# Determinants of Housing Underproduction in Washington State Counties: Analyzing the Impact of Policy, Demographic, and Economic Factors

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# Abstract

The urbanized regions of the State of Washington are widely known for being difficult cities to find an affordable place to live. The purpose of this thesis is to identify factors contributing to housing underproduction through correlation and regression analyses. The following research uncovers significant correlations and connections among variables like single-family residence square footage and Urban Growth Area (UGA) square footage. Specific trios of correlations are explored, unveiling the interdependence of housing shortages, mobility rates (the moving from one residence to another), and median gross rent. Regression analyses provide predictive insights, highlighting the importance of variables such as Urban Growth Area land, non-white population share, unemployment rate, and median gross rent in shaping housing underproduction.

Responses for housing policy and practice are postulated such as diverse zoning, public sector housing development, and federal support. This thesis challenges misconceptions by discrediting the notion that immigrants contribute to housing underproduction.

This study also scrutinizes rent's role, confirming intuitive relationships between median gross rent and housing underproduction. Recommendations include the easing of zoning restrictions for infill development, the implementation of proactive state involvement to incentivize housing production and the transfer of public capital resources to nonprofit housing developers and public housing agencies. Rent control's potential benefits and the importance of public housing initiatives are highlighted.

Policy makers are encouraged to recognize that developers and landlords are exploiting vulnerable Washingtonians. This can and must be corrected through revised policy.

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# Acknowledgements

I deeply thank my committee members, Himanshu Grover and Sharon Kioko for their guidance and help during this process.

I also thank Pranjali Rai for your analytical and moral support. Your coffee-brownies are on the way.

And thank you to my love Jacob Murie, with whom this was possible.

# Dedication

This thesis is dedicated to my neighbor who passed away on the afternoon of July 3, 2023 on University Way.

# Introduction

## Problem Definition

The United States grapples with an increasingly severe housing crisis that originates from an interplay of economic, social, and policy factors (Reid et al. 2017). Uncapped speculation and an ongoing gap between housing supply and demand have led to a pervasive struggle for affordable housing across the nation (U.S. Gov't Publishing Office 2023). Working class families face mounting challenges in securing stable and affordable shelter, forcing many into precarious living conditions or homelessness (U.S. Gov't Publishing Office 2021). Overholt (2022) describes this precariousness as coming from the commodification of housing and the lack of recognition of housing as a human right.

In the State of Washington, it is very difficult to find an affordable place to live, particularly if one's life includes responsibilities like children, illness, elderly family, a demanding job, studies, etc. One factor in the difficulty that Washingtonians face is the availability of housing produced.

The United States has the resources and expertise to help house all in every state. Though plenty of policies are ready to be put in place, ensuring that those policies are based on sound logic is also worthwhile.

## Purpose

This paper seeks to aid in the resolution of the housing crisis with additional knowledge that can be used to develop relevant, helpful policy. This study delves into the complexity of housing underproduction with a multifaceted approach that combines correlation and regression analyses. By dissecting the relationships between key variables, this research seeks to provide

valuable insights that can inform evidence-based policy decisions and guide future investigations. The findings bear significance for urban planning, housing policy, public administration, and the overall welfare of communities grappling with housing challenges.

## Research Question

I ask the question: **"What is the impact of policy, demographic, and economic factors on housing underproduction in Washington State?"** My primary objective is to ascertain the statistical validity of popular explanations for housing underproduction. Public perceptions and narratives surrounding this issue often reflect a combination of assumptions, experiences, and societal viewpoints. For example, someone who copes with economic anxiety by villainizing immigrants may view them as responsible for high rents. By subjecting these views to empirical scrutiny, I aim to illuminate their potential factual merit and to what extent they contribute to the broader housing underproduction scenario.

## Assumptions, Limitations, and Delimitations

It is assumed that the literature describes a sufficiently comprehensive set of factors to test the validity of. The study's scope is delimited by the data available and the specific geographic and demographic context of Washington state. While correlations and regressions can provide insights, causation may not be definitively established due to the cross-sectional nature of the thesis. Additionally, external factors beyond the scope of this research may influence housing dynamics. One example of a potential factor for housing dynamics that is beyond the scope of this research is the rise of remote work; proximity to employment theoretically matters less for housing choice for white-collar workers.

A fundamental aspect of my investigation involves clarifying the concept of housing underproduction itself. The organization Up For Growth has done extensive work on the issue of

housing underproduction. As “a national, cross-sector member network,” Up For Growth publishes data on the U.S. housing crisis, advocates for responsible housing policy on state and federal levels, educates experts and the public, and publishes frameworks for development for community members and housing professionals.

UFG identifies the underproduction of housing across the United States by comparing housing units to existing and “missing” households, with a 5% vacancy rate as a cushion. I contextualize it as the discrepancy between the housing units required to adequately accommodate the population and the actual availability of housing units.

The ideal amount of housing could include a wider set of considerations. Target vacancy rates can be adjusted. Building for increased immigration quotas would require a greater amount of housing. Finally, other ratios than the ratio of housing units to households formed could be used. These could include housing units per individual person, housing units per person within a defined young age group to represent rising potential homeowners, or a region’s growth of permit applications compared to population growth. Up For Growth’s definition of housing underproduction and data on housing units to households formed is straightforward and relevant to my questions and therefore the definition I choose for this thesis.

It is essential to challenge the tendency to blame vulnerable groups for their inability to afford housing as seen on local news and parroted elsewhere. These groups include immigrants, the homeless, low-income workers, and unemployed persons. The *Wall Street Journal* points a finger at rent control disincentivizing landlords to provide housing (2022). The *Los Angeles Times*, the *Toronto Star*, the *Chicago Tribune*, the *Washington Post*, and Vancouver, Washington’s *Columbian* each suggest that rent control causes housing shortages. Finding methodological mistakes and unsound sampling methods, Appelbaum et al. (1991) debunked Cato Institute’s William Tucker’s 1988 impactful claim that rent control causes homelessness,

another symptom of the housing shortage. Additionally, landlords and developers are not always the same entity; using the same rudimentary logic as the newspapers listed, it could be argued that reduced speculative demand from landlords raises prices in the housing market and makes owning a home less accessible for residents.

U.S. news outlets also target one of their favorite scapegoats: immigrants. The Denver Gazette Editorial Board said that “Citizens shouldn't compete with illegals for federal housing” (2019). That’s the title of the editorial. Alejandro Lazo reports from Santa Maria, California, that locals are critical of agriculture employers when they displace low-income residents as well as when they create housing through adaptive reuse for migrant workers (2019). Reporting from peer nations on colonized land, the Australian Broadcasting Company and Canada’s National Post agree that immigration is causing the shortage of housing. I aim to foster a more compassionate and holistic perspective, recognizing the complex interplay of structural and systemic factors that contribute to housing underproduction and housing unaffordability. As I demonstrate in the regression section, a housing shortage works in the favor of developers, regardless of immigration rates.

The nature of the free market is that developers, investors, and shareholders prioritize financial gains rather than the provision of basic services. The target profit margin for developers tends to be between 15% and 25%, partially based on lender requirements (Urban Real Estate Center 2022). This is a steeper required rate of return than many other industries. For example, in 2018, retail and construction net profit margins are 5%, hotels & hospitality is 8%, maintenance services is 10%, auto repair is 12%, food and restaurants is 15%, transportation is 19%, and tax services is 20% (Camino Financial 2023). Big lenders are one of only a few sources of financing for housing development, so their stipulations hold a lot of power. If it’s not profitable, they won’t finance it, and the easiest way to increase profit is to increase rent.

