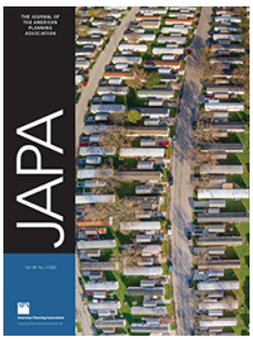

Routledge
Taylor & Francis Group

Journal of the American Planning Association

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rjpa20

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To cite this article: Ruoniu Wang & Xinyu Fu (2022): Examining the Effects of Policy Design on Affordable Unit Production Under Inclusionary Zoning Policies, Journal of the American Planning Association, DOI: 10.1080/01944363.2022.2027263

To link to this article: https://doi.org/10.1080/01944363.2022.2027263

Published online: 20 Apr 2022.

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ABSTRACT

Problem, research strategy, and findings: Evidence suggests that inclusionary zoning (IZ) correlates with affordable housing and mixed-income communities; however, what effect the policy design has on affordable housing productivity remains unclear. In this study we investigated the relationship between policy features and average annual affordable unit production under IZ by using the IZ data set, which includes adoption year, standardized characteristics, and outcomes in terms of affordable unit counts for 27 U.S. states and the District of Columbia. Although the data set does not fully capture affordable unit production for all IZ policies or those produced from in-lieu payments, this study is by far the largest scale empirical examination of IZ outcomes. Findings indicated that jurisdictions with policies that were mandatory, older, covered the entire jurisdiction, or had more complex income requirements designed to reach lower income levels had significantly higher production of affordable units. The top 15% of high-producing policies disproportionately consisted of policies that created affordable rental units, covered the entire jurisdiction, and had more complex income requirements. In addition, longer affordability terms were not associated with lower affordable unit productivity in our regression models.

Takeaway for practice: Our analysis identified common traits in IZ policies that produced at least one affordable unit as well as high-producing policies. These commonalities generally support enacting more stringent IZ policies with some flexibility in terms of the income levels served for greater affordable unit productivity. Limitations revealed in the data set suggested that local jurisdictions should better track affordable units to gain more information about what works. Considering that IZ policy design varies greatly, planners and policymakers must consider local housing market conditions relative to findings in this study as well as state and local regulatory environments when designing IZ policies.

Keywords: affordable units; inclusionary housing; inclusionary zoning; United States

Many communities across the United States are facing shrinking availability of affordable housing and growing economic inequality, creating a need for effective policy solutions. Inclusionary zoning (IZ; also known as *inclusionary housing*), has gained increasing attention as such a solution in recent decades. Through IZ, local governments make use of land use planning and zoning systems to require or encourage the creation of affordable housing by market-rate developers.[1] In 2019, there were nearly 700 unit-based IZ programs in the United States, and a report on 258 of them showed that developers had built about 110,000 affordable units in total to satisfy their provisions (Wang & Balachandran, 2021). Across the sample, however, success in producing affordable units varied widely. Although this represents a modest gain in affordable units compared with federal affordable housing subsidy policies (Freeman & Schuetz, 2017; Mukhija et al., 2010), in some communities affordable housing prompted by IZ policies represents most affordable units (Grounded Solutions Network, 2021). Likewise, there may be potential to increase the impact of such policies nationwide; understanding what factors contribute to the high productivity of certain IZ policies is vital.

Existing literature has said little about how policy design affects the success of IZ programs. Indeed, in the

DOI: 10.1080/01944363.2022.2027263

Color version available at ***tandfonline.com/rjpa***

theoretical literature, some hypotheses about how IZ policy features affect inclusionary unit production are contradictory. Also, empirical studies are scarce, have limitations in terms of methodological rigor, and often relied on the same small number of policies (Jacobus, 2015; Nzau & Trillo, 2021; Schwartz et al., 2012). In this study, we aimed to address this research gap by exploring the following core research question: Which policy features are associated with affordable unit productivity under IZ? Using a nationwide IZ database, by far the largest data set on IZ policies in the United States, we empirically analyzed such relationships. Although the data set is limited with selection bias and does not include the number of affordable units produced from in-lieu payments, it is by far the largest data set on IZ policies in the United States. In line with previous literature, our analysis accounted for housing tenure type, affordability term, affordability level, and geographic location (Mukhija et al., 2015; Schuetz et al., 2011).

In the following sections, we review the literature and develop a conceptual framing with both hypothetical and empirical evidence to show factors affecting IZ affordable housing production. Next, we explain the methodological approach used to analyze both IZ data and housing market measures. As the results section describes, policies that were mandatory, older, covered the entire jurisdiction, or had more complex income requirements designed to reach lower income levels were significantly associated with higher odds of producing any affordable units. Policies that created affordable rental units, covered the entire jurisdiction, and had more complex income requirements had higher odds of being within the top 15% in terms of unit production. In addition, contrary to economic reasoning, longer affordability terms were not associated with lower affordable unit productivity in our regression models. We conclude by discussing planning implications, including enacting more stringent IZ policies with flexibility in terms of the income levels served for higher affordable unit productivity, better tracking of affordable units under IZ, and prudently relating findings of our study to local housing market conditions and regulatory environments when designing IZ policies.

Affordable Housing Production Under IZ and Its Relationship to Housing Supply

IZ uses land use regulations to increase affordable housing stock and to facilitate socioeconomic integration. The basic path of generating affordable units through IZ is to require lower income housing units as a portion of newly constructed, market-rate residential developments and, at times, substantial rehabilitations and condominium conversions (Anacker, 2020). When the property developer deems the construction of onsite affordable units—also known as *inclusionary units*—infeasible or undesirable, these units may be created either offsite or via in-lieu fees. Also, affordable units may be created through impact fees collected in commercial developments (Wang & Balachandran, 2021). This market-oriented affordable housing policy is attractive to local governments because, unlike conventional social housing created by public subsidies, it relies primarily on private funds to build affordable housing (Nzau & Trillo, 2021).

The variation of affordable unit creation mechanisms under IZ often makes it challenging for local governments to accurately track the number of affordable units produced. There is no federal database. In the most ambitious empirical effort to count the volume of affordable units produced via IZ to date, Wang and Balachandran (2021) tracked approximately 110,000 affordable units—including about 70,500 rental units and 31,500 for-sale units—produced by 258 IZ policies across the United States. According to the authors, this unit count was only a fraction of the actual number for four reasons. First, they were unable to access unit counts for about half of unit-based IZ policies identified in their study, and policies without unit counts were disproportionately concentrated in regions where inclusionary unit production was relatively high. Second, the study did not capture affordable units created by fee-based IZ policies. Third, their methodology may not have captured all of the country's IZ policies. And last, the study included only "on-the-book" IZ policies, and thus omitted inclusionary units produced through ad hoc negotiations between local governments and developers.

