Land Use Regulations and Fertility Rates

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Abstract

Previous literature has shown that land use regulations influence where people choose to live within the U.S. by impacting housing prices. In this paper, we study the impact of these same regulations on another component of population growth, fertility rates. First, we employ a dataset on the stringency of land restrictions using court based measures created by Ganong and Shoag (2017). We add to this separate cross-sectional measures of land use regulations from the American Institute of Planners, the Wharton Urban Decentralization Project survey, and the Wharton Residential Land Use Regulation Index (WRLURI). Combining this data with fertility data from the CDC and the Survey of Epidemiology and End Results data, we explore the impact of land use regulations on fertility at both the state and county level. We find a significant negative relationship between land use restrictions and fertility rates across all measures and geographies. Specifically, we find that land use regulations reduce fertility rates for teens and women in their twenties while increasing the fertility rate for women in their thirties or older to a lesser degree.

1. Introduction

Economists have long known that housing supply is an essential contributor to population growth at the metropolitan level. Glaeser, Gyourko, and Saks (2005) show that there is an extremely tight link between MSA level growth in population and housing stocks, and Glaeser and Tobio (2008) show that much of the growth in population in the sunbelt can be credited to expansions in housing supply. The argument is intuitive; in order for regions to grow, there must be sufficient affordable housing to accommodate the new population.

Many factors contribute to the variation in the costs of supplying housing across markets. Gyourko and Saiz (2006) link differences in construction costs with differences in unionization rates and wages. Saiz (2010) documents the importance of geography – such as steep slopes and water bodies – in determining the elasticity of housing supply at the metro level. Finally, capital costs also vary across places and contribute to differences in the costs of supply (Hwang and Quigley 2006).

Though housing costs are determined by all of these factors, variation in these costs generally cannot account for the wide distribution of housing prices across the U.S. Glaeser and Gyurko

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(2017) note that structure costs per square foot for a modest quality home have an interquartile range of $72 to $86 across metro areas. This cannot account for the significantly greater variation observed in home prices. For example, industry groups report differences in prices per square foot ranging from $24 in Detroit to $810 in San Francisco.[2] Additionally, this variation cannot explain the rise in real house prices above these costs (Davis and Heathcote 2004, Davis and Palumbo 2008). For example, Gyourko and Molloy (2015) show that real construction costs are roughly unchanged since 1980, while real housing prices have nearly doubled.

This increase in variation and markup over construction has largely been attributed to increases in the stringency of land use regulation. Gyourko, Mayer, and Sinai (2013) document the "ever widening gap in the price of housing between the most expensive metropolitan areas and the average ones", and note the role of inelastic housing supply. Quigley and Raphael show an explicit link between regulation and house price increases across cities in California. Glaeser, Gyourko, and Saks (2005) show the same link in Manhattan. Less directly, Raven Saks (2008) shows that cities that have labor markets with tighter regulation develop less housing and see higher house price increases in response to labor demand shocks.

Though zoning and other land use restrictions have existed for at least one hundred years, with New York City instituting one of the first citywide zoning laws in 1916, significant changes beginning in the 1970s have magnified their impact. Fischel (2004) traces these changes to the emergence of new transportation options (e.g. highways), racial desegregation, and an increasing focus on environmentalism. These forces, Fischel observes, led to "regional governance arrangements that began to be formed in the 1970s" that created an effective "double veto" system in many parts of the country (Fischel 1989, Popper 1988). Developers, for the first time, had to win approval from both local and regional authorities, a process described as "The Quiet Revolution" by Bosselman and Callies (1971). As Fischel (2004) writes, the net impact of this new process "changed metropolitan development patterns after 1970."

The regionalism of the Quiet Revolution manifested itself in the courts as well. The textbook *The American Land Planning Law* (Taylor and Williams 2009) writes that, following the period in the 1900s where courts upheld the application of restrictions to particular tracts of land to be invalid, the courts in the 1970s and later "went to the other extreme, tending to uphold anything for which there was anything to be said." Perhaps the defining case marking this transition was brought against the Philadelphia suburb of Mount Laurel, New Jersey. The largely single-family home community put in place onerous restrictions on multi-family units. The National Association for the Advancement of Colored People (NAACP) sued in 1975. The New Jersey Supreme Court ruled in its favor, finding that each community had to provide its "fair share" of "low- and moderate-income housing."