As a result, the variables associated with the housing shortage can also be understood as factors that increase risks to developers' profits. This profit-driven control of housing development has profound implications for the quantity and affordability of available housing units. There is no policy that will make developers willing to accept a lower profit margin.

## Research Framework

The right amount of housing as defined by Up For Growth is the sum of the number of households and the number of missing households multiplied by 1.05 so as to make a 5% vacancy rate.. Missing households is the number-above-normal levels of unrelated adults co-habitating and adults living with parents.

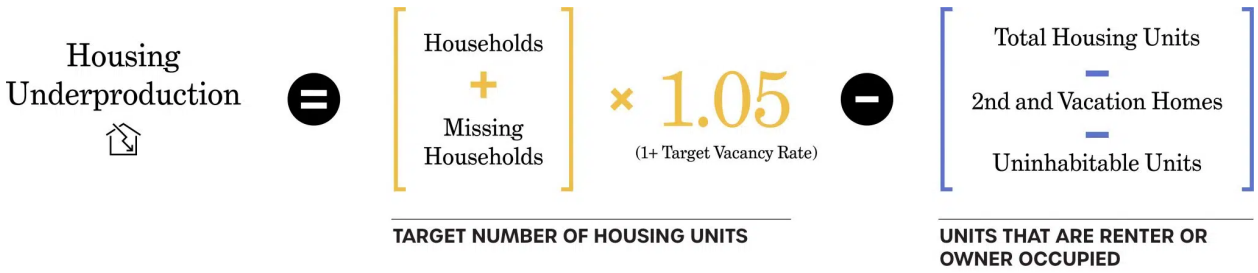


Figure 1.1 Up For Growth's Housing Underproduction Model

Source: Up For Growth

When we go below this vacancy rate, it is considered a housing shortage (Erdmann 2019). In a housing shortage, regional sprawl is encouraged, leading to environmental degradation, ultimately, a long-term decline in ecosystem balance and deteriorating public health (Fransham and Dorling 2018).

Adequate housing is fundamentally important for the economic and social health of a region. Some counties in Washington have a greater housing shortage than others. This thesis seeks indicators and reasons as to why housing underproduction is worse in some regions. Whether

or not housing gets built is the result of many, many different factors, but some of those factors can be examined and compared.

Housing production and, naturally, underproduction is influenced by a region's population, population growth, employment centers, age spread, concentration of wealth, mix of ethnic groups, migration and movement patterns, climate, topography, infrastructure, federal housing subsidies and programs, state regulations on safety and liability, and local zoning regulations.

Some of these are more easily quantified and compared than others. Of the variables that have literature and data more readily available, they can be divided into three broad categories: demographic factors, policy factors, and economic factors.

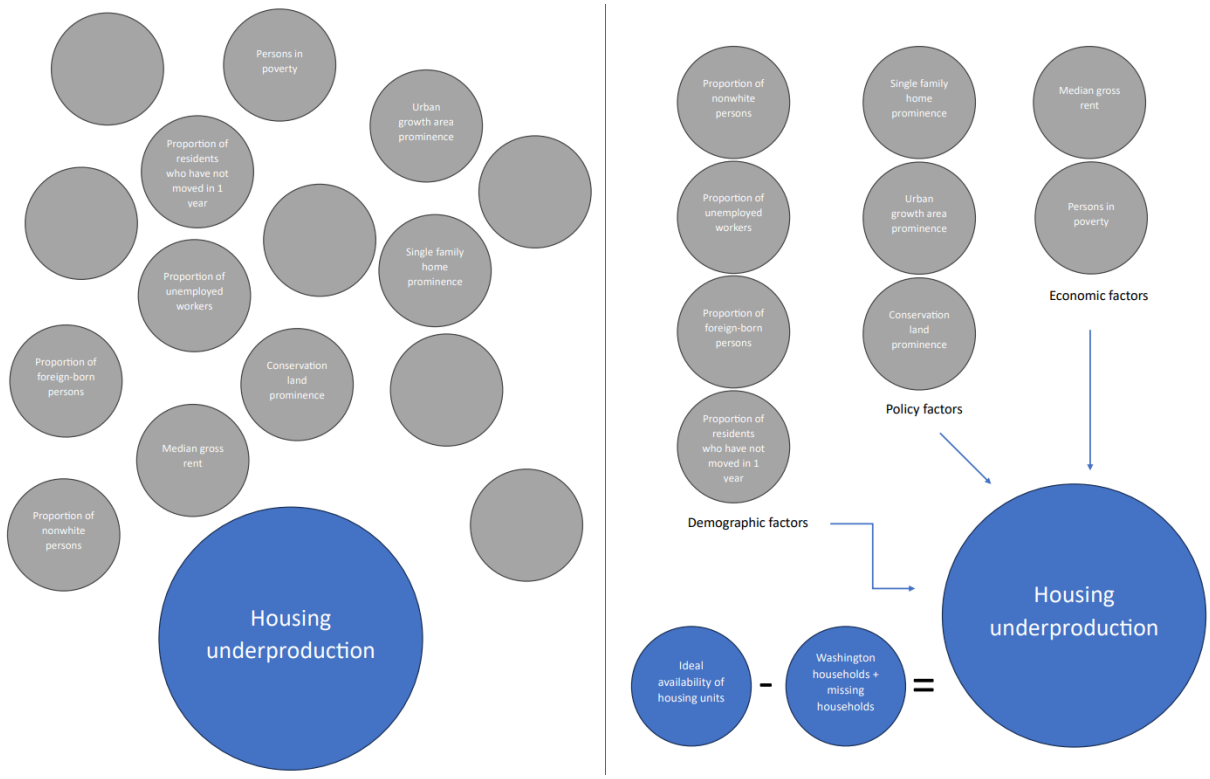


Figure 1.2 Research Framework

As the figure demonstrates, many factors exist at the same time as housing is being underproduced. These factors can be sorted into general topics for more focused analysis to

identify causes. Because housing is a fundamental need for a settlement and its people, it is thought to both impact and be impacted by all listed factors. Recognizing this, this thesis treats housing underproduction as the dependent variable.

# Literature Review

The topics for the literature review were selected based on their relevance, both real and imagined, to housing underproduction. Beyond assertions of social dynamics from news anchors and their listeners, the literature and the common provide more potential factors of the housing shortage to evaluate, including geological and atmospheric conditions and the policy environment. In other words, three categories of factors and literature emerged: natural constraint, housing policy, and socioeconomic dynamics.

## Natural Constraints

The housing crisis in Washington is a multifaceted issue that starts in the tangible world, taking up mass and volume on planet Earth. This section delves deep into the natural constraints that exert significant influence on housing underproduction, with a focused exploration of the challenges posed by steep slopes and wetlands. Through an examination of the existing body of literature that dissects the intricate interplay between the natural environment and housing production, this thesis endeavors to forge testable hypotheses that illuminate the nuanced relationship between nature and housing.