Wang and Balachandran (2021) found that affordable unit production under IZ was highly uneven at both the policy and regional levels. Because the production of inclusionary units is often tied to new residential developments, the impact of these policies reflects overall housing production and local housing market conditions. In general, larger and hotter housing markets without substantial housing supply barriers yield more residential developments. If IZ policies apply to these developments, they will lead to the creation of more inclusionary units.

Critics believe that IZ can reduce housing supply by distorting housing markets, and that evident success may disguise a counterfactual in which in areas without IZ, production would be greater overall, and this increased housing volume would lead to lower housing costs overall. This argument is based on an economic reasoning that IZ—especially mandatory IZ—is essentially a tax on new residential development (Ellickson, 1981; Hamilton, 2021; Schuetz et al., 2011). The inclusion

of below-market rate units, or choosing alternative affordable housing compliance options, is equivalent to a development cost increase, which means less return on investment. The prospect of lower revenues from housing projects in a municipality with IZ may shift developers' attention to neighboring localities without IZ or halt new construction altogether.

To counter potential housing shortfalls produced by IZ, landowners, market-rate home occupants, developers, and local governments variously bear the costs of IZ. Landowners bear costs through declining residential (especially multifamily residential) land prices (Jacobus, 2015), which may be considered a taking in some court decisions (Powell & Stringham, 2005). If land prices drop too far and landowners decide not to sell, the housing supply will decrease; policies should be written to guard against this. Developers can pass on the cost of inclusionary housing to market-rate tenants and homebuyers through rents and home prices. In this case, the presence of IZ will not affect overall housing production significantly. This is likely to occur in places where demand is relatively inelastic, such as cities with major academic institutions whose students and faculty may place a premium on proximity to the university (Schuetz et al., 2011). Developers may also absorb some of or all the cost increases when profits are high enough (Jacobus, 2015; Padilla, 1995). However, critics have pointed out that the competitive nature of the building industry would prompt at least some developers move to other markets without IZ (Powell & Stringham, 2005). On the other hand, IZ policies—especially voluntary policies—can offer incentives or cost offsets, such as density bonuses, easing other zoning requirements, or offering fee reductions to make up the cost of providing inclusionary units. This approach essentially transfers the cost increases back to local governments and communities.

The empirical evidence of IZ's effect on housing supply in the literature has been mixed. Two studies of IZ policies in California found that they reduced the construction of new homes (Means & Stringham, 2012; Powell & Stringham, 2004). Although the earlier study was methodologically flawed (Levy et al., 2012), the later study has not been challenged. In a study of developers' behavior in Montgomery County (MD) between 1985 and 2013, Dawkins et al. (2017) concluded that in most years more than half of all development projects fell just below the threshold triggering the inclusionary requirement. However, the IZ requirements may not have determined the size of the projects; the study did not provide a baseline to indicate the "normal" share of development proposals falling below the inclusionary policy threshold in the absence of such policies. Li and Guo (2022), however, showed new developments expanded in the unregulated market segment in London (United Kingdom) after the government broadened IZ requirements.

Other empirical studies of the impact of IZ on housing supply revealed that it has marginal, no, or even positive effects. Schuetz et al. (2011) found no impact of IZ policies in the California Bay Area but a slight a reduction of single-family permits from such policies in the Boston (MA) suburbs. Mukhija et al.'s (2010) study of IZ in two southern California counties and Hamilton's (2021) study of IZ in the Baltimore (MD)–Washington (DC) region found IZ had no impact on housing supply. Levy et al. (2012) found, based on interviews with developers active in Montgomery County (MD) and Fairfax County (VA), that IZ policies did not deter housing development. Bento et al. (2009) found California cities with IZ experienced an insignificant reduction in the rate of single-family housing starts and a marginally significant increase in multifamily housing starts. Zhu et al.'s (2021) study of IZ policy in Los Angeles (CA) found that its program, which had tiered density bonus incentives, encouraged development. The IZ effect on residential developments in each area varied based on the size of density bonus offered. As this suggests, IZ policy characteristics may have significant impacts; this may be particularly true in the case of affordable housing production.

Expected and Empirical Effects of Policy Features on Affordable Housing Production Under IZ

IZ policies vary widely in their design and implementation, and each policy feature affects the production of inclusionary units in different ways. Six studies have examined the impact of these features on affordable unit production under IZ. Table 1 describes both expected effects and empirical findings.

Policy Age

Policy age can be an indicator of how well the policy fits local conditions over time, as older policies need to withstand—or adapt to—local dynamics. Also, from an economic perspective, as the implementation of an IZ policy makes land less expensive over time (Jacobus, 2015), residential developments subject to IZ requirements may become easier and more profitable for developers. Therefore, we expected older IZ policies to produce more inclusionary units overall. On the other hand, some IZ ordinances—particularly those that are optional—can be on the books for decades without being used, so irrelevance can be another path to longevity. Using correlation analysis, Schuetz et al. (2009) found policy age was positively associated with total inclusionary units while having no statistically significant

Table 1. Expected and empirical effects of IZ policy features on affordable housing production.

