J Hous and the Built Environ (2012) 27:413–425
DOI 10.1007/s10901-011-9259-0

ARTICLE

Examining spatial patterns in affordable housing: the case of California density bonus implementation

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Received: 17 September 2010 / Accepted: 21 December 2011 / Published online: 10 January 2012

Abstract California State Density Bonus Law §65915–18 financially incentivizes housing developers to produce affordable housing by granting density bonuses to those who designate a percentage of the total units for residence by low or moderate income households. By incorporating affordable housing units alongside market-rate units, state density bonus law fosters opportunities to enhance neighborhood level socio-economic diversity. This paper investigates the effectiveness of density bonus policy at promoting socio-economic diversity within the City of San Diego by examining locational patterns of density bonus implementation and neighborhood demographic characteristics. This study utilizes spatial and non-spatial statistical analyses to identify trends and correlations in density bonus usage, housing stock, and racial and economic characteristics. The results indicate that density bonus usage in San Diego has not fostered socio-economic integration; rather its usage is clustered in neighborhoods characterized by high concentrations of Hispanics, Blacks, and multi-family housing units. The findings underscore the need to refine supply-side affordable housing tools so that they are effective in a range of land markets, and not only in the traditionally lower value land markets where minority households tend to reside.

Keywords Housing affordability · California density bonus law · Housing planning · Spatial analysis

1 Introduction

This study examines California state density bonus law, a voluntary inclusionary zoning law, and its relationship to neighborhood socio-economic diversity. The paper investigates the effectiveness of density bonus policy at promoting socio-economic balance by examining patterns of policy implementation and neighborhood demographics within the City of San Diego.

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San Diego provides an ideal context for analysis primarily because it is one of a few exceptions to density bonus underutilization across the state and also because between 1990 and 2000 "high levels of segregation for Blacks in the City and increasing segregation rates for Latinos metro-wide suggest that much remains to be done to insure that these populations have equal access to all communities" (McArdle 2002, p. i). In 2008 the City of San Diego expressed a commitment to preserving and creating racially and ethnically mixed communities in its general plan update (City of San Diego 2008). Furthermore, the City recognized the state density bonus law as a policy mechanism for achieving this goal of balanced communities (*Affordable Housing*, October 12, 2006).

The key research question is focused on determining whether implementation of this program has fostered integration or compounded segregation. In order for this policy mechanism to promote socio-economic diversity it must facilitate affordable housing production within moderate to high land value neighborhoods as well as within lower land value neighborhoods. Accordingly, this study examines whether density bonus developments are concentrated in low land value neighborhoods, where poorer households, renters, and racial/ethnic minorities tend to reside. The study's key hypothesis is that density bonus units are concentrated in neighborhoods with relatively higher rates of poor households, renters, and ethnic/racial minorities. The underlying theory supporting this hypothesis is that land developers are motivated to maximize profits, and that building density bonus units in low value land markets where marginalized populations tend to locate, is safer for land developers in terms of securing profits in the face of reduced sales prices for the affordable units.

Spatial and non-spatial analyses, as well as expert interviews, were employed to identify and understand patterns in density bonus implementation across San Diego and its relationship to patterns in household income, housing characteristics and race. The identified patterns are examined in relation to local and state government housing goals, the effectiveness in meeting these goals via the density bonus mandate, and motivations on the part of land development professionals who ultimately implement this program. This study contributes an important assessment of California density bonus law and the intended and unintended outcomes of its implementation.

2 Background

Municipalities use zoning as their primary regulatory device for ensuring certainty and consistency amongst land uses, however zoning's effects are also widely denounced (Cullingworth and Caves 2003). Critics have charged zoning with producing sterile and rigid urban forms (Jacobs 1961), low density, auto-dependent development or sprawl (Fischel 1999; Levine 2006), and have considered it vulnerable to local fiscal and political agendas (Babcock and Bosselman 1973). Adversaries have also criticized zoning for creating severe and persistent patterns of racial and economic segregation when ordinances give preference to single family, owner-occupied uses, impose minimum lot and housing size requirements, and exclude secondary units and mixed-uses (Fischel 2004). Inclusionary zoning is intended to surmount exclusionary practices. Although it has been extensively evaluated for its ability to produce affordable housing (e.g., Benjamin and Stringham 2004; Brunick 2004), fewer scholars have examined inclusionary zoning's capacity to engender neighborhood-level diversity. One such study by Freeman (2004) at the Brookings Institution reviewed the locational and neighborhood trends in siting the Low Income Housing Tax Credit (LIHTC) across the US during the 1990's and found

persistent concentrations of these units in central cities with disproportionate shares of Blacks and low income households. Calavita and Mallach (2010) provide an excellent comparative examination of trends in international inclusionary housing policies and underscore the challenge of achieving social inclusion through this type of policy mechanism. They further note that European governments at the local, state and federal levels are generally more attuned to issues of spatial segregation and social exclusion than their US counterpart.