### Steep Slopes: Hurdles and Costs

Steep slopes emerge as formidable obstacles to housing production, triggering a cascade of challenges that influence costs, feasibility, and safety in such a mountainous state. These inclinations necessitate customized construction methods, which, in turn, amplify expenses. The viability of employing prefabrication techniques, typically cost-effective, is considerably limited in steep or otherwise complicated terrains. Washington’s slopes are especially challenging, given

the significant risk to infrastructure and human life from earthquakes (Bouta et al. 2019). The very construction process on slopes mandates heightened labor efforts and protracted timelines, inevitably inflating the overall costs associated with building (Somerville 1999). The industry's predilection for building on more level surfaces is grounded in concerns over potential landslides and the substantial risks they pose (Salciarini et al. 2008). The realm of large-scale planned housing developments complicates these risks, as developers become liable for damages arising from suboptimal slope engineering or neglecting to disclose associated risks (Stark et al. 2011). These hurdles emphasize the intricate economic and safety considerations that builders and policymakers must grapple with when navigating steep terrains if they hope to get their buildings built.

## Wetlands: Ecological Significance and Regulatory Challenges

Washington’s ecosystem of wetlands presents another formidable barrier to housing production, characterized by both its ecological importance and the regulatory obstacles it imposes. These areas stand as vital ecosystems boasting rich biodiversity, serving as breeding grounds, migratory hubs, and nurturing nurseries for a diverse range of species (Pollock et al. 1998). Beyond these attributes, wetlands provide invaluable ecological services for the nearby human community such as water filtration, groundwater recharge, storm surge protection, and flood control (Cooke et al. 2022). Consequently, governments have instituted regulations at varying levels to shield these functions, leading to limitations on development and disturbances within wetland areas (Wade et al. 2022). The most relevant regulations for wetlands in Washington come from the State Environmental Policy Act, or SEPA. Guidelines from the United States Environmental Protection Agency and local regulations also play a large role. Developers frequently grapple with these regulations, especially when they intersect with policy frameworks favoring expansive housing developments over denser configurations (Cohen et al. 2014). It is

noteworthy that even when construction occurs beyond the legally designated wetland zones, there exists a potential to disrupt local water and drainage cycles, thereby amplifying flood risks and jeopardizing resident safety.

In summation, Washington's housing crisis is impacted by the natural constraints posed by steep slopes and wetlands. These challenges magnify the complexity of housing production, entwining economic considerations with ecological preservation and public safety priorities.

## Housing and Land Use Policy

The policy landscape significantly shapes the built environment This segment ventures into the realm of policy influences on housing production, exploring the plethora of hypotheses regarding their effects and implications. By delving into the existing literature, this section aims to assemble testable hypotheses that underpin the intricate relationship between policies and the challenges of housing underproduction.

### Single-Family Zoning: A Counterintuitive Hurdle

The prevalent preference for fully detached, single-family homes (SFH) within zoning regulations is a widely recognized factor contributing to housing underproduction and, consequently, the housing shortage (Lewis and Marantz 2019). The logic behind this assertion is straightforward: when zoning codes restrict the ability to construct a substantial number of units on a given piece of land, the outcome is a diminished overall housing supply. This inclination towards single-family zoning stands in contrast to market dynamics where denser development correlates with increased land values (Gabbe 2019). Single-family homeownership holds a deeply-rooted place of importance in United States culture, particularly in the absence of a comprehensive social safety net for elders. Regulations like minimum lot sizes, while

advantageous for current homeowners, raise housing prices, creating a divide in economic and political power that favors property owners over non-owners (Gabbe 2019). This divide in housing accessibility underscores the significance of policies in perpetuating disparities within the housing market. Beyond the local zoning scale, fully-detached homes are also preferred by federal policy, as resources from the Federal Housing Administration are much easier to obtain for fully-detached homes than for denser housing types such as condominiums (Traweek 2015). When resource-intensive single-family housing is preferred to denser, multi-family solutions, fewer people will be housed creating a detrimental ratio of housing units to households.

## Urban Growth Boundaries: Balancing Development and Constraints

Urban growth boundaries serve as delineations that dictate areas suitable for development, fueling debates among government bodies, residents, and businesses (Gloss 2022). Zoning preferences that favor single-family homes, coupled with factors such as mortgage assistance for detached residences and subsidized gasoline, prompt developers to opt for single-family homes with high return on investment (McFarling 2014). However, the limitation of available lots drives up home prices, making homeownership less attainable and curbing overall development (Macheel 2023). Yet, growing the number of lots by expanding urban growth boundaries can lead to urban sprawl and introduce costs to residents and governments, particularly in terms of public health implications such as air quality and frequency of collisions and injuries (Frumkin 2002). Balancing the aspiration for development with environmental and community considerations becomes paramount within the policy discourse.

## Conservation Land: Sustainability Versus Development

The concept of conservation land, characterized by protection against intensive human use, plays a pivotal role in shaping housing development dynamics. Urban and rural land

conservation efforts, often involving farmlands and parks, safeguard ecosystems and enhance the quality of life in developed regions (Lauf 2014). Living near parks and green space is desirable and increases property values. However, conservation's impact on housing production is subject to debate and controversies among developers and consumers (Pacella 2019). While conservation is often perceived as constraining housing stock growth, literature suggests that open space preservation might not substantially impact overall development within neighborhoods (Zipp et al. 2017). Striking a balance between the preservation of green spaces and the need for housing underscores the multifaceted nature of policy decisions, especially given that nearby green space is a desired amenity.

## Socioeconomic Dynamics of Housing Demand

This section explores the multifaceted realm of socioeconomic factors that significantly influence housing production such as employment, income distribution, racial disparities, and immigration. Housing is, consciously or unconsciously, made for specific people in mind. It is possible that data on the groups above will demonstrate neglected or favored groups.

### Employment and Housing Production

The measure of workers per job serves as a multifaceted indicator, reflecting not only unemployment rates but also equilibrium within the job market—a facet closely linked to housing production (Clarke and Herrmann 2007). Employment stands as a cornerstone of housing production dynamics: during periods of robust employment, increased homebuyer activity ensues, and builders respond by catering to this demand (Perry 2016). Conversely, the inverse holds true—a dearth of affordable housing can impede local employment prospects (Benner and Karner 2015). The concept of jobs-housing balance, relating the spatial distribution of jobs to available housing, adds another layer of complexity to this dynamic interplay (Blumenberg and

King 2021). The regression will demonstrate the scale to which local economic traits impact housing, which is the foundation for the local economy itself.

## Affordable Housing and Low-Income Workers

A dearth of housing affordable to lower-income segments underscores a prevalent challenge in numerous cities to the point of needing federal intervention according to the National Low Income Housing Coalition (2023). The NLIHC is an advocacy and educational organization founded in 1974 in pursuit of affordable housing for all. Observations of developers' reluctance to cater to this sector have led to the creation of initiatives like the Low-Income Housing Tax Credit, a tool that developers frequently leverage to cover a substantial portion of project costs with public funds (Efthmiadis 2021). However, the forces underlying gentrification and displacement also contribute to housing underproduction, particularly in disadvantaged neighborhoods that face an influx of wealthier residents (Goetz 2011). The dance between affordability, income disparities, and housing development underscores the need for multifaceted solutions that address both economic and social concerns.