IZ policy features	Expected effect	Empirical evidence
Policy age	↑, ↓, or no effect	↑ (Schuetz et al., 2011 [including counties]; Schuetz et al., 2009); no effect (Schuetz et al., 2011 [excluding counties])
Geographic coverage (apply to entire jurisdiction)	↑	↑ (NPH, 2007)
Policy stringency (being mandatory)	↑	↑ (Hamilton, 2021; Mukhija et al., 2010; NPH, 2007)
Cost offset/incentive to developers	↑	↑ (Schuetz et al., 2009, 2011[a]; NPH 2007); no effect (Levy et al., 2012)
Buyout/affordable housing compliance options	↑, ↓, or no effect	↑ (Schuetz et al., 2011 [including counties]; NPH, 2007); no effect (Schuetz et al., 2011 [excluding counties]); ↓ (Mukhija et al., 2010)[b]
Affordable housing set-aside	↑	↑ (NPH, 2007[c]); no effect (Schuetz et al., 2011)
Minimum project size that triggers the policy	↓	↑ (Schuetz et al., 2009, 2011)
Target income level	↑	↑ (Schuetz et al., 2011)
Affordability term of units	↓ or no effect	↑ (NPH, 2007)[d]
Study	**Analytical approach**	**Study area**
Hamilton, 2021	Regression	Baltimore–Washington region
Mukhija et al., 2010	Descriptive comparison	Two southern California counties
NPH, 2007	Descriptive comparison	California
Schuetz et al., 2009	Pairwise comparison	San Francisco Bay area and Boston suburbs
Schuetz et al., 2011	Regression	San Francisco Bay area
Levy et al., 2012	Qualitative analysis	Montgomery County (MD) and Fairfax County (VA)

Notes: a. Only the effect of presence of density bonus is assessed. b. Mukhija et al.'s (2010) study found that lower in-lieu fee is associated with fewer inclusionary units. c. NPH's 2007 report uses descriptive approach and identifies common characters for top-producing inclusionary zoning policies in California. d. The type of analytical approach only applies to the empirical evidence in this table, not an evaluation of the entire study.

association with average annual inclusionary units. Applying a more rigorous regression analysis, the same researchers found policy age was positively associated with total inclusionary units, but such an association was not observed if three countywide IZ policies were excluded from the study (Schuetz et al., 2011).

Geographic Coverage

IZ policies that apply to the entire jurisdiction rather than parts of the jurisdiction should cover more residential developments and thus create more inclusionary units. In addition, according to the spatial diffusion theory (Meltzer & Schuetz, 2010), policies that apply to a broader geographic area would leave open fewer areas just outside the coverage area, and thus make developers less likely to escape the IZ requirements by building in neighboring areas. On the other hand, a highly stringent IZ policy covering an entire jurisdiction could in theory further reduce the amount of new market-rate housing developed, resulting in relatively fewer inclusionary units. However, the Non-Profit Housing Association of Northern California's (NPH, 2007) study found most top-producing IZ policies in California applied to the entire jurisdiction.

Mandatory Versus Voluntary Policy

Developers must comply with mandatory IZ policies; they may choose to comply with voluntary IZ policies to obtain cost offsets and incentives that the state offers for compliance. Hence, mandatory policies are more restrictive and should produce more inclusionary units. This hypothesis is consistent with empirical findings from multiple studies (Hamilton, 2021; Mukhija et al., 2010; NPH, 2007).

Cost Offsets/Incentives to Developers

Types of cost offsets include density bonuses, parking reductions, reduced permitting fees, and tax abatement (Wang & Balachandran, 2021). Incentives alleviate the

reduction in revenue that results from providing affordable units (or the cost of paying an in-lieu fee); therefore, they should result in the development of more inclusionary units. Empirical studies have been generally consistent with the theory that incentives—particularly density bonuses—encourage inclusionary units (NPH, 2007; Schuetz et al., 2009, 2011). However, developers in Montgomery and Fairfax counties who participated in Levy et al.'s study said that density bonuses did not encourage them to produce inclusionary units (Levy et al., 2012).

Buyout/Affordable Housing Compliance Options

Common alternatives to building below market-rate units onsite include allowing developers to build affordable units at other sites in connection with a project, donate land for future affordable housing development, or pay a fee in lieu of constructing units (Wang & Balachandran, 2021). It is not clear whether buyout options increase or decrease the production of inclusionary units, as it depends on whether developers use them and the impact in number of resulting affordable units if they do option. Empirical findings are mixed: Some studies found a positive association between buyout options and affordable unit production (NPH, 2007; Schuetz et al., 2009), whereas Mukhija et al. (2010) found a negative association, and Schuetz et al. (2011) did not find any effect.

Affordable Housing Set-Aside

The required share of housing units in a development that must be priced affordably influences the overall development cost imposed by an IZ policy. The higher the required percentage, the larger the cost of providing inclusionary units, which is more likely to discourage production and reduce housing supply. On the other hand, all else being equal, a higher set-aside percentage directly results in more inclusionary units. NPH (2007) found a positive association between the set-aside percentage and affordable housing production, but Schuetz et al.'s (2011) study found no effect.

Minimum Project Size That Triggers the Policy

Some IZ policies grant exemptions for development by project size. The higher the minimum project size requirement, the fewer developments are subject to the IZ policy. Hence, there are fewer inclusionary units. However, two empirical studies found a positive association between minimum project size and number of IZ units (Schuetz et al., 2009, 2011).

Target Income Level

IZ policies set income requirements for households to live in affordable units. Setting a higher income target implies less reduction in developer profits and, potentially, more new building permits. Following this logic, there is a tradeoff between getting more affordable units serving higher income households, and fewer affordable units serving lower income households. Schuetz et al.'s (2011) study verified this understanding empirically. In addition, some policies—especially those in larger cities—use more complex income targeting requirements to serve lower income households (Jacobus, 2015; Reyes & Wang, 2021). The more complex requirements mainly consists of the *mixed-income level approach,* the *multiple option approach*, or a combination of the two (Wang & Balachandran, 2021). The former requires the creation of affordable units allocated across multiple income groups, and it largely serves lower income households. The latter offers developers flexibility in meeting income requirements. The former approach is to serve lower income households; hence, applying this approach may result in fewer inclusionary units, whereas the impact of the latter approach may increase inclusionary units if developers always choose the higher income option.

Affordability Term of Units

From an economic reasoning perspective, longer periods of affordability restrictions make an IZ policy more stringent, so in theory they may deter new residential development and result in fewer inclusionary units. Empirically, there has been little research on the association between affordability terms and inclusionary unit production. A study reported that the cost of achieving a 50-year affordability term is only marginally higher than the cost of achieving a 30-year term (Brennan et al., 2013). NPH's (2007) report found that most top-producing inclusionary zoning policies in California required inclusionary units to be priced affordably for at least 30 years.

The empirical studies mentioned above carried a few important caveats, which may explain why their findings differed and sometimes produced findings inconsistent with theoretical expectations. First, all studies provided a snapshot of policy features and total units produced at the time of the survey, but did not account for changes in policy characteristics over time (Schuetz et al., 2011). However, IZ policy updates are common (Wang & Balachandran, 2021), and these changes can have a substantial impact on affordable unit production (Zhu et al., 2021). Second, the data on inclusionary units does not always distinguish between income targeting, tenure requirements, affordability durations, or location (Mukhija et al., 2015). Third,

affordable unit counts omitted affordable units produced by in-lieu fees (Mukhija et al., 2015). Fourth, the analytical approaches varied widely. Only two of six studies used regression modeling, which implies they used more methodological rigor than the other studies. And last, these empirical studies focused on the same few states or regions. Because policy design varies widely across the United States, the findings are not generalizable.