State Density Bonus Law, California Government Code Section §65915–18, is a land-use policy intended to enhance the economic feasibility of affordable housing development for developers. The law mandates that local governments grant density bonuses to developers who choose to designate a percentage of units for residence by low or moderate income households within otherwise market-rate residential developments. Under the provisions, developers are authorized to deviate from permissible densities by up to 35% beyond local zoning standards and are eligible to receive reduced parking requirements and between one and three other concessions, such as deviations on design standards and expedited permit processing. State density bonus law also requires local governments to adopt ordinances that delineate local implementation of this State law.

Although the density bonus law's stated objective is to increase affordable housing development onsite with market-rate housing development projects, public aversion, market forces, regulatory obstacles and local inaction have curtailed density bonus application and thus limited its impact on affordable housing production. Whereas underutilization has garnered attention from policymakers, practitioners and academic planners, the potential to foster socio-economic diversity, has been less studied in planning literature and political dialogue.

The relative benefits of voluntary versus mandatory bonus density regulation have been examined in the literature (Mallach 1984; Porter 2004). Many scholars assert that mandatory policies are substantially superior to voluntary policies for generating housing that is affordable to extremely low, low and moderate income persons. Further, according to Mallach (1984) mandatory "inclusionary housing programs are the best, perhaps even the only, currently available means by which residential integration can be actively fostered…" (p. 45). Thus, voluntary density bonuses have been criticized because they usurp governments' ability to enforce balanced development citywide (Lerman 2006; Mallach 1984). One successful example of mandatory inclusionary housing is provided by Montgomery County, Maryland's Moderately Priced Housing Law. This innovative, countywide mandatory inclusionary zoning law and density allowance program was adopted in 1974 by the county council in response to rapid growth and associated increases in land values which caused developers to build almost exclusively large-lot, high priced homes, unaffordable to new home buyers and moderate to low income households. The program requires between 12.5 and 15 percent of the total units in every new subdivision or high-rise building of 50 or more units be sold or rented at specified, affordable prices. Developers are granted density bonuses of up to 22 percent. The law has garnered broad support in Montgomery County from new homebuyers, employers and businesses, advocates, and elected officials. Since 1974, more than 10,000 units of affordable housing have been built in Montgomery County (Montgomery County Department of Housing and Community Affairs 2011).

Some researchers advocate for density bonuses to mitigate the financial impact of mandatory inclusionary requirements on developers and to obviate legal challenges. In describing the New Jersey Supreme Court's famous Mount Laurel decision, Rubin et al. (1990) emphasize the legal function of density bonuses to surmount regulatory exclusion.

Porter (2004) argues that if appropriately configured, density bonus incentives can sustain profitability for developers and can neutralize the negative impacts of mandatory inclusionary policies on local housing markets. The combination of mandatory inclusionary zoning and density bonus programs in the Montgomery County case appears to provide an example of a long-term, sustainable affordable housing policy approach.

Researchers have also identified particular factors that can negate the efficacy of density bonuses. Development regulations such as parking requirements and setbacks can limit developers' ability to utilize density bonuses (National Housing Conference 2004). Carlson and Mathur (2004) noted that parking requirements can impede the number of units a developer can build thereby limiting cost off-sets. Porter (2004) recommends that municipalities consider in-lieu fees and off-site construction as elements of inclusionary policies that proffer density bonuses. Some of the programs reviewed have explicit mention of flexibility in parking requirements.

The current research attempts to examine the spatial patterns in density bonus unit construction across San Diego in order to comment on the extent to which this supply-side affordable housing program is fostering social and economic dispersion. The research is intended to illustrate whether refinements to this particular policy tool are necessary so that more socially integrated, affordable neighborhoods can be achieved.