## Racial Disparities and Housing Access

The pernicious influence of racial disparities on housing access cannot be overlooked. White supremacy and preferential treatment are manifest in the housing sector, with the white-Black homeownership gap standing at 26% in 2014 (Seah et al. 2017). As seen in this gap and resultant property and generational wealth, whites wield disproportionate control over land and financial capital. The imperative to combat racism within the housing industry gained prominence, evident in the Democratic Party's commitment to racial equality as well as expanding affordable housing—a central and unfulfilled promise of Joe Biden's campaign in 2020 (Bloomberg 2020). With a disproportionate amount of Black residents renting instead of

owning, affordable housing is a key policy toward racial equality (HT Digital Streams Limited 2021). The expansion of affordable housing encounters the very obstacles that impede housing production, revealing the complex layers of challenges that must be tackled to rectify disparities.

## Immigration and Housing Dynamics

The impact of immigration on housing production is not straightforward. While it is tempting for some to assume that population influx due to immigration strains housing resources, studies suggest a more nuanced scenario. An intriguing example is found in Canada, where immigration corresponded to a minute (0.1%) increase in housing prices and no substantial capital gains for homeowners due to heightened demand (Akbari and Aydede 2012). This underscores that housing scarcity might not necessarily intensify with population growth through immigration. Understanding that immigration's connection or lack thereof with housing shortages is essential to avoiding scapegoating.

A complexity of immigration in the United States is that the agricultural sector depends heavily on exploiting migrants, both those who stay in the United States and those who work seasonally (Mazzoni 2007). Many agricultural migrants prefer to return to their home countries during their industries' off-seasons, making the provision of housing entirely under the purview of their employer (Montange 2022). This places an additional layer of vulnerability for migrant workers.

In summation, the housing crisis transcends mere economic and policy factors; it intertwines deeply with socioeconomic dynamics. Who "matters" enough for their housing needs to be met is not determined simply by economics. The intersections between employment, affordability, racial disparities, and immigration create a complex tableau that shapes housing production. Solutions to the housing crisis must address these intricate threads, recognizing that an equitable and sustainable housing landscape requires a holistic understanding of the social, economic, and demographic influences at play. Effective strategies have been developed to

untangle the multifaceted challenges that contribute to the current housing scarcity in the United States. This thesis aims to add data-backed conclusions to these strategies.

# Methodology

## Study Area

The study area of this thesis is the state of Washington.

Over the past few decades, Washington state has witnessed remarkable population growth. Since 2020, its population has increased by nearly a quarter of a million people (Mohrman 2023). This surge in population is popularly attributed to a combination of factors, such as robust job opportunities. As a fast-growing state, Washington's housing policy is the crucial foundation for the health, safety, and prosperity of its residents. Washington state is an interesting case among its forty-nine peers as a Western state with much sparser planning, less normalization of denser home types, greater dependence on the automobile, and relative isolation to nearby states for casual travel compared to the Eastern seaboard's buses, planes, and trains. The study area is therefore less impacted by neighboring states compared to East Coast states.

According to the Washington State Office of Financial Management, the primary driver of population growth in Washington state is domestic and international immigration (2023). Potential attractors are Washington's large tech and agriculture sectors. Across the state, scenic landscapes, and outdoor recreational opportunities attract movers. However, economic growth without sufficient centralized housing policy has led to challenges, particularly in urban centers. Washington State is one of only eleven states that requires local jurisdictions such as cities and counties to adopt comprehensive plans (American Planning Association 2022). Washington places a significant emphasis on land use planning, environmental sustainability, and preserving its natural resources. The Growth Management Act (GMA), enacted in 1990, has been a

cornerstone of Washington's approach to comprehensive planning. Though a vital first step, comprehensive planning is not comprehensive building. Housing development is still within control of private interests.

Housing across Washington State can be characterized by unaffordability in urban areas and homelessness leading to suburban sprawl and long work commutes, leadership in sustainable building techniques, geographic challenges in western cities involving bodies of water and steep slopes, and modest innovations in housing policy such as incentive zoning (Kadesh and Roach 1997). One regressive housing policy is Washington State's prohibition of rent control, disallowing cities to regulate rent and rent increases (Schmitt 2022).

## Data Source and Collection

The data used in this analysis was obtained from three sources: the U.S. Census American Community Survey, Washington Geospatial Open Data Portal, and Up for Growth's Washington State Housing Underproduction Report. The datasets consist of demographic, housing, and socioeconomic variables from Washington State. Using Social Explorer, data from the U.S. Census American Community Survey 2021 5-Year Estimate was exported to a data frame. In other words, the ACS data spans 2017 to 2021. Using the Washington Geospatial Open Data Portal, GIS data was exported to seven different dataframes. Up for Growth's underproduction data was converted to a dataframe from their Washington State report. The data for housing units to households formed comes from Up For Growth from 2010 to 2017.

To create a unified dataset for analysis, the cleaned datasets from different sources were merged by county, requiring relabeling of county identifiers in RStudio. The merging process ensured that relevant variables from each dataset were appropriately combined.

Table 3.1 Variable Descriptions

All data describes Washington counties.

| Name | Description | Source | Range | Median | Mean |
|---|---|---|---|---|---|
| *Dependent variable* | | | | | |
| Housing underproduction | The ratio of housing units to households formed. | Up For Growth | 0.32 to 3.1 | 0.79 | 0.96 |
| *Independent variables* | | | | | |
| Proportion of single-family residential area | The percentage of county land that is zoned for single-family homes | U.S. Census | 0.0040 to 0.33 | 0.030 | 0.060 |
| Proportion of Urban Growth Area | The percentage of county land that is designated as a UGA | U.S. Census | 0.00066 to 0.24 | 0.016 | 0.043 |
| Proportion of conservation land | The percentage of county land that is designated by a government for conservation | U.S. Census | 0.015 to 0.62 | 0.19 | 0.23 |
| Proportion of Foreign-born persons | The percentage of the population who was not born in the United States | U.S. Census | 0.015 to 0.24 | 0.075 | 0.090 |
| Proportion of non white persons | The percentage of the population who identify as a race other than white, including mixed race | U.S. Census | 0.074 to 0.46 | 0.19 | 0.21 |
| Proportion of unemployed workers | The percentage of worker who are unemployed | U.S. Census | 0.026 to 0.076 | 0.057 | 0.056 |
| Proportion of persons who did not move housing (non-movers) | The percentage of residents who live in the same housing as one year prior | U.S. Census | 0.69 to 0.93 | 0.86 | 0.86 |
| Proportion within 5% to 99% of the poverty line | The percentage of people whose incomes are 5% to 99% of the federal poverty line | U.S. Census | 0.073 to 0.25 | 0.12 | 0.13 |
| Median gross rent | The median amount of rental payment without utilities or other expenses | U.S. Census | 21.50 to 40.90 | 29.00 | 29.01 |

## Dependent variable: Housing units to household formation

The ratio of existing housing units compared to households formed is a measure of how well the housing market is responding to household formation. A low ratio indicates more households than there are units for and that housing is being underproduced.

To measure housing underproduction, I use Up For Growth's variable of the ratio of housing units compared to households formed by county.