In summary, based on how IZ policy works, we expected that mandatory policies that apply to the entire jurisdiction, offer incentives and lower project size exemptions, require higher set-asides, and allow higher income households were likely to produce more inclusionary units. Yet, there have been only a few empirical studies, and their findings are not consistent with each other or with expected effects. Our study relied on a new national IZ data set and used regression models to explore these relationships.

Data Description and Sources

We used two sets of data. The first set was the Inclusionary Housing Program Database, which came from a 3-year study conducted by Grounded Solutions Network, a national nonprofit organization promoting housing strategies with lasting affordability. The data set was publicly accessible online. It included IZ policy name, location, adoption year, standardized characteristics, and outcomes in terms of affordable unit counts as well as fees. It drew from a combination of ordinance review and an online survey conducted between 2018 and 2020. It included affordable unit production data for 2018 and 2019. Wang and Balachandran (2021) described the scope, collection, and pattern of the data in detail. A limitation of this data set was that it did not include New Jersey, which represented more than a quarter of the IZ policies in the United States, due to lack of information on policy age and affordable unit counts.

The second set was census data. We expected market factors of housing supply and demand, which affected the production of market-rate housing, to affect the production of affordable units. These variables included population count, median housing price, vacancy rate, and the count of housing units built in 2010 or later.[2] We also included an unaffordability index calculated by dividing median housing price by median household income; hence, the higher the index, the lower the affordability it implies. In addition, we factored in population change between 2010 and 2019. As shown in Schuetz et al.'s (2011) study, political and institutional factors may affect affordable unit production, as progressive places are more likely to have additional local resources that contribute to affordable housing production. We therefore added a variable of the partisan leaning of the local jurisdiction in the modeling process, which was measured as the percentage of votes cast for Hillary Clinton in the 2016 presidential election. We also included a variable of jurisdiction type (whether the government is county) to control for potential institutional effects as well as varying geographic coverage of IZ policies. Finally, to control for geographic location, we included a variable of state- and U.S. Census–defined core-based statistical areas (CBSAs) in which IZ was implemented. Further descriptions of the variables are shown in Table 2.

Estimation Strategy

For the dependent variable, we used average annual unit production to measure the IZ productivity rate. To calculate this measure, we divided the total number of affordable units reported in each policy by the policy age as of 2019, the latest point at which affordable unit production was available.[3] None of the IZ policies in New Jersey were included in the study because information about the year of policy adoption was not available in the original data set. The average annual unit count did not reflect the number of actual affordable units produced in a given year, as the IZ production rate could fluctuate widely due to changes in the local housing market and IZ policy features. Although our study did not directly capture such changes, this average annual unit count measure did account for the extent to which IZ policies weathered both internal and external changes in producing affordable housing units. We excluded newer IZ policies (policies less than 3 years old at the time of the survey) that did not produce any affordable units, as these policies might conceal the relationships between policy features and productivity. Figure 1 shows a map of IZ policies included in the study.

Two caveats applied to our measure of IZ productivity. First, the reported total affordable units did not include affordable units produced by fees collected through the IZ policy. Very few IZ policies in the United States track affordable units produced by fees (Mukhija et al., 2015). Even though the IZ data set contained fee amounts, it was almost impossible to reliably estimate affordable units based on the fees because they were reported as lump sums and in nominal value. Also, fees collected via IZ policies were used in a wide variety of ways, ranging from directly building affordable units to supporting operations of local nonprofits that develop affordable units. Second, because there was a tradeoff between getting more affordable units and serving lower income households, affordability level should be accounted for when examining IZ affordable unit productivity (Mukhija et al., 2015). Although information

Table 2. Variable definitions and sources.

Variable	Definition	Source
Dependent variable		
Any affordable unit	= 1 if IZ has produced at least 1 unit, 0 otherwise	Grounded Solutions Network (GSN) 2019 inclusionary housing (IH) database
Average annual unit	Divide the total number of affordable units produced in an IZ policy (not capture affordable units built through in-lieu payments) by the policy age as of 2019	GSN 2019 IH database
Affordable unit productivity level	Low = 0.1–2.9 units per year; moderate = 3.0–19.0 units per year; high = 20 or more units per year	GSN 2019 IH database
Independent variable		
Policy age	Number of years since IZ adopted as of year 2019	GSN 2019 IH database
Rental	= 1 if affordable units are for rental, 0 for-sale	GSN 2019 IH database
Mandatory	= 1 if IZ is mandatory, 0 for voluntary	GSN 2019 IH database
Entire jurisdiction	1 = IZ applies to entire jurisdiction; 0 = IZ applies to certain areas of the jurisdiction	GSN 2019 IH database
Single income requirement	= 1 if IZ only has a single income requirement, 0 otherwise	GSN 2019 IH database
Affordable term $\geq$ 50 years	= 1 if IZ's affordability term is 50 years or longer, 0 otherwise	GSN 2019 IH database
Incentive count	Number of incentives	GSN 2019 IH database
Compliance option count	Number of compliance options	GSN 2019 IH database
3rd-party entity	= 1 if IZ has a 3rd-party entity to manage the policy, 0 otherwise	GSN 2019 IH database
Mandatory with incentive	An interactive term. = 1 if IZ is mandatory and has incentive, 0 otherwise	GSN 2019 IH database
Control variable		
County	= 1 if IZ is adopted in a county government, 0 otherwise	U.S. Census
Log(pop)[a]	Log of population in 2019	U.S. Census 2019 American Community Survey (ACS) 5-year estimates
Population change	Change of population between 2010 and 2019	2019 ACS 5-year estimates; U.S. 2010 decennial census
Vacancy rate[a]	Percentage of vacant residential units	2019 ACS 5-year estimates
Log(median housing price)	Log of median housing price	2019 ACS 5-year estimates
Log(overall housing growth)	Log of housing units built in 2010 or after	2019 ACS 5-year estimates
Unaffordability metric	Divide median housing price by median household income	2019 ACS 5-year estimates
Democratic vote	Percentage of votes cast for the Democrat in the 2016 presidential election	Massachusetts Institute of Technology Election Data and Science Lab
State-CBSA	State- and U.S. Census–defined core-based statistical area in which IZ is implemented	2019 U.S. Census

Note: a. log(pop) and vacancy rate are excluded from regression models due to collinearity issues.