3 Methodology

San Diego, California, is the largest jurisdiction within San Diego County and the urban center of the San Diego metropolitan area. With an estimated population of 1,256,951 in 2006, San Diego is the second largest city in California and the eighth largest in the nation (U.S. Census 2006). The coastal city shares a border with Tijuana, Mexico which significantly influences it's economic and demographic composition. The city of San Diego is divided into 64 Community Planning Areas (CPA) which approximate neighborhoods and are utilized by the city to carrying out long range land use planning. In particular, each of the CPAs has a long range community plan and together, these community plans are adopted by the city council as the land use element of the city's general plan. Figure 1 displays the boundaries of the CPAs in San Diego, as well as the census tract boundaries that serve as the unit of analysis for this study. There are 269 census tracts within the city of San Diego's border.

Relationships between neighborhood characteristics and density bonus usage in San Diego are examined using spatial and conventional statistical techniques. Spatial analysis techniques allow for the identification of statistically significant patterns in the distribution of particular variables such as clustering or dispersion. Coupling spatial and non-spatial analytic techniques has been employed for example to examine the spatial relationships between socio-economic characteristics and housing patterns (Pamuk 2006).

For the purposes of this study, data was obtained from four sources: the City of San Diego Housing Commission (SDHC), U.S. Census Bureau, the San Diego Association of Governments (SANDAG), and the San Diego Geographic Information Source (SanGIS). The San Diego Housing Commission, a public agency established by the San Diego City Council in 1979, supplied the "Density Bonus Master List" for this study. The "Density Bonus Master List" is continuously maintained to monitor density bonus usage and compliance. This list contains the residential projects' addresses, the number of units per development, the amount of affordable units constructed, and the terms of affordability under each covenant. As of January 2007 the list showed a total of 278 development