Figure 3.2 Up For Growth's Washington County Level Ratio of Housing Units vs. Households Formation (2010-2017)

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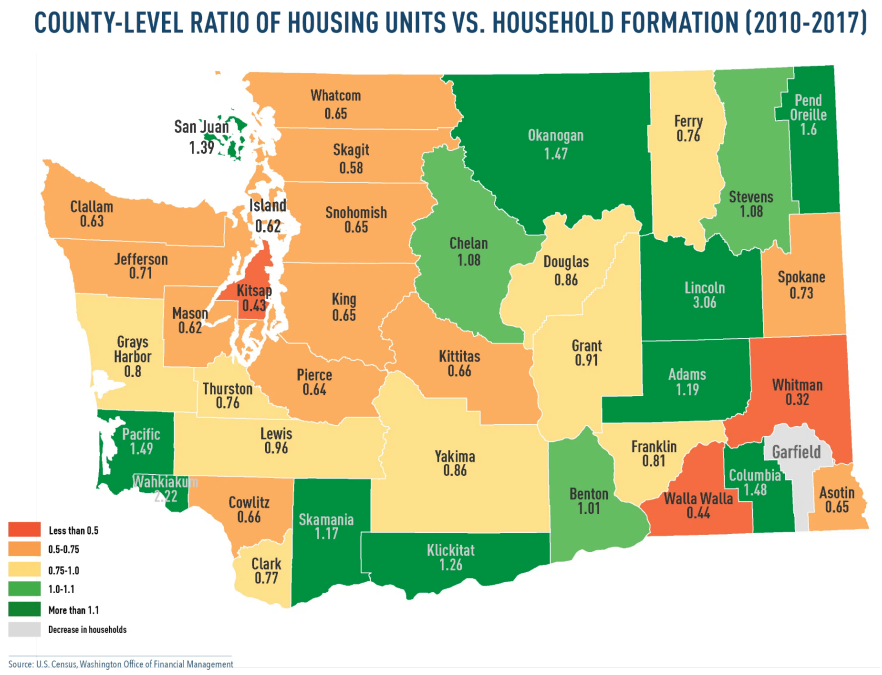


# Independent Variables

## Proportion of single-family residential area

This variable will influence housing underproduction by reporting the share of single-family residence zoning out of all residentially-zoned land in Washington. It demonstrates a municipality's priorities in density types utilized on residential land.

Physically and technically speaking, SFR-zoned land is always a candidate for more development with denser and taller housing types. Of course, socially and administratively, there are obstacles to building denser, but the specific percentage of land that hosts SFRs is therefore land that could host more housing.

## Proportion of Urban Growth Area

Similar to single-family residential area, the proportion of Urban Growth Area describes land that could hypothetically be rezoned for housing development. This impacts housing underproduction by alluding to the availability of land that could host housing. Of course, Urban Growth Area can include industrial and commercial land uses and may not be suitable for residences without remediation.

## Proportion of conservation land

Conservation land is the designation that is least likely to host housing. The most likely is SFR, then Urban Growth Area, then land that designated neither conservation or Urban Growth Area. The percentage of a county's conservation land indicates a level of limitation on the potential for housing production.

### Proportion of Foreign-Born persons

Newcomers to the United State and to Washington State are thought to be more likely to rent, not to have a couch to crash on if their risk of homelessness was to rise, and to depend on keeping their employment in order to keep a visa. This makes immigrants a more vulnerable group whose housing needs must be met and who may not always be ‘seen’ by developers.

### Proportion of non-white persons

Being built on Indigenous land and with stolen labor, racism and discrimination are baked into the United States’ existence by elevating white residents over all others. Ethnic neighborhoods lacking resources found in the white mainstream for investing in and developing their neighborhoods is an example of systemic inequality. Governments and lending institutions may be more likely to overlook a need for investment in an ethnic community (So 2012).

### Proportion of unemployed workers

When people are unemployed, their income is reduced to zero or near zero. This is troubling for producers who want to sell things to them; they will make fewer things. This includes housing. Determining the strength of the relationship between unemployment and housing underproduction is a key piece of information.

### Proportion of persons who did not move housing (non-movers)

Many factors go into a household’s decision to move or not to move, and I believe that the availability of housing is a highly relevant factor. Every rental or mortgage application is an indicator of housing demand, but the actual moves to and from residences are indicators of supply and demand meeting.

### Proportion within 5% to 99% of the poverty line

People in poverty are denied choices that are available to many and can reflect the policy and market environment as vulnerable participants. The housing experience of people in poverty is the core mission of this thesis such that all experiences can improve.

### Median gross rent

Theoretically, rent (price of housing) is a simple function of supply and demand. It's also a function of many more things, including desperation on the part of renters and power on the part of landlords given that housing is not an optional good.

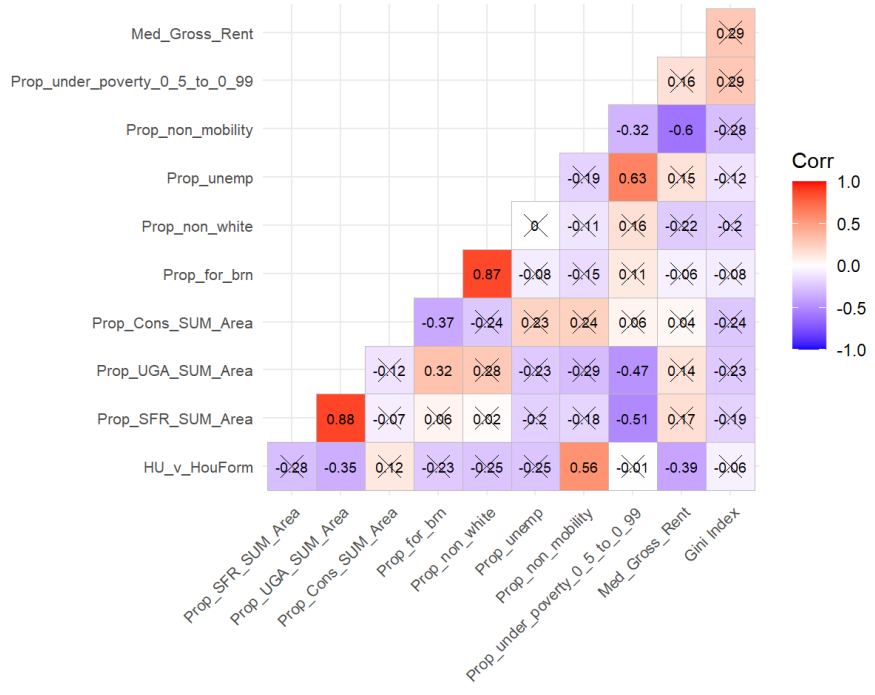
# Results and Discussion

## Correlations

The results of the correlation analysis, arranged on Figure 4.1, are 55 potential correlative relationships between chosen variables. The correlation portion of the analysis yielded twelve points of statistically significant outputs. For each correlation, I will suggest potential narrative explanations.

The greatest positive correlations were between single-family residence square footage with UGA square footage at 0.88 and Foreign-born persons and nonwhite at 0.87. The greatest negative correlations were non mobility with Median Gross Rent at -0.6 and SFR square footage with people living within 5-99% of the poverty line at -0.51. The variables with the greatest number of statistically significant correlations are people living within 5-99% of the poverty line and UGA square footage. These two have one negative correlation with each other at -0.47.

