ratio, median income, percentage Asian, and percentage African American were mapped against a layer for actual condominium conversions that took place in 2000, creating four maps. (In the Appendix we present analogous maps for price-to-rent ratio and median income with overlays for condominium conversions for the year 2001.)

Although our results are strongly suggestive, a few caveats are in order. The most significant limitation of the analysis is that it involves aggregated data (at the block group level), not transactions data. This means that we ascribe to transactions (condominium

conversions) features of the aggregated variable. Furthermore, we do not have information on the actual characteristics of the condominium conversions. Therefore, we cannot say the degree to which these units differ from the typical housing unit in the same block group.

Figure 1 below shows the price-to-rent ratio overlaid with condominium conversions for the year 2000. This figure shows that condominium conversions are concentrated in areas with a higher price-to-rent ratio, which is consistent with the theory we presented.

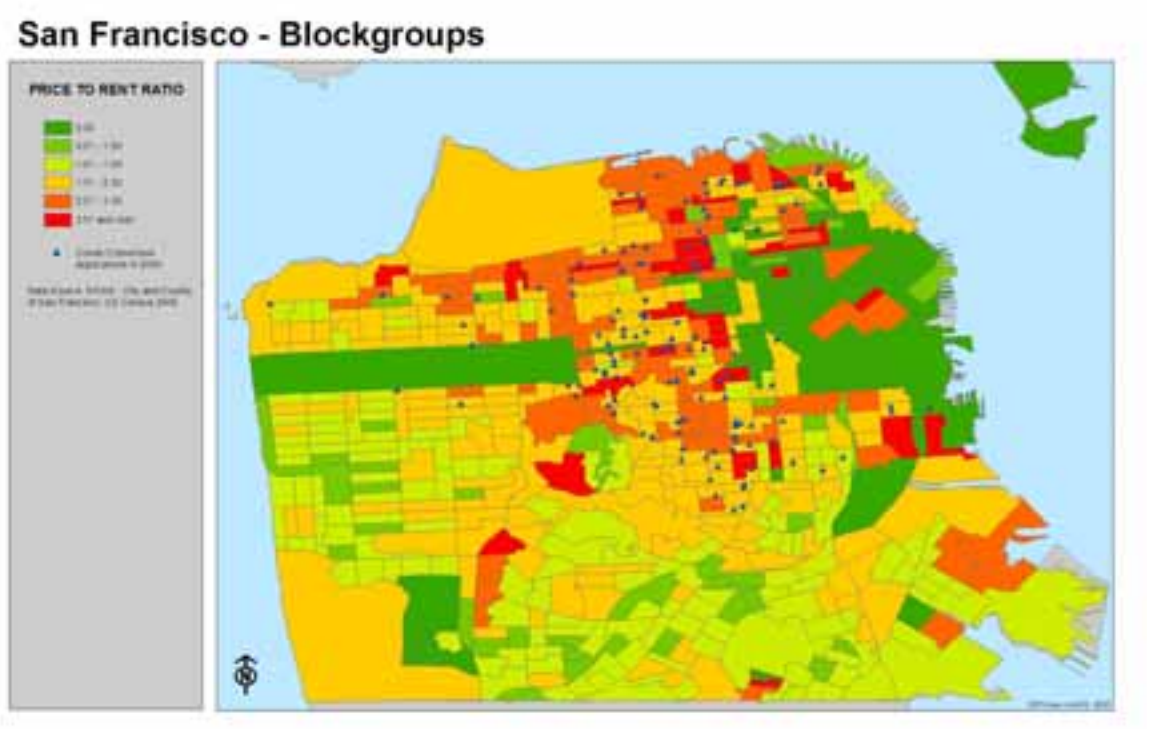

Figure 1. Price-to-rent ratio and Condominium Conversions, 2000

Broadly speaking, the median income map showed that in areas with higher income, more condominium conversions took place. Figure 2 shows median income overlaid with condominium conversions for the year 2000. Condominium conversions

are concentrated in areas with a higher median income, which is consistent with our assumption that ΔV is increasing in income.