[2] http://www.foxnews.com/real-estate/2016/10/21/what-is-average-price-per-square-foot-for-home-and-why-does-it-matter.html

While the NAACP won the case, suburbs interested in restricting development won the war. Mount Laurel's compliance with the ruling involved only trivial concessions, and another state supreme court ruling (Oakwood at Madison) undid the minor protections Mount Laurel provided. The changes taking place in New Jersey were mirrored around the country. These court decisions were instrumental for effecting the regionally focused change described by Fischel, a fact emphasized by Ellickson (1977).

The rise in land use regulation since the 1970s has been linked to changes in population growth in Ganong and Shoag (2017). In that paper, Ganong and Shoag show that historically the population grew most quickly in the richest parts of the country, a process they label "directed migration". Ganong and Shoag show that this process effectively came to an end when high income places embraced regulations that stifled development.

While Ganong and Shoag (2017) focused on migration, land use restrictions may affect population growth through other channels as well. Higher housing prices or increased transportation costs (Muehlegger and Shoag 2015) could lead people to delay having children or have fewer children altogether. To our knowledge, this relationship has not previously been explored in the data.

In this chapter, we establish that measures of land use restrictions are tightly correlated with lower fertility rates. This is true across a wide range of data sources and geographies, and this relationship remains strong in multiple demanding specifications. While it is impossible to rule out confounding factors entirely, the strong relationship suggests that land use restrictions may affect regional population growth through fertility changes as well.

The remainder of the chapter proceeds as follows. In section two, we describe the data sources. In sections three and four, we discuss the results at both the state and county level. Finally, in section five we conclude.

2. Data Sources

To document the link between fertility and land use restrictions, we make use of several data sets to create multiple measures of these regulations. This is important because these laws vary considerably in their details and enforcement. Moreover, individual metrics are often based on noisy survey measures or fail to cover important geographic or regulatory areas. Therefore, it is important to establish that the relationship between fertility and land use restrictions is consistent across different measures and at different levels of geography.

Our primary measures are collected from Ganong and Shoag (2017). These measures are based on the number of cases in state supreme and appellate court databases containing the terms such as "land use" or "zoning". Since the raw number of cases will be influenced by the volume of total cases, we scale these numbers in two ways. In our primary approach, we divide the total count of cases to date mentioning land use by the total number of cases to date in the database.

This is a cumulative measure beginning with 1940--the first year for which we have data. We believe that a cumulative measure is preferable because it captures the impact of earlier regulations. As a robustness test, we also construct a measure of the annual count divided by the total number of cases contained in the state court database for that year. We explore both in the tables below.

The central advantage of these court-based measures is twofold. First, they are omnibus measures that capture a wide range of restrictions. Intuitively, it is likely that any binding limit will at some point generate litigation and hence contribute to the data set. This has an advantage over survey based approaches, which only focus on a subset of narrowly pre-defined policies. The second major advantage is that these data vary both across space and time. To our knowledge, these data represent the first national panel measure capturing land use restrictions.

To assess whether the relationships using these measures are robust, we introduce three alternate cross-sectional sources. While they do not provide variation over time like the court-based measures, they do supply a useful robustness check.

The first measure comes from the 1975 survey by the American Institute of Planners. These data were aggregated to a state level index following the procedure described in Ganong and Shoag (2017). Our second measure comes from the Wharton Urban Decentralization Project survey, conducted in 1989. We summed the questions on the sufficiency of zoned residential land (graded on a five-point scale), and then aggregated the metro level data weighting by population. Our final measure is the Wharton Residential Land Use Regulation Index (WRLURI) constructed by Gyourko, Saiz, and Summers (2008) and aggregated similarly.

Finally, we measure fertility rates using data from the CDC and the Survey of Epidemiology and End Results data hosted by the National Bureau of Economic Research. Following the literature, we define fertility rates as the number of live births per 1,000 women ages 15-44. The distribution of fertility rates across states in 2015 is plotted in Figure 1 below.