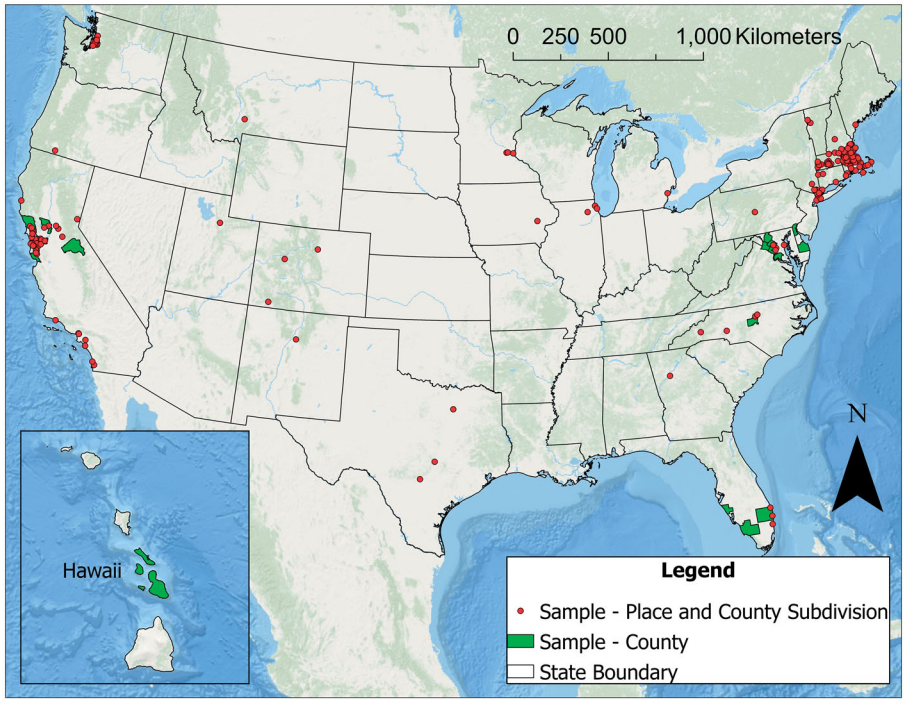

Figure 1. Map of sample area.

about affordability level was not available for all IZ policies included in the study, we were able to construct a weighted average annual unit variable by accounting for affordability level for a subset of the policies. Technical Appendix A presents the comparison results and describes the method in which the weighted dependent variable is calculated.

Whether an IZ policy applied to rental development, homeownership development, or both varied across the United States. Even though the IZ requirements might differ between rental and homeownership developments, some jurisdictions treated these policies as one IZ policy. In the original IZ database, survey respondents from local governments reported the number of IZ policies in their jurisdiction. Although this approach served the goal of explaining IZ policy design and policy administration, it was not appropriate for the purpose of our study, which required the actual number of policies to determine their impact in affordable unit productivity by housing tenure. Therefore, we considered IZ policies that applied to both rental and homeownership developments as two separate policies. We were able to do so and modeled the effects of IZ features by housing tenure on IZ productivity because the IZ data set had separate affordable unit counts by housing tenure. With these adjustments to the original data set, we examined 539 IZ policies.

Because 46% of the 539 IZ policies included in the analysis had produced zero affordable units since policy adoption, our first level of modeling was to examine which policy feature(s) affected whether an IZ policy produced any affordable units. We answered this research question using binary logistic regression. The dependent variable was whether an IZ policy produced any affordable units ($n = 490$; 265 policies with affordable units and 225 policies without). The first model only included IZ policy features, and the second model added controls for market and institutional factors.

Our second level of estimations focused on the 265 IZ policies that reported at least one affordable unit at the time of the survey. We employed two analyses, an ordinary least squares (OLS) linear regression and a multinomial logistic regression. The latter grouped the dependent variable of average annual unit from OLS into three categories: low productivity level, or 0.1–2.9 affordable units per year ($n = 126$); moderate productivity level, or 3.0–19.9 affordable units per year ($n = 102$); and high productivity level, or 20 or more affordable units per year ($n = 37$). These categories approximately represented the bottom 50th percentile, 51st to 85th percentile, and top 15th percentile, respectively, in terms of affordable unit productivity of the IZ policies included in this level of estimation. The data set had a range of affordable units listed for some IZ policies. In such cases, we took the middle point of the range for the OLS analysis. In addition, average annual unit production under IZ was sensitive to the amount of new residential development, especially for newer policies

and when large-scale development took place. Hence, we used multinomial logistic regression to examine the effect of policy features on IZ productivity level.[4] For both OLS and logistic regression analyses, we constructed two models, one only including IZ policy features and the other adding controls for market and institutional factors. We did this to explore to what extent do external factors affect the relationship between policy features and affordable unit productivity. A test for model misconception revealed no violations of OLS or logistic regression assumptions.

This study had some limitations. No sampling technique was applied to the online survey, so selection bias was likely (Wang & Balachandran, 2021). As well, we did not include any information about IZ policies in New Jersey due to lack of information on policy age and affordable unit counts. In addition, the data did not include affordable units generated through in-lieu fees, leading to an underestimation of the full policy productivity in terms of all affordable units developed. For improved outcome measurement, policy design, and research purposes, local jurisdictions need to better track the creation of affordable units under their IZ policies.

Explaining the Relationship Between IZ Policy Features and Affordable Unit Production

Statistics for key policy features align with findings from Wang and Balachandran's (2021) study, indicating IZ policies included in this study are representative of all IZ policies in the United States. Table 3 displays the descriptive statistics of IZ policies, both altogether and by level of affordable unit production.[5] Overall, 70% of IZ policies were mandatory. Most (91%) policies required inclusionary units to remain affordable for at least 30 years, and the average affordable housing set-aside was 15.7%. In addition, clear patterns existed for some policy features by affordable unit productivity level. As affordable unit production increased from zero to the high productivity level, a higher share of policies was rental, mandatory, and administered by a county government. Also, we observed clear trends between productivity level and a larger proportion of policies having income requirements targeted to very-low-income households, having a system in place to track affordable units, having a third-party managing entity, requiring 50 years or more of affordability, and providing incentive(s). Affordable unit productivity level was also positively related to numbers of incentives and compliance options, population growth, and overall housing growth. In contrast, as the level of affordable unit production increased, a lower share of IZ policies only had a single income requirement. Contrary to expectations, as unit productively level went up, the minimum set-aside went down.