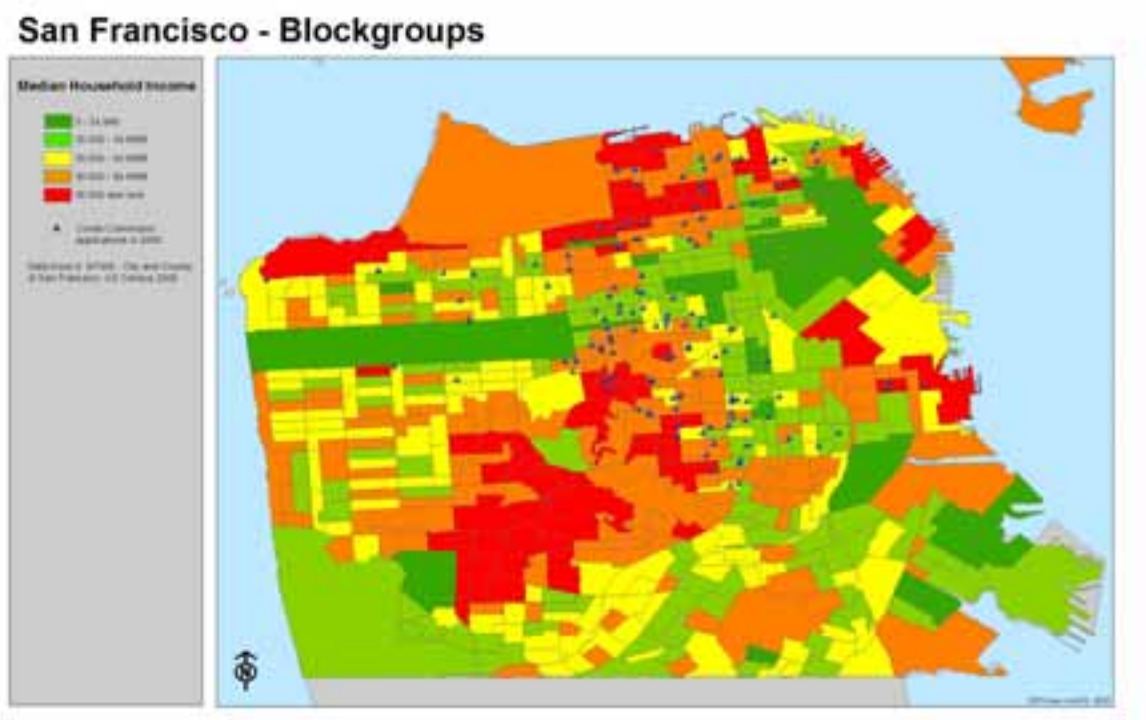

Figure 2. Median Income and Condominium Conversions, 2000

Although the majority of condominium conversions occur in block groups where the median income is high, a significant number occur in areas of mid-level median income. However, these areas of mid-level median income border areas of high median income. So, the occurrence of condominium conversions in these areas may be related to "gentrification," which is more likely to occur in border neighborhoods. The assumption we use concerning the connection between income and the desire to convert is supported, but not as strongly as the connection between the price-to-rent ratio and conversions.

We examined the relationship between ethnic variables suggested by the literature on homeownership and condominium conversions. Specifically, we examined the

relationship between the percentage Asian and the percentage African American and condominium conversions. Figure 3 shows percent Asian overlaid with condominium conversions for the year 2000. This figure shows that condominium conversions are not especially concentrated in areas with a higher percentage of Asian. One possible explanation for this is that the studies that form the basis for higher homeownership rates among Asians may be based on cases where Asians are a minority, and often at the higher end of the income scale. The large and diverse Asian community in San Francisco means that a broader range of income groups are included among Asians.