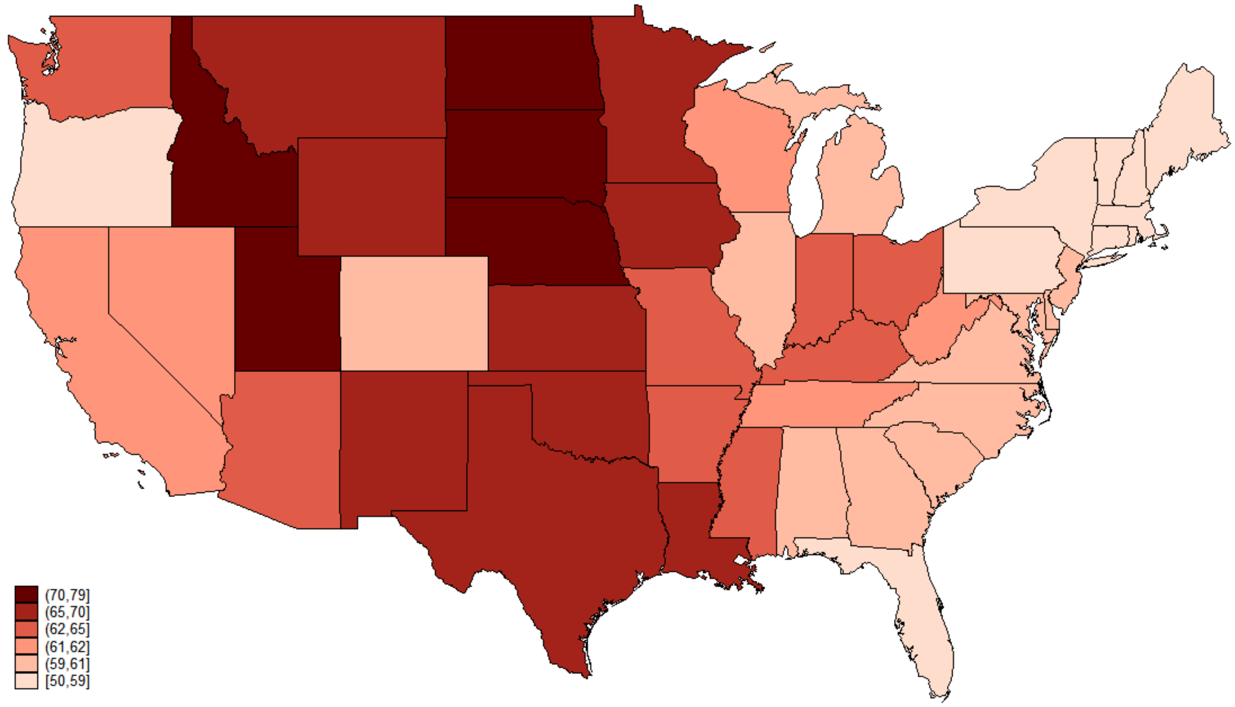

Figure 1: Fertility Rates (live births per 1,000 women ages 15-44) across US states in 2015.

3. State Level Results

We begin our analysis at the state level by exploring cross-sectional correlations. As Figures 2-4 show, each of the purely cross-sectional state-level measures is strongly negatively correlated with fertility rates. Although the measures are constructed using independent and unrelated surveys spanning across three decades, this negative correlation holds firm.

In Figure 5, we plot the annual cross-sectional relationship between the cumulative "land use" court based measure and fertility rates across states. As is evident in the graph, the relationship is quite strong in virtually every year.

Figure 2: Correlation of Fertility Rates and a Land Use Regulation Index constructed from the American Institute of Planners data in 1975.