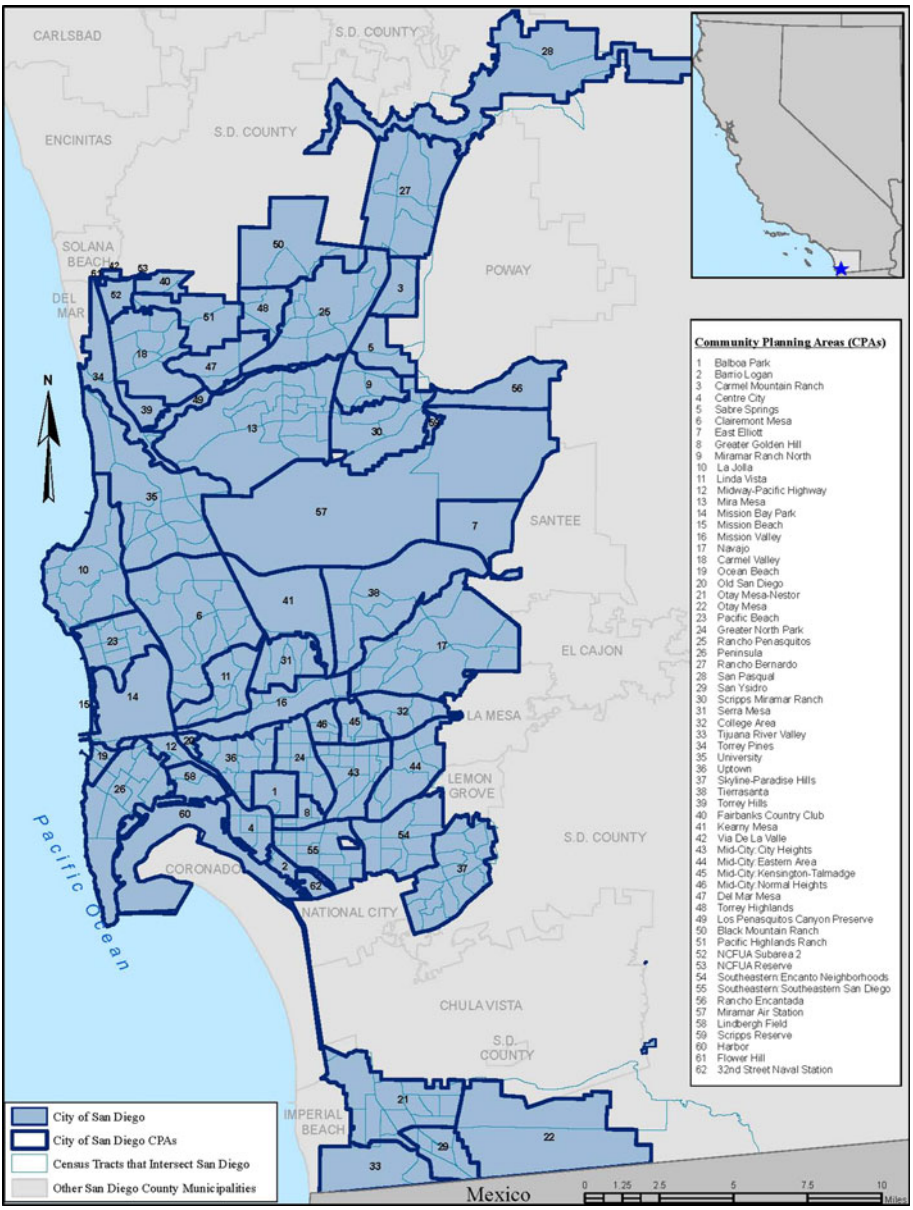

Fig. 1 Community planning areas in the city of San Diego

projects with 6,918 total units of which 1,044 of these units were affordable (San Diego Housing Commission 2007). U.S. Census Summary File 1 and 3 data were obtained from SANDAG's Data Warehouse and from the U.S. Census Bureau download center.

The key hypothesis tested in this research is that since developers are motivated by minimizing cuts in profits, they utilize the density bonus program in relatively low land value markets where racial minorities, families in poverty and high residential densities

exist. This strategy on the part of the developer in other words, minimizes risks to profit margins. Relatively lower development costs (i.e. lower land values) ensure that the increase in the total units the developer is able to sell, as provided via the density bonus, will offset the reduced sales price of the affordable units. Three groups of independent variables are therefore employed in the model specification, including those associated with poverty, race, and density. The dependent variable is the number of density bonus units normalized by total housing units. The unit of analysis is the census tracts. Table 1 shows the independent variables employed in the regression analysis with the expected direction of each variable's relationship with the dependent variable.

Table 2 displays descriptive statistics for all independent variables and the dependent variable.

Table 3 summarizes density bonus developments by CPA according to the San Diego Housing Commission's record of density bonus projects. As Table 3 shows, the number of density bonus units in existing developments ranges from three to 923 with a mean of 25 units per structure. The number of affordable density bonus units within the developments ranges from one to 71 with a mean of four. The largest of the developments exist in neighborhoods outside of the density bonus concentration area, specifically in the University City neighborhood.

Density bonus developments were mapped and then tested for the significance of spatial patterns using spatial autocorrelation and hot spot analysis. These statistical tools identify spatial trends in data across a geographic area, determine the statistical significance of these trends, and then displays findings as a map feature. The spatial autocorrelation tool calculates the Global Moran's *I* index and a *z*-score indicating whether the null hypothesis can be rejected, meaning that the variable of interest is randomly distributed across the study area. This tool allows for an evaluation of whether a spatial pattern associated with a given variable is clustered, dispersed, or random (ESRI 2011). The Global Moran's *I* index takes into account both the location and value of the variable of interest. Spatial autocorrelation can also assist in determining a value for the maximum clustering distance where the spatial processes are most active or pronounced. This distance measure can then be used with the hot spot analysis tool which allows for testing the significance of high or low values of the variable of interest across a study area. The hot spot tool typically uses the Getis-Ord General *G* statistic.

Table 1 Summary of independent variables

Independent variables	Expected relationship w/density bonus usage
Economic	
Percent families in poverty	(+)
Median household income	(–)
Median contract rent	(–)
Racial and ethnic	
Percent Hispanic	(+)
Percent Black	(+)
Percent Asian	(+)
Housing	
Percent renter-occupied housing units	(+)
Percent multi-family housing units	(+)
Housing units per residential acre	(+)

Dependent variable is density bonus units/total housing units by census tract

From U.S. Census Bureau (2000) summary files 1, 2 & 3; SANDAG (2000)

Table 2 Descriptive statistics for independent and dependent variables

Variable	*N*	Minimum	Maximum	Mean	Standard deviation
Percent families in poverty	267	0	0.449	0.103	0.111
Median household income	269	0	$99,718	$45,398	$21,169
Median contract rent	269	0	$2,001	$831	322$
Percent Hispanic	269	0.028	0.957	0.250	0.236
Percent Black	269	0.002	0.606	0.075	0.092
Percent Asian	269	0.003	0.771	0.127	0.128
Percent renter occupied	269	0	1.0	0.483	0.277
Percent multi-family housing	269	0	1.0	0.389	0.299
Housing unit per residential acre	269	0	214.4	15.2	20.4
Density bonus units per total housing units	269	0	0.052	0.002	0.007