Using binary logistic regression analysis, we found that certain policy features were associated with whether an IZ policy produced any affordable units. As shown in the first column of Table 4, a 1-year increase in policy age and an additional incentive were associated with a 6% and 67%, respectively, greater likelihood of an IZ policy producing at least one affordable unit ($p < .01$). In addition, mandatory policies and those applying to the entire jurisdiction were associated with 1.50 times and 72%, respectively, more likely to produce at least one affordable unit ($p < .05$). Policies with a single income requirement, on the other hand, were 63% less likely to produce any affordable units ($p < .05$). Odds ratio estimates and significance levels were fairly robust when the market and institutional factors were added to the model (column 2 of Table 4). The only change was that the significance level of mandatory policies dropped from the 5% level to the 10% level. For the control variables, we observed that overall housing growth was associated with a 32% greater likelihood of the presence of affordable units under IZ ($p < .05$).

Results of both the OLS and the multinomial logistic regression models revealed that certain IZ policy features were associated with the amount and production level of affordable units under IZ (Table 5). In the policy feature–only model (column 1), rental policies were associated with 17.87 more average annual affordable units under IZ. Also, an additional compliance option was associated with 6.62 more units. On the other hand, policies applying to the entire jurisdiction and those with a single income requirement were associated with 23.34 and 26.57, respectively, fewer average annual affordable units under IZ. Levels of significance for all these variables were at the 10% level. When control variables were added, none of the policy features was significant (column 2). For control variables in the OLS model, we found a 1% increase in overall housing growth was significantly associated with a 28.88% increase of average annual affordable units under IZ ($p < .01$). Findings also indicated that analyzing affordability level of affordable units under IZ did not appear to affect the OLS results, as shown in Technical Appendix A for a small subset of policies. The low R-squared value of 0.03 in the policy feature–only model was in part due to accuracy and sensitivity issues of the dependent variable, which justified the use of the multinomial logistic regression.

The multinomial logistic regression analyses revealed that housing tenure and flexibility of income levels served were associated with levels of affordable unit production. Columns 3 and 4 of Table 5 display odds ratios of each policy feature for the policy

Table 3. Descriptive statistics by level of affordable unit productivity under IZ.

Variable	Overall	≥ 20 units/year	3–19.9 units/year	0.1–2.9–units/year	0 units/year
Policy feature					
% entire jurisdiction	52% (*N* = 539)	70% (*N* = 43)	59% (*N* = 109)	64% (*N* = 139)	37% (*N* = 248)
% rental	50% (*N* = 539)	70% (*N* = 43)	64% (*N* = 109)	35% (*N* = 139)	48% (*N* = 248)
% mandatory	70% (*N* = 539)	72% (*N* = 43)	75% (*N* = 109)	73% (*N* = 139)	65% (*N* = 248)
% no minimum project size	26% (*N* = 443)	27% (*N* = 41)	24% (*N* = 97)	15% (*N* = 120)	33% (*N* = 185)
% single income requirement	69% (*N* = 524)	26% (*N* = 42)	57% (*N* = 106)	65% (*N* = 133)	84% (*N* = 243)
% very-low-income households	7% (*N* = 433)	24% (*N* = 29)	14% (*N* = 80)	4% (*N* = 105)	3% (*N* = 219)
% tracking production	64% (*N* = 492)	92% (*N* = 39)	80% (*N* = 100)	66% (*N* = 130)	50% (*N* = 223)
% 3rd-party entity	31% (*N* = 505)	47% (*N* = 38)	36% (*N* = 106)	31% (*N* = 132)	26% (*N* = 229)
% affordable term ≥ 30 years	91% (*N* = 522)	88% (*N* = 42)	84% (*N* = 105)	92% (*N* = 131)	93% (*N* = 244)
% affordable term ≥ 50 years	29% (*N* = 522)	57% (*N* = 42)	39% (*N* = 105)	30% (*N* = 131)	18% (*N* = 244)
% mandatory with incentive	42% (*N* = 539)	67% (*N* = 43)	55% (*N* = 109)	45% (*N* = 139)	31% (*N* = 248)

	N	Mean	*SD*	*N*	Mean	*SD*	*N*	Mean	*SD*	*N*	Mean	*SD*	*N*	Mean	*SD*
Policy age	539	15.7	8.6	43	18.6	11.1	109	16.9	9.7	139	17.6	8.8	248	13.7	7.0
Minimum set-aside (%)	478	14.7	7.3	39	13.9	5.2	96	14.5	5.6	123	14.7	8.8	220	15.0	7.4
Minimum project size	330	9.0	7.0	30	14.9	14.6	74	9.6	8.3	102	7.8	4.1	124	8.2	4.2
Incentive count	539	1.4	1.4	43	2.3	1.4	109	1.9	1.6	139	1.4	1.4	248	1.1	1.1
Compliance option count	539	2.4	1.6	43	3.0	1.5	109	2.8	1.7	139	2.6	1.5	248	2.1	1.5

Variable	Overall	≥ 20 units/year	3–19.9 units/year	0.1–2.9–units/year	0 units/year
Control variable					
% policies in Massachusetts	49% (*N* = 264)	9% (*N* = 4)	27% (*N* = 29)	49% (*N* = 68)	66% (*N* = 163)
% policies in California	15% (*N* = 79)	28% (*N* = 12)	29% (*N* = 32)	14% (*N* = 20)	6% (*N* = 15)
% county	8% (*N* = 539)	30% (*N* = 43)	10% (*N* = 109)	9% (*N* = 139)	2% (*N* = 248)
% Democratic vote	51%	58%	52%	51%	49%

	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
	N = 539		*N* = 43		*N* = 109		*N* = 139		*N* = 248	
Population	206,325	800,541	802,158	1,758,071	246,035	899,687	98,953	271,737	145,742	634,412
Population change	7.8%	11.1%	13.3%	9.4%	10.5%	12.2%	7.1%	12.8%	5.9%	9.2%
Vacancy rate	9.1%	10.2%	7.4%	5.4%	9.1%	9.7%	9.2%	11.7%	9.4%	10.0%
Median housing price	556,027	305,275	573,149	239,885	617,139	365,187	606,086	303,107	498,141	277,643
Overall housing growth	5,039	13,837	15,544	22,711	5,409	13,738	2,459	7,810	4,501	13,763
Unaffordability metric	18.8	4.9	21.9	3.4	20.9	4.4	18.3	5.0	17.7	4.7

Table 4. Odds ratios from binary regression of whether IZ policies produce at least one affordable unit.