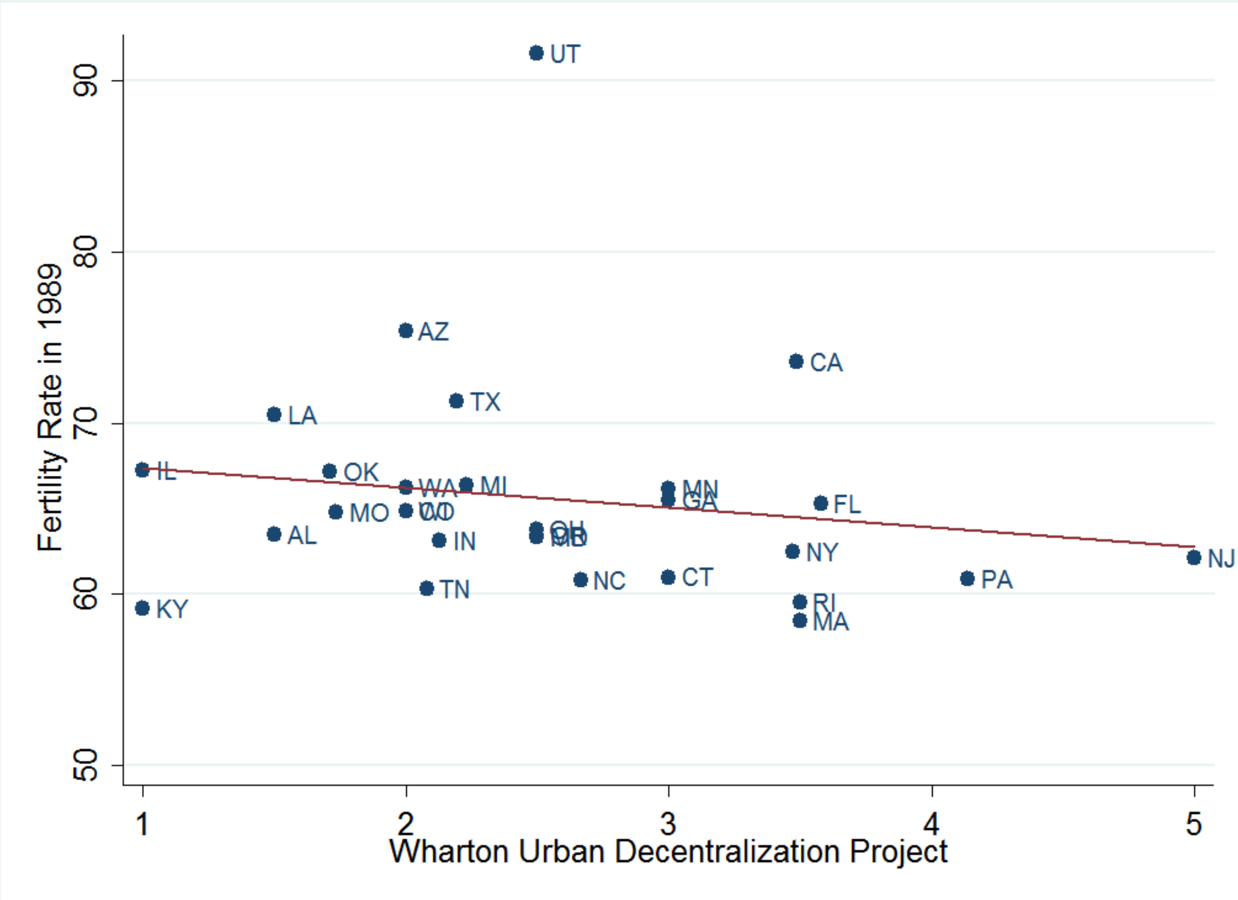

Figure 3: Correlation of Fertility Rates and a Land Use Regulation Index constructed from the Wharton Urban Decentralization Project data in 1989.