From U.S. Census summary files 1, 2 & 3, 2000; SANDAG Data Warehouse (2000)

Table 3 Density bonus developments by community planning area as of October 2007

Community planning area	Total projects	Total units	Affordable units
Clairemont Mesa	2	130	19
College Area	2	37	8
Encanto Neighborhoods	21	536	103
Greater Golden Hill	13	313	40
Greater North Park	48	387	67
Linda Vista	9	369	42
Mid-City Communities	115	1,064	173
Mira Mesa	1	355	71
Mission Valley	1	78	15
Ocean Beach	1	5	1
Otay Mesa-Nestor	9	472	80
Pacific Beach	12	90	17
Peninsula	2	27	5
San Ysidro	9	772	140
Skyline Paradise Hills	1	5	1
Southeastern	22	549	95
University City	3	1,507	135
Uptown	7	158	20
Totals	278	6,918	1,044

This summary is based on the San Diego Housing Commissions' records at the time agreements were made

Correlation analysis (Pearson's Correlation Coefficient) and multiple regression analysis were also performed in order to understand how the independent variables vary with the dependent variable, and whether a significant regression model could be specified to estimate density bonus usage. The independent variables relate to economic, racial and housing characteristics that are potentially indicative of low land values.

Finally, several local housing experts were interviewed for this research to illuminate issues related to spatial clustering of density bonus usage in San Diego.

4 Summary of the results

This section summarizes the results of the spatial analysis, multiple regression analyses, and interviews.

4.1 Spatial analysis findings

Spatial analytic tools test whether apparent clustering or dispersion is random or statistically significant. The spatial autocorrelation and hot spot analyses suggest significant clustering of density bonus units in San Diego, as well as significant relationships between the patterns of density bonus usage and various demographic characteristics. The spatial autocorrelation analysis shows that density bonus projects are clustered and that clustering is statistically significant (Z score = 26.15, peaking at a 2.25 mile radius). According to the results, there is less than 1% chance that the clustered pattern is random. The peaking value, 2.25 miles, provides the researcher with an understanding of the extent across which the spatial processes are at work in the environment causing clustering.

The *hot spot with rendering analysis* tool utilizes the autocorrelations results to map clusters. The autocorrelations tool identified a peak distance band of 2.25 miles in which clustering is most statistically significant. The hot spot tool uses that distance range to measure density bonus unit clustering across the city. It generates a Z score for each census tract and classifies the Z scores from hot to cold. The Z score represents the statistical significance of clustering for the specified distance. The highest Z scores are classified as hot, whereas insignificant Z scores are displayed as cold. Results of the hot spot analysis mapping show that significant clustering is occurring in the CPAs adjacent to Centre City San Diego, where the central business district (CBD) is located. As Fig. 2 displays, there is statistically significant density bonus clustering in the Mid-City, North Park, Balboa Park, Southeastern San Diego, and portions of the College Area and Encanto neighborhoods. An additional "manual" examination of the distribution of density bonus units across San Diego showed that approximately 85 percent of density bonus units are located within five miles of the San Diego CBD, about 10 percent are located between 5 and 10 miles of the San Diego CBD, and only about 5 percent are located more than 10 miles from the CBD. With evidence that density bonus development is clustered, the second facet of this analysis is devoted to investigating potential relationships between clustered density bonus developments and economic, racial and housing characteristics to determine if such correlations may possibly explain the clustering phenomenon.

4.2 Pearson's correlations and multiple regression results

Table 4 displays the results of the Pearson's Correlation test to identify whether any of the independent variables tend to vary with implementation of density bonus units.

The results of the correlation assessment indicate that several of the independent variables are significantly correlated with the dependent variable, including median household income, percent of families in poverty, percent of multi-family dwelling units, percent Black, percent Hispanic, percent of renter-occupied units, and median contract rent. The direction of the significant relationships in each of these cases was as hypothesized in Table 1. Residential density and the percent Asian did not show a significant correlation with the usage of density bonus units.