Figure 4.1 Statistically Significant Correlation Results



### Housing Availability and Urban Growth Area

The correlation between housing availability and the prominence of Urban Growth Areas in Washington counties is -0.35. This indicates that when more of a county's landmass is designated as an Urban Growth Area, the ratio of units of housing to new households decreases. This is surprising, given that more buildable land for a growing population would seem to suggest being able to accommodate that population. Because less-populated counties have larger HU-to-households ratios, it can be presumed that the more populous counties are not developing a sufficient quantity of housing, regardless of whether land becomes available by an expanded urban growth boundary. Development in more populated counties may be trying to take place near urban centers, already well within a UGB.

## Poverty

Poverty appears as a variable in four correlations. First, poverty correlates with the share of residents who did not move in the past year at -0.32. This suggests that when rates of poverty are higher, people move less. It can also suggest the reverse: when people are moving more, poverty lowers. However, moving costs money as well as time away from work; moving while having no available funds is a route that most will avoid, preferring to move when disposable income is present. Within the context of my research question, poverty seems to dampen the demonstration of demand for housing, as people are less likely to move away and start new households or move at all.

The second variable correlated with poverty is unemployment at 0.63. This indicates that unemployment and poverty rise and fall together. When someone is unemployed for a long enough period of time that they don't have the means to feed, clothe, and house themselves, they have entered a state of poverty.

Poverty's other two correlated variables will be discussed in the 'Trio B' section.

## Foreign-Born

Foreign-Born status correlates with three other variables. Foreign-born status correlates with nonwhite persons at 0.87, indicating that most recent migration has been performed by people of the global majority. In other words, most of the world's population is not white, and white or nonwhite status of Washington migrants is aligned with the white and nonwhite ratio worldwide.

The second variable correlated with Foreign-born status is the prominence of Urban Growth Areas at 0.32, meaning that when a county has more Foreign-born persons, it also has a higher share of Urban Growth Areas. One explanation could be that the regions that immigrants settle in tend to be heavily populated regions where housing demand is high and pressure to expand the Urban Growth Area is high. Another way to put this is that immigrants likely choose what region they'll settle in depending on how likely they are to find work, affordable housing, and community. Ethnic neighborhoods easily describe the phenomenon of moving to live with people in similar groups and with similar amenity needs such as ethnic grocery stores and community programming. This demonstrates that immigration is an impactful demographic variable as to where housing demand is experienced and then supplied.

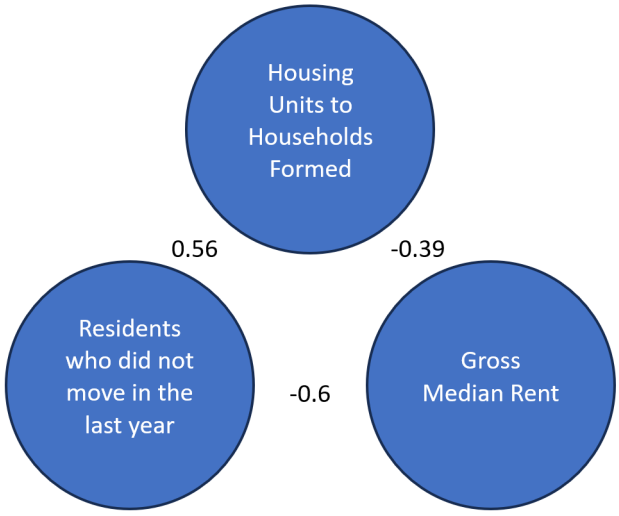
The third variable correlated with Foreign-born status is the prominence of conservation areas at -0.37. This indicates that where there are more Foreign-born persons, there is less conservation area. Conservation area is, most generally, rural, and is much less populated. If a county is primarily conservation land, that means there is not as much land to move to the next step of designating as Urban Growth Area. As expressed in the previous paragraph, Foreign-born persons tend to move to where Urban Growth Area is a more prominent land use. Conservation land operates as the converse of Urban Growth Area, as they are mutually exclusive.

## Correlation Trios

Trio: my nomenclature for a set of three variables that have statistically significant correlations with each other.

### Trio A - Availability and affordability

Figure 4.2 Trio A




The first set of correlations in Trio A is between the ratio of units of housing and households formed (HU-to-households) and the share of residents who did not move in the past year at 0.56. This indicates that the share of residents who did not move in the past year and the availability of housing rise and fall together. This is surprising, as more housing developed means more housing that can be moved into. One explanation is that people already in Washington are not moving as much as people who are new to Washington. The other sets in this trio expand.

The second set of correlations in Trio A is between gross median rent and housing units compared to households formed at -0.39, indicating that high rent is correlated with a low

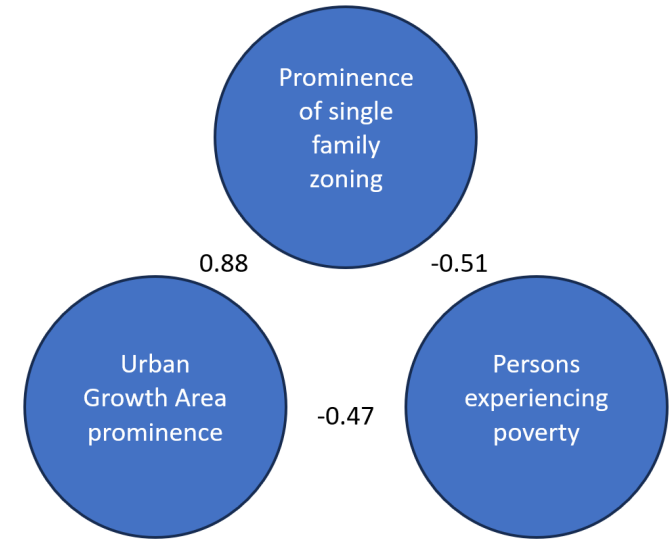
housing availability. This follows principles of supply and demand; if supply is low and demand is high, price will be high.

The third set of correlations in Trio A is between the share of residents who did not move in the past year and gross median rent at -0.6. When rent rises, the share of residents who did not move falls. Potentially, vice versa, when rent falls, the share of residents who did not move rises, but it's unusual for rents to fall. This is a very significant correlation, suggesting a close relationship between tendencies to move for residents and gross median rent.

A simpler way to think of Trio A is to think of median gross rent as negatively correlated with both non-movers and housing availability, which positively correlate with each other. When people can afford the rent, they won't want to move, and rent is more affordable when more housing is available.

## Trio B - Land use and economic policy

Figure 4.3 Trio B




The first set of correlations in Trio B is between the prominence of Urban Growth Areas and the prominence of single-family residence zoning at 0.88, which strongly indicates that UGA and

single-family residence zoning rise and fall together. This stands to reason easily; single-family zoning takes up a lot of space to house its population, requiring a large UGA.

The second set of correlations is between the prominence of single-family residence zoning and the share of persons experiencing poverty at -0.51. This indicates that when more of a county is zoned for single-family residences instead of commercial, industrial, or mixed-use zoning, poverty is low. This aligns with the phenomenon of bedroom communities, where in order to afford a large, fully-detached house, you must be quite far from poverty. Because of the automobile, American workers can commute long distances and continue segregating by socioeconomic class and race.