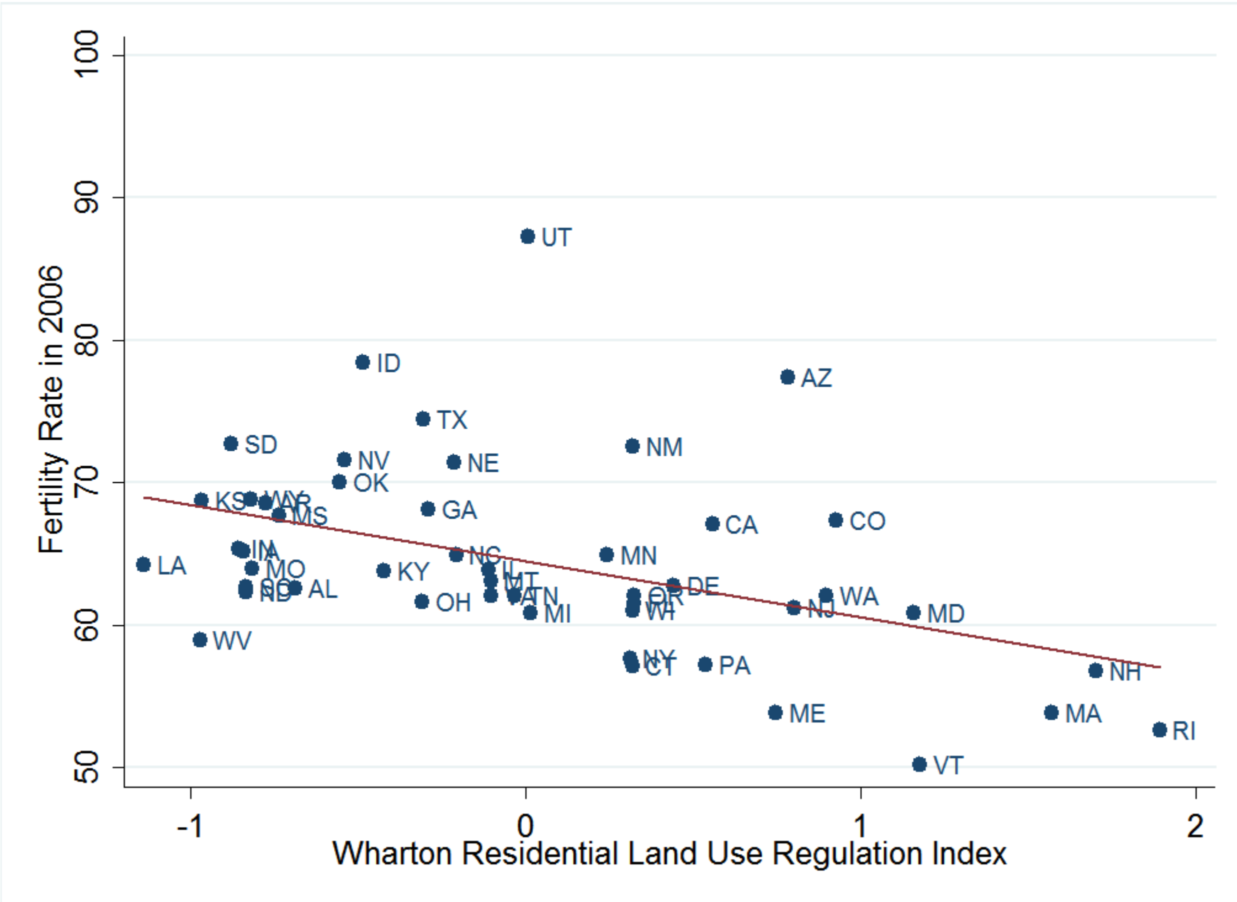

Figure 4: Correlation of Fertility Rates and the Wharton Residential Land Use Regulation Index data in 2006.