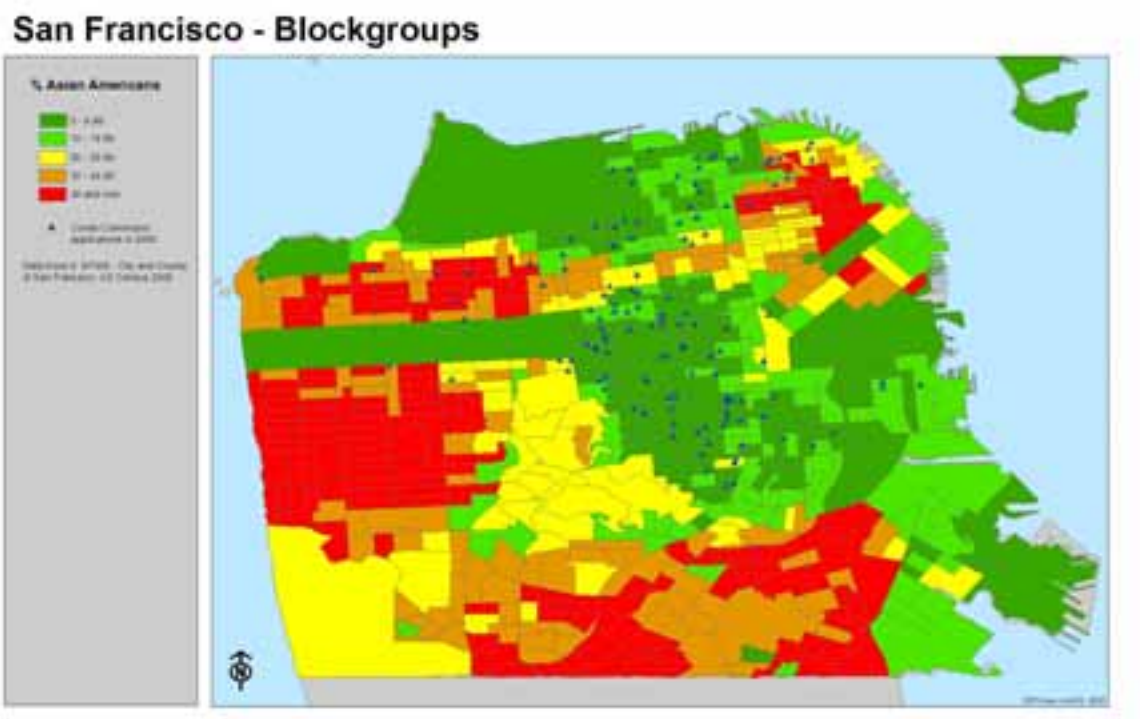

Figure 3. Percent Asian and Condominium Conversions, 2000

Figure 4 shows percent African American overlaid with condominium conversions for the year 2000. This figure shows that no condominium conversions occurred in areas that are substantially African American.