Variable	Policy feature only Odds ratio (*p* value)	With market control Odds ratio (*p* value)
Policy age	1.06 (<.01)***	1.06 (<.01)***
Rental	1.22 (.36)	1.22 (.38)
Mandatory	2.50 (.02)**	2.11 (.07)*
Entire jurisdiction	1.72 (.07)**	1.87 (.05)**
Single income requirement	0.37 (.01)**	0.40 (.03)**
Affordability term ≥ 50 years	0.98 (.95)	0.85 (.7)
3rd-party entity	1.12 (.71)	1.16 (.63)
Incentive count	1.67 (<.01)***	1.60 (.01)**
Compliance option count	1.01 (.92)	0.99 (.96)
Mandatory with incentive	0.51 (.12)	0.56 (.19)
County		2.27 (.62)
Population change		1.02 (.28)
Log(median housing price)		0.92 (.85)
Unaffordability metric		0.98 (.63)
Log(overall housing growth)		1.32 (.02)**
Democratic vote		2.17 (.53)
Controlled for state and CBSA	Yes	
Akaike information criterion	605.45	607.66
McFadden's pseudo R-squared	0.30	0.31
N	490	

Notes: *$p < .1$; **$p < .05$; ***$p < .01$.

feature–only model. These ratios show the probability of an IZ policy being at the low (column 3) or moderate (column 4) productivity level compared with the reference category of the high productivity level. Compared with homeownership policies, rental policies were 92% less likely to be at the low productivity level than at the high productivity level ($p < .01$). Also, policies with a single income requirement were 5.51 times more likely to be at the moderate productivity level than at the high productivity level ($p < .05$). Other policy features were not statistically significant factors associated with affordable housing productivity level in the policy feature–only model.

When adding control variables to the multinomial logistic regression model (columns 5 and 6 of Table 5), a couple of changes in policy features were observed. Specifically, rental policies were 70% less likely to be at the moderate productivity level than at the high productivity level ($p < .05$). And policies applying to the entire jurisdiction were 85% less likely to be at the moderate productivity level than at the high productivity level ($p < .10$). For control variables, we found policies administered at the county level were 63.86 times more likely to be at the low productivity level than the high productivity level ($p < .10$). A one-unit increase in overall housing growth was significantly associated with 74% less likely to be at the low productivity level ($p < .01$) and 59% less likely to be at the moderate productivity level ($p < .05$) than at the high productivity level.

Implications for Planning Practice

Inclusionary zoning is a common local affordable housing supply strategy in the United States and has been expanding substantially since the turn of this century. Yet, there remains a lack of understanding as to what policy features contribute to an effective policy tool that successfully delivers affordable housing units.

Enhancing certain policy features, such as expanding geographic coverage and increasing affordable housing set-asides, should in theory directly increase inclusionary unit production. On the other hand, from an economic perspective, these enhancements can increase development costs and therefore may negatively affect general housing supply and reduce affordable housing production. Limited empirical studies relying primarily on the same small subset of IZ policies due to data constraints

Table 5. Coefficients from OLS regression and odds ratios from multinomial logistic regression of IZ policy affordable unit production level.

	OLS		Multinomial logistic regression			
	Policy feature only Coefficient (*p* value)	With market control Coefficient (*p* value)	Policy feature only Odds ratio (*p* value)		With market control Odds ratio (*p* value)	
Variable			0.1–2.9 units/year	3–19.9 units/year	0.1–2.9 units/year	3–19.9 units/year
Policy age	−0.89 (.16)	−0.10 (.86)	0.99 (.08)	0.99 (.78)	1.03 (.53)	1.01 (.75)
Rental	17.87 (.07)*	13.05 (.15)	0.08 (<.01)***	0.42 (.12)	0.06 (<.01)***	0.30 (.05)**
Mandatory	−25.16 (.17)	−15.98 (.36)	3.48 (.26)	2.30 (.46)	2.39 (.53)	1.36 (.82)
Entire jurisdiction	−23.34 (.09)*	−7.13 (.59)	0.6 (.52)	0.33 (.14)	0.25 (.19)	0.15 (.07)*
Single income requirement	−26.57 (.10)*	−23.86 (.13)	3.36 (.13)	6.51 (.02)**	2.36 (.39)	7.28 (.03)**
Affordability term ≥ 50 years	−7.66 (.64)	1.53 (.92)	2.22 (.33)	0.61 (.50)	1.58 (.62)	0.49 (.38)
3rd-party entity	10.42 (.45)	14.59 (.25)	0.80 (.78)	0.57 (.48)	0.42 (.37)	0.33 (.22)
Incentive count	−8.10 (.22)	−1.58 (.81)	1.03 (.92)	0.84 (.55)	0.80 (.53)	0.74 (.39)
Compliance option count	6.62 (.10)*	2.51 (.50)	0.91 (.64)	1.03 (.86)	1.11 (.65)	1.17 (.46)
Mandatory with incentive	13.06 (.52)	3.96 (.83)	0.17 (.12)	0.45 (.48)	0.16 (.16)	0.40 (.48)
County		−47.64 (.16)			64.86 (.06)*	3.48 (.47)
Population change		−0.67 (.23)			1.05 (.18)	1.05 (.23)
Log(median housing price)		0.26 (.99)			4.68 (.34)	2.38 (.57)
Unaffordability metric		−0.48 (.78)			1.01 (.93)	1.15 (.34)
Log(overall housing growth)		28.88 (<.01)***			0.26 (<.01)***	0.41 (.02)**
Democratic vote		−91.28 (.12)			0.66 (.91)	0.40 (.78)
Controlled for State and CBSA			Yes			
Adjusted R-squared	0.03	0.16	/		/	
Akaike information criterion	3,092.10	3,041.04	568.44		554.30	
McFadden's pseudo R-squared	/	/	0.36		0.43	
N	265					

Notes: *$p < .1$; **$p < .05$; ***$p < .01$.