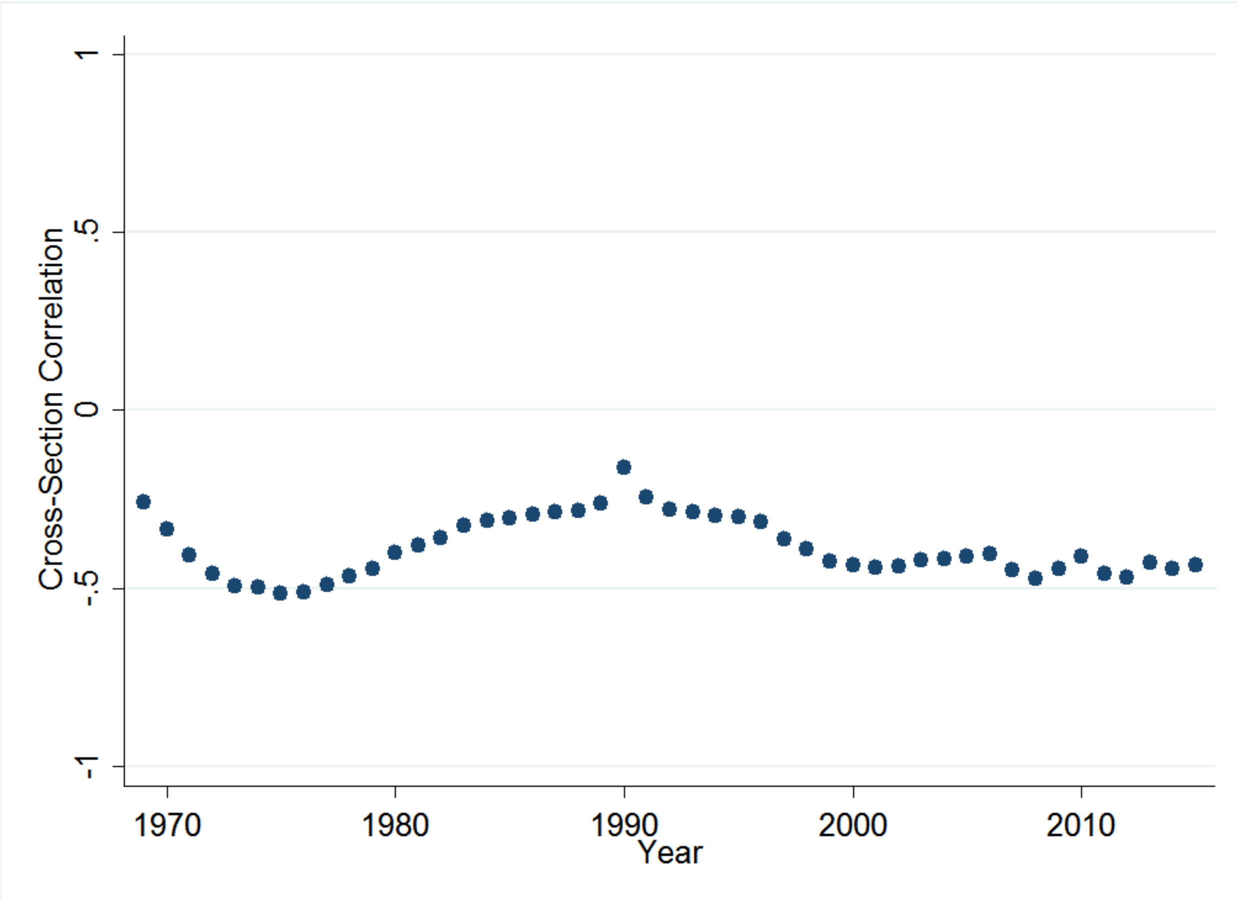

Figure 5: Annual Cross-Section Correlation of Fertility Rates and Court Based Cumulative "Land Use" Regulation Measure Over Time

However, it is reasonable to think that this cross-sectional relationship could be confounded by fixed differences across states. To address this issue, we turn to regression models that exploit the changes within a state over time in the stringency of land use restrictions. We operationalize this with a fixed effects model in which we control for both state and year fixed effects and regress state annual fertility rates on our land use restrictions measures. The state fixed effects control for unchanging differences across metro areas, and the year fixed effects absorb common trends over time. The negative relationship between fertility and land use remains strong for all of the court-based measures after these controls. While the magnitudes may be hard to parse from the table, the cumulative measures imply that a one standard deviation increase in the land use measure is associated with a 0.14 to 0.38 standard deviation decrease in fertility rates.

Table 1

VARIABLES	(1)	(2)	(3)	(4)
	State Annual Fertility Rate (Live Births per 1,000 women ages 15-44)			
Cumulative:				
"Land Use" Cases/ Total Cases	-313.4***			
	(32.3)			
"Zoning" Cases/ Total Cases		-190.0***		
		(16.4)		
Annual:				
"Land Use" Cases/ Total Cases			-35.7***	
			(13.8)	
"Zoning" Cases/ Total Cases				-16.0**
				(6.3)
Observations	2,256	2,256	2,016	2,016
R-squared	0.84	0.85	0.84	0.84

Robust standard errors in parentheses. All specifications include state and year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

However, even after controlling for state and year fixed effects, the potential for omitted variable bias or misspecification remains. In Table 2, we address this issue by adding state-specific linear time trends and Census Division-year fixed effects. The state-specific trends, used in Columns 1-2, absorb any constant state specific trend. The Census Division-year fixed effects absorb any non-linear pattern that would apply regionally. The coefficients on the land use measures are virtually unchanged by these additional controls. The constancy of the relationship suggests that this robust pattern may not be purely spurious.

Table 2

VARIABLES	(1)	(2)	(3)	(4)
	State Annual Fertility Rate (Live Births per 1,000 women ages 15-44)			
Cumulative:				
"Land Use" Cases/ Total Cases	-323.3***		-373.1***	
	(59.2)		(44.0)	
"Zoning" Cases/ Total Cases		-177.1***		-178.1***
		(21.4)		(13.3)
Additional Controls	State Specific Time Trends		Census Division-Year Fixed Effects	
Observations	2,256	2,256	2,016	2,016
R-squared	0.84	0.85	0.84	0.84

Robust standard errors in parentheses. All specifications include state and year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Of course, a state level analysis makes use of only very coarse geographic variation. To study the question at more refined levels, we turn to county level data in the next section.