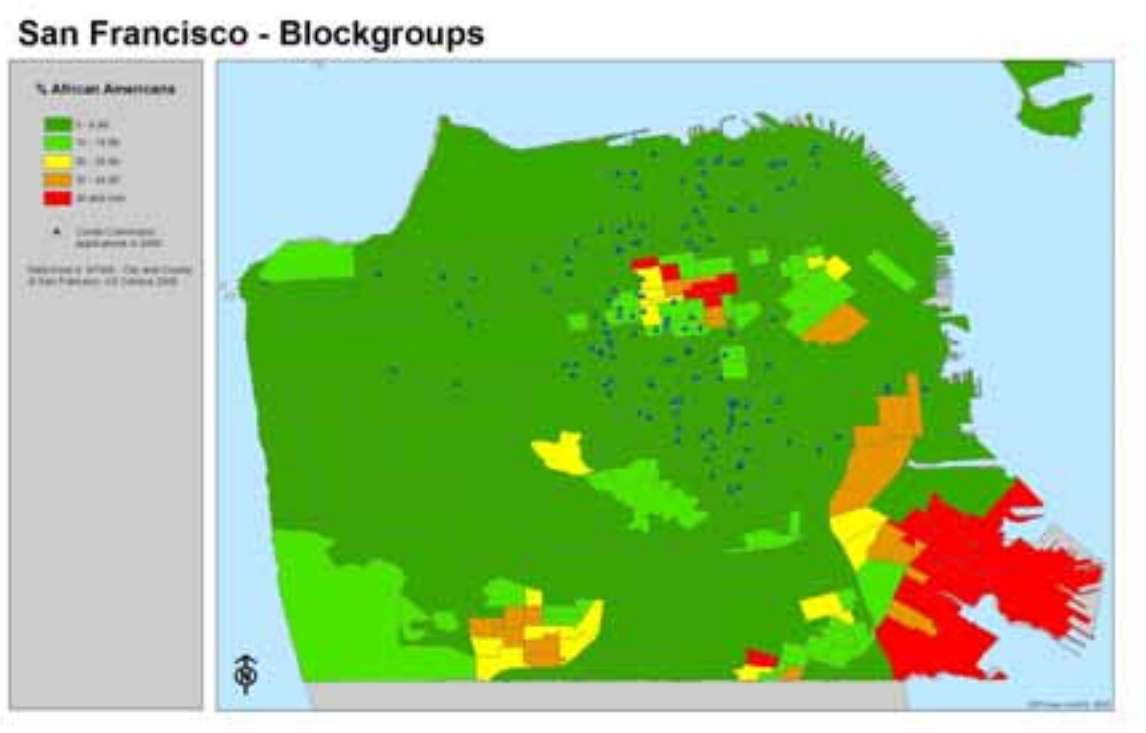

Figure 4. Percent African American and Condominium Conversions, 2000

VII. Summary and Conclusions

This paper has examined condominium conversions in San Francisco. An economic model testing the utility of various tenure forms was developed and calibrated using GIS. The results indicate that in addition to our general theory being correct, GIS is a powerfully illustrative tool with which to conduct research to inform policy decisions.

Acknowledgments

We wish to thank Cheryl Herrera, San Francisco Department of Public Works for data about condominium conversions in San Francisco.

Appendix

In this appendix we provide the overlay maps for condominium conversions with price-to-rent ratio and median income for the year 2001.