Table 6. Summary of research findings.

IZ policy feature and affordable unit productivity	Discernable trend? (Descriptive analysis)	Ever produce any affordable units? (Binary regression)	More affordable units? (OLS and multinomial regressions)
Are older policies associated with higher affordable unit productivity?	Yes	Yes	No
Are rental policies associated with higher affordable unit productivity?	Mixed	No	Yes
Are mandatory policies associated with higher affordable unit productivity?	Mixed	Yes	No
Are policies covering the entire jurisdiction associated with higher affordable unit productivity?	Mixed	Yes	Mixed
Are policies with higher minimum set-asides associated with higher affordable unit productivity?	Opposite	N/A	N/A
Are policies with a single income requirement associated with lower affordable unit productivity?	Yes	Yes	Yes
Are policies serving very-low-income households associated with lower affordable unit productivity?	Opposite	N/A	N/A
Are policies with longer affordability terms associated with lower affordable unit productivity?	Opposite	No	No
Are policies with a 3rd-party managing entity associated with higher affordable unit productivity?	Yes	No	No
Are policies tracking affordable unit production associated with higher affordable unit productivity?	Yes	N/A	N/A
Are policies with more incentives associated with higher affordable unit productivity?	Yes	Yes	No
Are policies with more compliance options associated with higher affordable unit productivity?	Yes	No	Yes, with weak evidence

have compounded the relationship between policy features and inclusionary unit productivity. For communities intending to adopt or amend IZ policies, there is always a need to understand how policy design affects affordable unit productivity under IZ.

In this study, we used a novel data set to address the research question. This data set expands the study area of prior studies from one or a few regions to 27 U.S. states and the District of Columbia. This data set also allowed us to address the relationship between policy features and productivity by accounting for housing tenure type, affordability term, and geographic location, which previous studies have identified as areas in need of improvement (Mukhija et al., 2015; Schuetz et al., 2011). For a small subset of policies, we also constructed a weighted dependent variable by accounting for the affordability level of affordable units under IZ (Technical Appendix A). This additional analysis suggested that inclusionary unit affordability level did not appear to affect modeling results.

After controlling for market and institutional factors, we found that older policies, mandatory policies, those covering the entire jurisdiction, those with more incentives, and those with more complex income requirements[6] had significantly higher odds of ever leading to the production of affordable units. In addition, we found that among policies designed to create affordable rental units, those covering the entire jurisdiction and those with more complex income requirements had higher odds of being in the top 15% of high-producing policies. These findings suggest that overall, more stringent IZ policies with flexibility in terms of income levels served not only are more likely to produce affordable units, but also have higher odds of being top-producing policies.

It is also important to highlight two policy features that we did not find significantly associated with affordable unit productivity under IZ. The first is affordability term. In all regression models, we found that having longer affordability terms (50 years or more) did not affect affordable unit productivity. In the descriptive analysis, on the contrary, we observed a trend showing that the higher the level of affordable unit productivity, the higher the share of IZ policies with 50 or more years of affordability requirements. This empirical evidence counters the notion that longer affordability terms would deter new development and result in fewer affordable units. The second is whether a policy is mandatory or voluntary, a primary indicator of policy stringency. Although we found that mandatory policies were significantly associated with higher odds of ever producing any affordable units under IZ, we did not find mandatory policies to be significantly associated with more policy productivity. The latter finding implies that voluntary IZ policies, when designed appropriately, can be as effective in producing affordable units as mandatory policies. However, this finding should be interpreted with caution, as voluntary policies included 100% affordable housing developments in their counts, whereas mandatory policies typically did not (Reyes & Wang, 2021). We present a summary of research findings in Table 6.

In this study we examined the inter-programmatic patterns and relationships between policy features and affordable units under IZ. We did not focus on how policy feature(s) and their changes might affect the impact of individual policies. It would be a mistake for policymakers to conclude from this study that the "best" policy maximizes all the statistically significant policy features reported here. Policymaking must take into account local policy objectives, housing market conditions, community preferences, and their broader regulatory and political environments. For example, policies with complex income requirements may be more productive, but they will only achieve that productivity if the development community has the requisite experience and sophistication to comply with them and if staff with the time and skill needed to apply them are available. In smaller communities with fewer staff and less experienced developers, simpler policies may be more effective.

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ACKNOWLEDGMENTS

We thank Dr. Ann Forsyth for editing this article and the three anonymous reviewers for their constructive comments. We also thank Grounded Solutions Network for supporting this research. All errors are our own.

SUPPLEMENTAL MATERIAL

Supplemental data for this article can be accessed at the publisher's website.

NOTES

1. Affordable housing units created through inclusionary zoning policies are also known as *inclusionary units* and *below-market-rate units*. In this study, we use the term *inclusionary units* when we refer to onsite below-market-rate units, and the term *affordable units under IZ* when we include affordable units generated via alternative compliance options, such as building affordable units offsite. *Affordable housing* is traditionally defined as at or below 80% area median income (AMI), and we use the term *affordable units under IZ* to connote any below-market-rate housing produced through IZ, which can include housing costing up to 150% AMI based upon the maximum of any policy in the study.

2. We tested multicollinearities for all independent variables. We removed two variables—population count and vacancy rate—from subsequent models because of multicollinearity issues.

3. Six policies reported the number of affordable units during a period of time rather than since the adoption of the IZ policy. In this case, we used this period of time as the denominator.

4. Although the grouped variables appear to be a set of ordered categories, or ordinal data, we used multinomial logistic regression instead of ordinal logistic regression because the Brant Test revealed violation of the key assumption for ordinal regression ($p < .01$), namely, proportional odds (i.e., the relationship between each pair of outcome groups should be the same). This suggests the ordinal modeling approach would be inappropriate in our case (Brant, 1990). Another reason we chose to use multinomial logistical regression was that it allowed us to compare groups across all the categories, whereas ordinal regression only compares groups in order (Agresti, 2003).

5. For descriptive analysis, we included more policy features in Table 3 than we included in the regression models due to sample size limitations. We also included control variables (i.e., log(pop) and vacancy rate) in Table 3 that are excluded in the regression models due to multicollinearity issues. Including these variables in Table 3 provides a fuller picture of the IZ policy characteristics.

6. *More complex income requirements* refers to the mixed-income level approach, which is designed to reach lower income levels, and the multiple option approach that offers flexibility.

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