4. County Level Results

To explore this question at sub-state geographies, we matched county level fertility rates to the Wharton Residential Land Use Regulation Index (WRLURI). We use the county decomposition of this series outlined in Ganong and Shoag (2017). Neither the CDC Wonder database nor the WRLURI is comprehensive. In total, we were able to match 425 counties comprising 200 million people in the year 2006. As discussed above, we do not have sub-state data that varies over time, and so our county results exploit only cross-sectional variation.

We began our investigation by regressing county level birth rates on the Wharton index, both weighted and un-weighted, as reported in Table 3 below. The data show a strong negative relationship that is statistically significant. The Wharton index has a standard deviation of roughly 0.77 in this sample and a mean of roughly zero. Fertility rates have a mean of 65.4 and a standard deviation of 10.3 at the county level. The magnitude of the raw relationship implies that a one standard deviation increase in land use regulation is associated with a 0.18 standard deviation change in birth rates. Alternatively, a one standard deviation increase in the WRLURI is associated with 1.8 fewer births per year per 1,000 women.

Table 3

VARIABLES	(1)	(2)	(3)	(4)
	County Annual Fertility Rate in 2006 (Live Births per 1,000 women ages 15-44)			
WRLURI	-2.36***	-2.96***	-1.68***	-2.63*
	(0.56)	(0.75)	(0.56)	(1.47)
Specification	-	Weighted by Population	Controls for Per Cap Income Share BA	Labor Market Area Fixed Effects
Observations	425	425	425	425
R-squared	0.03	0.04	0.09	0.77

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Again, we are aware that this relationship may be confounded by outside factors. To address this possibility, we add control variables in column 3. Specifically we add controls for the share of the population with a college degree and the average per capita income in the county. The addition of these controls lowers the coefficient, but the impact of land use regulations remains significant and important.

Finally, in column 4, we explore the importance of confounding factors by adding fixed effects for labor market areas (Tolber and Sizer 1996). These dummy variables absorb any variation across labor markets and estimate the impact by comparing counties within a given labor market area. The results are less precisely estimated but extremely similar in size to the baseline county-level estimates. Moreover, they remain statistically significant at the 10% level.

Though the data do not permit a natural experiment, the relative constancy of the result across specifications suggests that there may be some causal relationship. Intuitively, markets where housing supply is limited may causally restrict fertility in addition to migration.

To investigate the mechanism further, we collected county-level data on fertility by race and by age of the mother. The CDC data report race only in crude buckets. To ensure sufficient data, we focus only on CDC reported black or African American and white fertility rates. The results, not reported here, show that the impact of land use restrictions appears comparable across groups. Though mean fertility rates differ, the data cannot reject the hypothesis that the two groups are identically impacted.

Finally, in Table 4, we break out the impact of land use restrictions on fertility by age. The fertility rates are now defined as the number of live births to women in five-year age brackets. We control for each age bracket and then estimate the impact of land use restrictions on fertility rates for teens, women in their twenties, and women ages thirty and above. We find that, as before, tighter land use restrictions are associated with lower fertility rates for teens and women in their twenties. In fact, the impact is significantly larger than the general impact – a reduction of 5.8 births per year per 1,000 women for teens and 7.2 for women in their twenties.

Table 4

VARIABLES	(1) County Annual Fertility Rate in 2006 (Live Births per 1,000 women in age bin)
WRLURI (teen baseline)	-7.48*** (1.00)
WRLURI x Women Age 20-29	-1.94 (1.567)
WRLURI x Women Age 30+	13.23*** (1.10)
Observations	2,550
R-squared	0.83

Data comprise six five-year age brackets from 15-44 for each county. Fixed effects for each bracket included. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This large negative impact is partially balanced by a positive effect on women ages thirty and above. Tighter land use regulations actually increase fertility for this group, as can be seen by summing the interaction coefficient with the un-interacted on WRLURI in the above table. This seemingly puzzling result can be reconciled by noting that land use restrictions and expensive housing may cause families to delay having children. This would increase the fertility rate for older mothers, while at the same time reducing overall fertility, as we observe in the data.

5. Conclusion

While it is impossible to definitively trace a causal link between land use restriction and fertility, the results here suggest that the two are strongly related in the data. This is an important finding because it suggests that migration does not capture the full impact of zoning and land use regulation on metro-level population growth. By providing some of the first evidence of the impact of land use restrictions on fertility, we hope to spur further research on this topic and on the potential long run consequences of this mechanism.

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