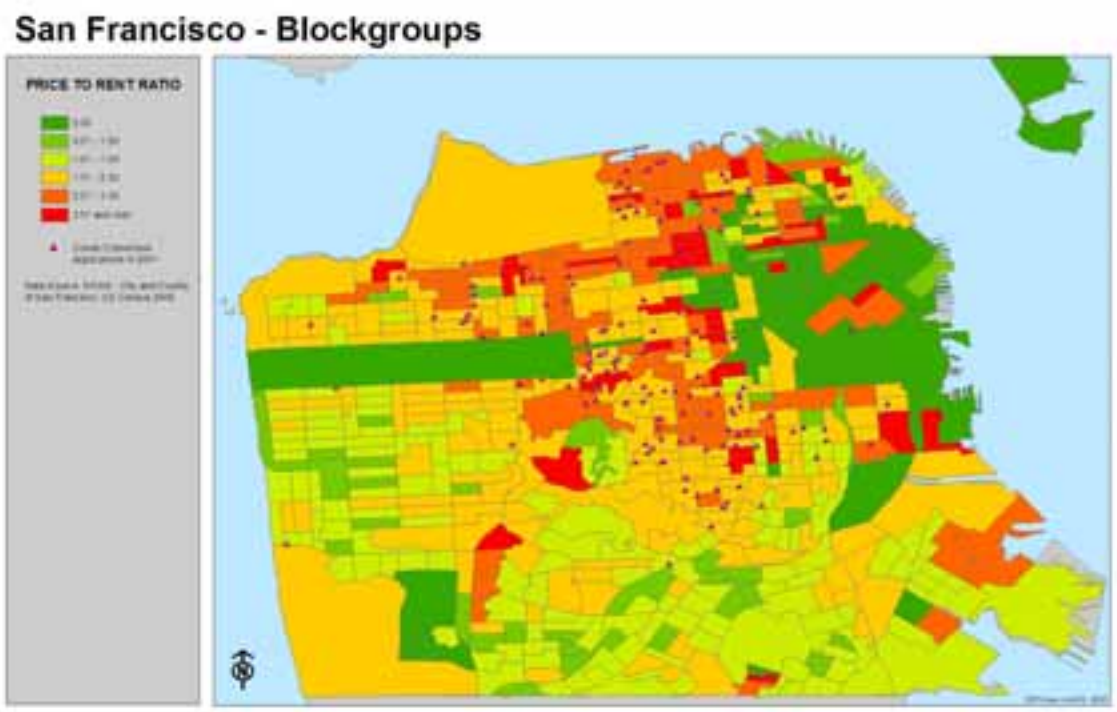

Figure 1A. Price-to-rent ratio and Condominium Conversions, 2001

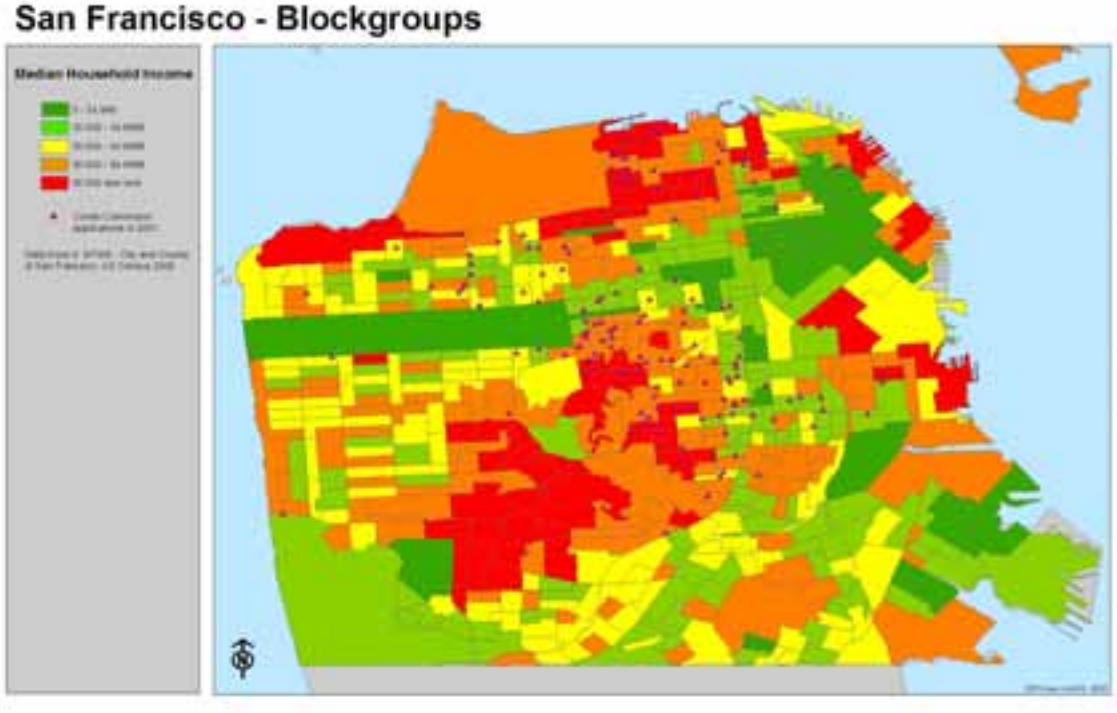

Figure 2A. Median Income and Condominium Conversions, 2001

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[22] John Dinkelspiel, Joel Uchenick, and Herbert Selesnick. *Condominiums: The Effects of Conversion on a Community*. (Massachusets: Auburn House Publishing Co., 1981), 124.
[23] Under tenancy-in-common, the right to occupy the space reverts to the common owners; under individualized ownership the right to occupy the space reverts to the survivor, or can be assigned by a will. Assuming that individuals care about the disposition of their property after their deaths, this means that the maximum price they would be willing to pay for an asset that can be passed on is greater than the maximum price they would be willing to pay for an asset with the identical characteristics that cannot be passed on.
[24] This model is most closely based on Henderson and Ionnides (1983). We note where our development deviates from theirs most significantly.
[25] Some ideas along these lines are developed by Barzel (1997).
[26] Henderson and Ioannides assume this for the case of renters vs. owners – the only case they consider; we extend the concept to differences between individual ownership and tenancy in common, by a rationale similar to theirs.
[27] It is possible to obtain this as a result for a particular specification of the parameters of the utility function.
[28] Henderson and Ioannides' expression (6) [p. 101] is a long run equilibrium condition which accounts for the differential costs they assume for owners and renters. Gallin (2004) gives a similar expression. DiPasquale and Wheaton (1996; especially pp. 58-59) develop some straightforward expressions for the long-run relationship between prices and rents.
[29] See DiPasquale and Wheaton (1996, p. 58).
[30] Shiller, Robert J., *Irrational Exuberance*, Princeton: Princeton University Press, 2000.

[31] To see this, assume that a short run equilibrium obtains at P_0 and R_0. Assume that there is a tendency to convert rental units to owner-occupied units. If demand remains the same, and the supply of owner-occupied units increases, and the supply of rental units decreases, the result will be a new pair of equilibrium prices P_1 and R_1, where $P_0>P_1$ and $R_0<R_1$. For given interest rate r, the ratio $[(P_1r)/R_1]<[(P_0r)/R_0]$.