The third set of correlations is between the share of persons experiencing poverty and the prominence of Urban Growth Areas at -0.47. This indicates that when Urban Growth Areas take up a greater share of county land, poverty is low. This makes sense for the same reasons as the correlation with single-family residence zoning. Its correlative value is, however, *less* negative. Urban Growth Area encompasses wider scope of land use, and this correlation reinforces the previous explanation as well, given that a county with heterogenous zoning (industrial, commercial, multifamily, single-family, and mixed use) will include less expensive housing types such as condos and apartments.

Trio B is more effectively thought of as the correlations between poverty and two different measures of land use. The correlation of 0.88 for Urban Growth Area and single-family residence zoning indicates that they are nearly the same entity. The prominence of single-family homes in the housing makeup of Washington state is apparent here. When building fully detached homes, you can’t put very many on one parcel, and you can’t house very many people where you build them, and thus are correlated with a housing shortage.

# Regression Analysis

The relationship between housing availability and the selected variables is estimated in the regression model. Housing availability is the dependent variable and Urban Growth Area prominence, share on non-white population, share of unemployed workers, and median gross income are the independent variables. Multiple linear regression was used to test whether selected variables significantly predicted the intensity of housing units to households formed.

The generalized linear regression model is as follows:

$$HUHF = C + a*UGA + b*NW + c*UE + d*MGR$$

Where HUHF is the ratio of housing units to households formed, C is the constant, UGA is the prominence of a county's Urban Growth Area, NW is the share of the population that is non-white, UE is the share of unemployed workers, MGR is median gross rent, and a, b, c, and d are their coefficients.

It was found that median gross rent has a significant relationship with housing units to households formed.

It was found that the Urban Growth Area, the non-white population, and the share of unemployed workers have a lesser significant relationship with housing units to households formed.

Because generalized linear regression was used, there is no R-squared value.

## Regression model results

The Urban Growth Area land variable, share of non-white population variable, and share of unemployed workers regression results are statistically significant at the 10% level. Median

gross rent is statistically significant at the 5% level, which is the lowest of any variable from any model. The 10% confidence level of the first three variables indicates that those variables are important factors of housing units to households formed. These are part of the story in enough cases that they have a clear relationship with housing units to households formed.

Table 4.4 Regression Model Results

| | Coefficient | Std error | t value | p value | Confidence level |
|---|---|---|---|---|---|
| (Constant) | 3.69 | 0.75 | 4.90 | | |
| Urban Growth Area Prominence | -2.4 | 1.29 | -1.9 | 0.070 | 90% |
| Non-white population share | -1.38 | 0.80 | -1.7 | 0.095 | 90% |
| Unemployment rate | -11.01 | 6.20 | -1.8 | 0.085 | 90% |
| Median Gross Rent | -0.059 | 0.024 | -2.50 | 0.018 | 95% |

## Median Gross Rent

The 5% confidence level of the median gross rent variable indicates that, of all variables observed in the model, it has the strongest link. Just as shown in the correlations section, median gross rent has a negative relationship with housing units to households formed. The correlation coefficient between median gross rent and the ratio of housing units to households formed is -0.059. This means that for every $1 per square foot increase of median gross rent, the housing units to households formed ratio will decrease by 0.059. One potential explanation for this causal relationship is that when rents are high, developers are enticed to “get a piece of the action” by acquiring and/or building units to extract rent from. In the reverse case, low rents may discourage developers from constructing new housing, as they would not expect to turn a profit. Unfortunately, both high rents and low housing availability are theoretical risk factors for homelessness and become a sort of catch-22. If you can’t pay a high rent and have no local

alternatives to move to, the emergence of more privately-developed and managed units will not save you, because new units will be trying to attract the highest bidder and likely have higher rents. The question then becomes whether affluent residents who can afford the higher rents move out and whether rents in old units will stabilize.

The moderate statistical significance and non-zero coefficient demonstrate the impact of economic factors on housing units to households formed.

### Urban Growth Area Prominence

The coefficient estimate of the Urban Growth Area prominence is -2.40, meaning that as the prominence of the Urban Growth Area increases by 1%, the ratio of housing units to households formed decreases by 2.4. More area results in a worse housing-to-households ratio, curiously. One explanation for this is that new land is not needed for new housing if built densely, which is more affordable to developers (but not necessarily as profitable) and for buyers. With new land being annexed into urban growth boundaries, the more likely scenario is that those homes are fully-detached single-family homes.

Either way, not enough homes are being built to accommodate the formation of new households, and medium- and high-density planning are not properly emphasized to accomplish this. The statistical significance and non-zero coefficient demonstrate the impact of policy factors on housing underproduction, given that the Urban Growth Area is within political leaders' power to adjust.

### Proportion of Non White Residents

The coefficient estimate of the share of non white residents is -1.40, meaning that as the share increases by 1%, the ratio of housing units to households formed decreases by 1.4. Data regarding the racial makeup of new households is needed for a clearer picture. For now, one

explanation is the historic, racially-motivated underinvestment in communities of color. Properties where people of color are present have been structured to be less valuable by governmental policies and white supremacist culture. A lack of investment in developing housing in communities of color is in line with racist housing norms and policies such as racially restrictive covenants and the race-informed procedures of redlining. Another explanation for non-white persons relating to a continuing housing shortage is simply that a significant share of Washington's population growth has come from immigration, and the vast majority of the world is not white. The coefficient itself is quite close to one, which suggests that a regression using general population growth could yield similar results.

### Proportion of Unemployed Workers

The coefficient estimate of the share of unemployed workers is -11.01, meaning that as the share increases by 1%, the ratio of housing units to households formed decreases by 11.01. This is a staggering coefficient, demonstrating the abstracted relationship between a developer and a community it works or could work in; as a community declines, investment in that community declines even faster. In reality, these variables are interrelated; people living in a neighborhood sparks a need for services and therefore creates employment. This coefficient supports the relationship between housing development and economic health for a community and emphasizes the importance of economic factors in my research question.

# Conclusions

## Summary of Results

The variables influencing housing units to households formed have been explored through both correlation and regression analyses. This examination offers valuable insights into the multifaceted factors that contribute to housing challenges, presenting opportunities for informed policy decisions and further research.

## Correlation Results

The twelve significant correlations found provide a deeper understanding of the intricate connections between different aspects of housing underproduction. Notable positive correlations include the strong relationship between single-family residence square footage and Urban Growth Area (UGA) square footage at 0.88, as well as the correlation between foreign-born and nonwhite individuals at 0.87. On the negative side, correlations such as non-mobility with Median Gross Rent at -0.6 and single-family residence square footage with people living within 5-99% of the poverty line at -0.51 highlight crucial dynamics within the housing landscape.

Furthermore, significant correlations between people living within 5-99% of the poverty line and UGA square footage emerge, revealing the nuanced relationship between housing affordability and land availability. The correlation of -0.47 between these two variables underscores their impact on each other, shedding light on the need for holistic approaches to address housing challenges.

### Insights from Trio A and Trio B

The analysis of Trio A and Trio B correlations further unravels the complexities of housing underproduction. Trio A, which focuses on availability and affordability, exposes the interdependence between housing availability and the share of residents who did not move in the past year. Additionally, the correlation between gross median rent and housing availability at -0.39 highlights the role of rent in shaping housing availability.