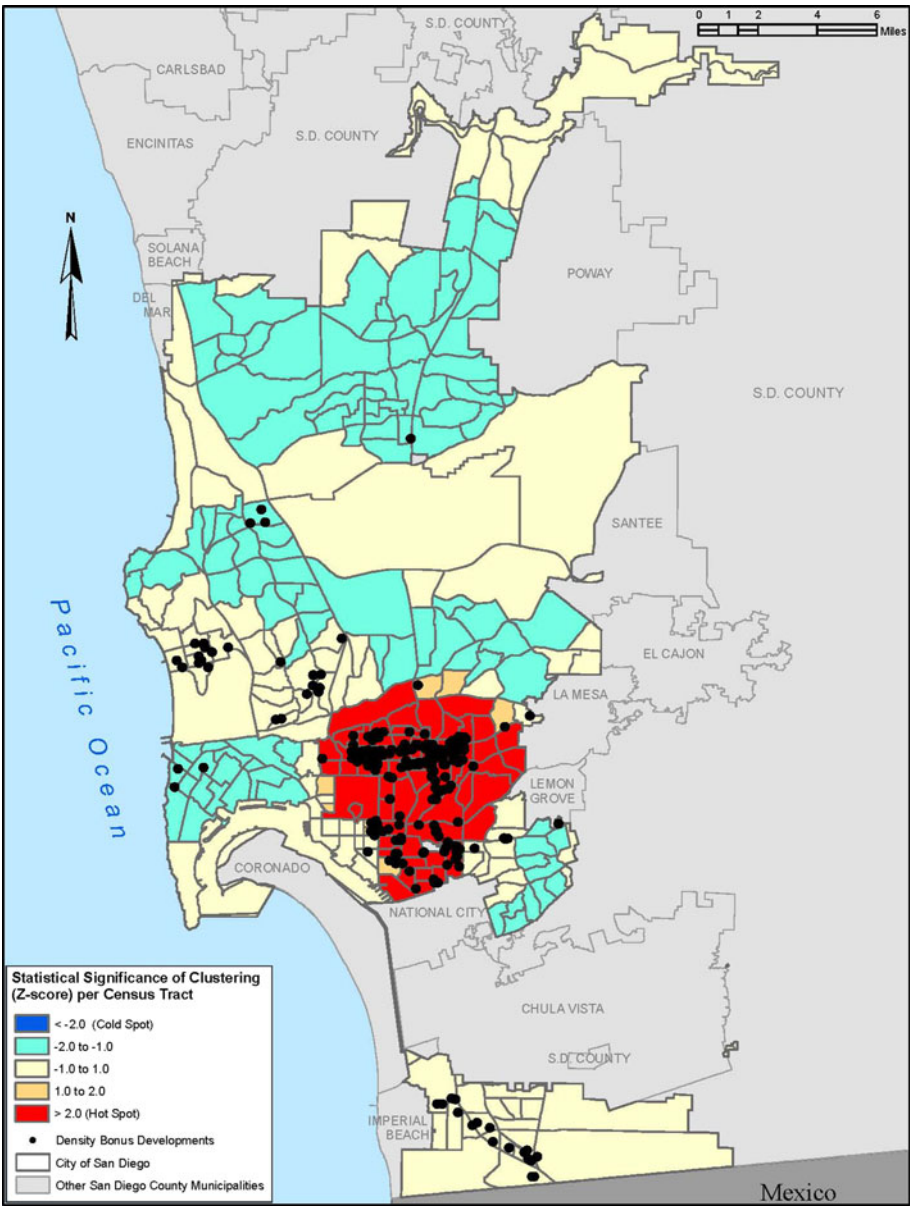

Fig. 2 Spatial clustering of density bonus developments in San Diego, California

Table 5 displays the results of the multiple regression analysis where the model specification is based upon the hypothesis that the intensity of bonus density usage is a function of economic characteristics (poverty, income and median rent), racial characteristics (Hispanic, Black, and Asian), and housing characteristics (multi-family, residential density, and percent renters).

Table 4 Pearson's correlations results

Independent variable	Pearson's correlation with density bonus units/total housing units	Sig.
Percent families in poverty	0.353**	0.000
Median household income	−0.205**	0.001
Median contract rent	−0.176**	0.004
Percent Hispanic	0.356**	0.000
Percent Black	0.170**	0.005
Percent Asian	−0.036	0.559
Percent renter occupied	0.238**	0.000
Percent multi-family housing	0.213**	0.000
Housing unit per residential acre	0.023	0.706

** Correlation is significant at the 0.01 level (2-tailed)

Table 5 Multiple regression analysis results[a]

