So your primary question is whether cities with <ave. precip. are growing faster than other cities.

Y = population growth | X = precipitation

these are ? Housing prices are just a control variable for ceteris paribus.

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Course Project Topic

their

1. Are people in the United States moving to cities that experience below average precipitation at a higher rate than cities that have average or above average precipitation? Further, are house prices in ~~these~~ cities with below average precipitation growing at a ~~higher rate~~ than cities with average or above average precipitation? Cities like Bozeman, Salt Lake City, and Reno have experienced high population growth in the last decade. However, cities that have below average precipitation, ~~historically~~, experience droughts ~~for over half of the year~~ and do not have enough water sources to supply the growing population. Further, these cities have high housing prices. So, are people moving to below average precipitation cities at a faster rate, which is causing housing prices to increase at a faster rate, than cities that have average or above average precipitation?

faster

Further,

s

, frequent

Two topics here: 1) precip 2) housing prices

2. The cause and effect relationship implied by the above question is that people are moving to cities with below average precipitation per year which is causing housing prices to increase at a fast rate. The cause in this relationship is the growing population and the effect is the housing prices. By observing this effect in cities with below average population and comparing that to cities with average or above average precipitation, we can determine if precipitation affects people's decisions.

vague

Have there been Δ precip. within locations across time? Would be good variation to exploit.

3. The ideal randomized experiment to determine the effect of precipitation rates on housing prices would be to force a set of identically sized groups of people to move to cities of varying precipitation, and measure the change in the housing prices of each city. The experiment would monitor the groups, which would ideally be identically sized, as they find homes in each city. We would then be able to find the exact rate at which housing prices in cities would change as population increases, as well as trends in people moving to cities with different precipitation levels.

It's not clear why you talk about migration (Δ population) but focus on home prices. If home prices are your Y, Δ pop growth would be a control.

4. Cities that have below average precipitation are forced to obtain water from somewhere other than their natural water source. There are significant environmental impacts that are caused by ~~traversing~~ transporting water across the U.S. If there is evidence that people are moving at a high rate to cities with below average precipitation, then policy could be created to incentivize people to not move to cities that have low water sources. We should consider adjusting the state level tax policies, increasing more employment opportunities, thereby upgrading overall wellbeing for people. We want to incentivize population size to be in line with the capacity of a city. Hence, if a city population goes beyond its capacity, it will not only experience housing crises and high prices, but also will spur pressure on the overall services and resources. Hence, a lot of consequences should be taken into account when relating population changes and housing prices.

wouldn't high home prices do that w/o policy action?

5. Feng, Y. L., Kim, T., & Lee, D. C. (2018). Housing price and population changes: growing vs shrinking cities. *Accounting and Finance Research*, *7*(4), 59-65. https://ideas.repec.org/a/jfr/afr111/v7y2018i4p59.html

a) The research question examines the relationship between population changes and housing prices in the United States within the context of the post-Great Recession housing market recovery from 2010 to 2017. It further investigates whether the asymmetrical impact of population movements on property values observed under economic stability holds true during this period of recovery and potential overheating in particular places, building on the original work of Glaeser and Gyourko (2005).

b) The study's data sources are diverse. They used the Federal Housing Finance Agency's (FHFA) quarterly MSA house price indices (HPI) based on sales and appraisal data to construct annual house price growth (HRet). The Census Bureau provides population estimates from 2010 to 2017, while the Bureau of Economic Analysis (BEA) provides GDP per capita and growth data (up to 2016). The Bureau of Labor Statistics (BLS) provides unemployment rates based on December numbers. Mortgage rates are acquired from the FRED database of the St. Louis Federal Reserve, while statistics on annual new building permits issued at the MSA level are obtained from the Census Bureau's Building Permits Survey.

c) The primary argument, validated by empirical evidence across 357 U.S. metropolitan regions, underlines that when population falls, housing prices demonstrate greater elasticity than when population increases, aligning with the durable goods nature of housing. Specifically, a 1% increase in population correlates with an average 0.896% rise in house prices, while a 1% population decline corresponds to an average 1.515% decrease in house prices, although the magnitudes differ from Glaeser and Gyourko's (2005) findings using decadal data. Furthermore, the paper extends its analysis to include additional variables such as unemployment rates, GDP per capita, mortgage rates, and housing supply measured by building permits. This study contributes valuable insights into the persistence of population-driven housing price dynamics during a unique economic context and highlights the multifaceted factors influencing housing markets in the post-Great Recession era.

Hunter, B., & Biddle, N. (2011). Migration, labour demand, housing markets and the drought in regional Australia. Migration-labour-demand-housing-markets-and-the-drought-in-regional-Australia.pdf (researchgate.net)

a) The question at play in this paper was "what was the quantifiable impact on migration, labor demand and the housing markets of Australia, due to the drought of 2001 to 2004". The event of the drought allowed researchers to analyze the effect of a sudden and sustained lack of rainfall over a period of time, which is important to the context of our paper as it will allow us to establish the dynamics of low precipitation compared to high

precipitation cities.

b) The paper uses Australian census data from 1996, 2001, and 2006, Bureau of Meteorology data, which gives the meteorological data for the past three years up to the date of census (the authors acknowledge the implicit gaps in data from BOM), and Statistical Local Area(SLA) data to fill in the meteorological gaps, as well as glean migration, labor market and housing market data for use in the study.

c) Surprisingly, the paper finds that people migrated away from drought stricken agricultural communities at a significantly lower rate than non-drought communities; there was in fact a positive net migration rate for drought stricken agricultural communities, indicating that people were actually choosing to move into the most drought stricken communities. They also found that weekly rent and monthly loan repayments were higher for drought stricken communities, relative to non-drought communities. The authors note that there was more employment growth in the drought stricken communities as well. The only communities which had higher net in-migration rates were the metropolitan areas, and only non agricultural communities experienced higher rates of employment growth and higher costs of monthly rent and mortgage repayments. The drought stricken agricultural communities were shown to have a growth in weekly rent and monthly loan repayments, while non-drought communities were shown to have had a drop in weekly rent and monthly loan repayments. All of this shows that even a sudden drop in rainfall from the norm is not necessarily associated with a drop in economic activity.

Good start.

Write out your estimating equation now ($Y = \alpha + \beta_1 X_1 \ldots$)

noting how precip / prices / Δ population fit together. An interaction?

- what will be level of observation?
- what is your "random" treatment variable (X)?