Trio B delves into the relationship between land use and economic policy. The strong correlation of 0.88 between the prominence of UGA and single-family residence zoning underscores the dominance of fully-detached homes. Furthermore, correlations between zoning, poverty, and the share of persons experiencing poverty indicate the influence of zoning decisions on socio-economic disparities.

## Regression Results

Regression analyses bring predictive power to the forefront. The Urban Growth Area land variable, share of non-white population, share of unemployed workers, and median gross rent emerge as statistically significant at either the 10% or 5% level. This reveals their significance in shaping housing underproduction. The high significance of median gross rent at the 5% level underscores its tight connection to housing shortages, implying its pivotal role in influencing housing challenges, especially in the context of the recent Seattle City Hall vote (Seattle City Council Blog 2023).

## Implications

The findings of this study bear significant implications for housing policy, design, and practice. Understanding the intricate relationships between variables allows for more targeted

interventions. Policies promoting diverse zoning, fostering affordable housing, and encouraging mobility could help alleviate housing shortages. Additionally, recognizing the role of UGA in influencing housing supply highlights the importance of responsible land use planning.

### Key implication

Though a bigger Urban Growth Area correlates with a smaller share of persons in poverty, a bigger UGA is also shown in the regression to bring a lower housing availability, which raises rents and worsens poverty.

### Vulnerable Groups

While the foreign-born population does correlate with Urban Growth Area and Conservation Land prominence, that is easily explained by the tendency of immigrants to move close to places of employment, which are typically in Urban Growth Areas and not in Conservation Lands. Therefore, the lack of correlation between the foreign-born population and median gross rent suggests that the share of immigrants does not adversely impact the supply of housing anymore than non-immigrants, discrediting anti-immigration thinkers.

The regression analysis demonstrated a significant link between the share of non-white persons and the share of unemployed workers to housing units to households formed. As seen in the Census ACS data, people of color tend to live in more densely populated counties, where housing shortages are more acutely felt. On municipal and neighborhood levels, with what we know about redlining, blockbusting, and gentrification, development in communities where people of color live only tends to happen when developers see an opportunity to make a large profit, jumping property values and rents starkly (McDonald 2022). Anti-displacement measures add to development costs and may reduce revenue, so presumably a greater share of people of color will not see development that could benefit them as much as white people would.

## Rezones and UGA

The correlation between a higher share of a county's land being designated as Urban Growth Area and a lower housing units to households formed implies strongly that an expanded UGA would expand housing development. The relationship is self-fulfilling: when a UGA expands, more gets built, requiring more land again. However, solely broadening the borders of an Urban Growth Area would not be an effective way to address the housing crisis, because it will cause worsen the commute and public health crisis if housing units are built as the sprawl-inducing norm in America: fully-detached single-family homes. But there are other ways of finding and designating more buildable land through policies that encourage infill and the use of greyfield and brownfield land, requiring rezoning and administrative resources for developers.

The prominence of the Urban Growth Area is significant in the regression analysis. The same logic as with the correlation analysis applies; more available land means more building can take place and more units will be available.

## Rent

The negative correlation between median gross rent and housing availability is straightforward. The law of supply and demand would suggest that a high availability of housing units would mean more competition among landlords to drive down rent, and this is supported in my research. It also reinforces that private developers have a vested interest in a housing shortage as artificial scarcity.

The regression analysis indicates that median gross rent is the most significant variable connected with housing units to households formed. Without a temporal regression, causation is unclear, but combined with the pair's correlation, it is clear that Washington's market equilibrium

for housing units and rents does not result in both livable rent prices and healthy housing availability.

## Recommendations

### Loosening Zoning Restrictions

Though I showed the prominence of a county's Urban Growth Area to be negatively correlated with housing availability, implying that a greater Urban Growth Area would correlate with greater housing production, the regression results were different. The regression showed that an increase in a county's UGA did *not* lead to an improved housing units to households formed ratio. The implication is that while existing counties with great proportions of land dedicated to Urban Growth Area have less severe housing shortages, when bringing in multiple variables for the regression, an increase in UGA land actually worsens the shortage. The actionable interpretation of this is that while more land must be found for development, it must not come from extending the urban growth boundary.

Much of an urbanized area's infill is not permitted to be densified, leaving many opportunities for housing development out of reach. Rezoning to allow detached and non-detached accessory dwelling units, fourplexes, and low-rise buildings is a feasible action by counties and municipalities. My recommendation is for the state to take on an active role such as what we've seen in California, i.e. a blanket upzone to legalize two units on one lot in all residential areas. If there's land available, developers will build. Recent federal encouragement to ease restrictions and allow more housing to be built is hopeful, but more pressure and assistance will be required (Dow Jones & Company 2021).

## Rent Control

Seattle City Council recently failed to pass a rent control ordinance that would take effect upon the Washington legislature lifting the state ban (Seattle City Council Blog 2023). Among the arguments against rent control was that it drives down housing production. Uncontrolled rents result in high levels of housing cost burden in urbanized regions and clearly does not lead to development of housing to meet demand.

If housing everyone rather than some or most was profitable, the development market would be larger. But the existence of a shortage of housing demonstrates that it is not in developers' interest to house all, that a portion of the market will not turn a profit to house. In the meantime, Washingtonians are spending high shares of their wages to landlords who can raise the rent to the highest bidder without improving their product (Appelbaum et al. 1991). As Appelbaum and their co-authors note, rent control alone will not solve the housing crisis but is a tool available to change market dynamics.

## Public Housing Development

Whether or not rent control discourages development, a significant portion of Washington' population are cost-burdened, unhoused, or living with others against their preferences (adults living with parents or roommates). There is a clear need for more housing that people can afford that the market will never provide. This thesis has made reference to the profit motivation of private developers at many points.

The state should be funding public housing that is not meant to turn a profit. The private market cannot be depended upon to build what is needed, even with more liberal zoning and other incentives (Sitaraman and Alstott 2019). The state and counties must intervene, whether by acquiring and administering housing or heavy support to non-profit developers.

## Contributions to Knowledge and Future Research

This study enriches existing knowledge by revealing the complexity of factors underlying housing underproduction. The correlations and regression analyses contribute to a more nuanced understanding of the issue. However, further research is needed to explore how these findings apply in different geographic and socio-economic contexts. Rent control is illegal in Washington State. Do cities in other states with rent control have better or worse housing shortages? Many factors play into that question as well, such as the prominence of employment opportunities in cities with and without rent control. Research into the more and less effective incentives for developers could inform future policy choices. In-depth studies on specific variables, such as the impact of income level on housing dynamics, could also yield deeper insights.

## Future Work: Toward Holistic Solutions

Future research endeavors should aim to develop holistic strategies that consider the multifaceted nature of housing underproduction. Integrating insights from various fields, such as urban planning, public administration, public health, economics, and sociology, can lead to more effective solutions. Analyzing the interactions between variables over time could especially provide insights into the evolving nature of housing challenges.

To balance impact and the pursuit of knowledge, I recommend future research be accomplished through the implementation and observation of housing solutions such as public housing, investment in non-profit housing developers, and widespread upzones.

In conclusion, this study sheds light on the intricate relationships that contribute to housing underproduction. The findings emphasize the importance of a multidisciplinary approach in

addressing these challenges and pave the way for innovative solutions that consider the dynamic interplay of factors within the housing landscape.

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