Independent variable	*B*	Std error	Beta	*t*	Sig.
Percent families in poverty	0.004	0.007	0.063	0.576	0.565
Median household income	1.028E-8	0.000	0.029	0.379	0.705
Median contract rent	3.900E-6	0.000	0.167	2.067	**0.040**
Percent Hispanic	0.011	0.003	0.367	3.485	**0.001**
Percent Black	0.011	0.005	0.141	2.135	**0.034**
Percent Asian	0.001	0.003	0.019	0.332	0.740
Percent renter occupied	−0.003	0.003	−0.099	−0.856	0.393
Percent multi-family housing	0.010	0.003	0.403	3.477	**0.001**
Housing units per residential acre	−6.065E-5	0.000	−0.168	−2.324	**0.021**

Bold indicates the *t*-statistic is significant and therefore the coefficient is significantly different from zero

R: 0.44; R^2: 0.197; Adjusted R^2: 0.169

The results of the multiple regression analysis indicate that the overall model is statistically significant ($F = 6.992$, $p = 0.000$). Furthermore, three of the predictor variables (percent Hispanic, Percent Black, and percent multi-family housing) are statistically significant with the expected relationship with the dependent variable. As the percent Hispanic, Black and multi-family units increase, the number of density bonus units increases. Although median contact rent and residential density are statistically significant, the sign on the coefficient is not consistent with the hypothesized direction. Several of the variables were not statistically significant, including poverty, median household income, percent Asian, and percent renter-occupied housing.

5 Discussion of findings

This research finds significant correlations between certain neighborhood socio-economic characteristics and density bonus usage, which is helpful for understanding how this policy mechanism may not in fact by supporting local government planning goals related to

achieving balanced and diverse communities. The results indicate that density bonus usage is not clearly associated with balancing housing opportunities citywide, rather it has been implemented in a manner that is clustered and its frequency correlates significantly with minority racial status (Black and Hispanics) and the presence of multi-family units. Although this study establishes a relationship between density bonus usage certain socio-economic and housing variables, further inquiry is needed to determine the causality of these patterns.

The current findings show that the distribution of density bonus units is significantly related to the distribution of populations with histories of residential exclusion and less influence over planning processes, specifically racial minorities and household residing in multi-family units.

Interviews with two local affordable housing experts illuminate some of the causes for density bonus unit clustering. One expert noted that high concentration of density bonus usage in Mid-City and Southeastern (both of which have high rates of minority populations) occurred in the 1980s because of the relative public tolerance for higher density affordable housing developments in these neighborhoods, while many other neighborhoods throughout San Diego vehemently resisted affordable housing construction. This phenomenon however represents a significant policy dilemma in that pressuring middle-income, White neighborhoods to accept affordable housing will likely slow affordable housing production. There may ultimately be a trade-off between the quantity of affordable units and the dispersion of these units.

Another expert interviewee noted that developers focus density bonus units in land markets were development costs are low—i.e. where there is little political resistance and where socially and economically excluded populations tend to reside—in order to ensure that the density bonus units offset the full cost of providing affordable units. This interviewee felt that policy modifications which brought about higher cost offsets in higher value land markets may encourage more developers to build density bonus units in middle to high income neighborhoods. This interviewee's thoughts in fact are reflected in California's State Bill 1818 which modified the state bonus density law by introducing a "sliding" scale that increases allowable density bonus units based upon the level of affordability provided. In other words, the deeper the affordability, the more units a developer is allowed (APA CA Chapter 2005). The impetus for the 2005 revisions to the state density bonus law was to make the incentive more enticing to developers in response to reported underutilization (Kautz 2005). It is still unclear whether broadening density bonus incentives will incentivize developers to build density bonus units in moderate to high land market neighborhoods, thereby increasing the socio-economic diversity of affordable neighborhoods.

An earlier version of San Diego City staff's proposed ordinance included a City-initiated amendment to provide a density bonus to developers who choose to meet the City's inclusionary housing requirements by constructing affordable housing on-site with their market-rate projects. This policy effort to increase mixed-income affordable housing was omitted from the final approved density bonus ordinance due to political and public opposition (*Affordable Housing*, November 6, 2007). Reconsidering a policy that would provide density bonuses to developers who elect to meet inclusionary housing requirements on-site may help lessen affordable housing and

These research findings provide significant impetus to state governments to refine affordable housing policies so that developers are either required, or choose, to build affordable units in moderate to high value neighborhoods thereby fostering socio-economic mixing.

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