Does Condominium Development Lead to Gentrification?

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Abstract: The condominium structure, which facilitates ownership of units in multi-family buildings, was only introduced to the US during the 1960s. We ask whether the subsequent development of condominiums encouraged high-income households to move to central cities. Although we document a strong positive correlation between condominium density and resident income, this association is entirely driven by endogenous development of condos in areas otherwise attractive to high-income households. When we instrument for condo density using the passage of municipal regulations limiting condo conversions, we find little association between condo development and resident income, education or race.

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I. Introduction

The metropolitan population of the United States has been shifting away from central cities toward the suburbs since at least the early twentieth century. In recent decades, this exodus from central cities has slowed down and, in some cities even changed direction, with an influx of new and often high socio-economic status residents into the urban core – a phenomenon known colloquially as "gentrification."

The majority of economic research on gentrification has focused on changes in *demand* for urban living due to shifts in the location of employment and the expansion of downtown amenities (Glaeser and Gottlieb, 2006; Guerrieri, Hartley, and Hurst, 2013; Edlund, Machado, and Sviatschi 2015; Diamond, 2016; Couture and Handbury, 2017). This paper considers a neglected, but potentially complementary, *supply-side* explanation for gentrification: the introduction of the condominium as a legal form, which permitted households to pair home ownership with residence in dense urban neighborhoods in large number for the first time.[1] The condominium became a legally recognized form of owner-occupancy only by 1970, after states passed enabling legislation to authorize the development of condominiums. To the best of our knowledge, our paper offers the first empirical analysis of the effect of condominiums on urban space.

In a time series, the spread of the condominium form coincides with a rise in owner occupancy in multi-family units for college-educated household heads. **Table 1** compares the ownership and rental patterns in 1960, before the rise of the condominium, with those in 2010, forty years after the condo form first emerged. During this period, the overall homeownership rate rose for both college-educated and non-college educated household heads. At the same time, the *multi-family share* of owner-occupied units doubled for the college educated, while declining somewhat for the non-college educated.[2]

In this paper, we ask whether cities that built more condo units after 1970 were able to attract more high income residents. Our empirical challenge is that any observed correlation between condo development and residents' characteristics could be driven by the (endogenous)

[1] Before the advent of the condo, the main options for owning multi-family units was to form a housing cooperative, a solution that was common only in New York City, or to own a duplex and rent out one unit (Bennett, 2011). We discuss this history in Section II.

[2] For college-educated owner-occupiers, the probability of living in a multi-family unit rose from around 10 percent in 1960 to 20 percent in 2010 (=6 percent/64 percent in 1960, and 14 percent/73 percent in 2010).

construction decision of developers, responding to the perceived demand for condos in areas otherwise valued by high-income households. We exploit policy variation in the strictness or laxity of municipal codes regulating condominium conversions to identify the supply-side effect of condo availability on gentrification.

We collect new archival information for the 100 largest cities on the passage of city-level ordinances intended to regulate conversion of rental buildings into condominium units. These regulations include protection against evictions, advance notification requirements for existing residents, and temporary moratoria on condo conversions, among other provisions. Thirty-four cities passed some form of restrictive condo ordinance between 1973 and 2009, 28 of which imposed substantial restrictions on the development process.

Our main analysis focuses on the 54 metropolitan areas that can be consistently identified in the Integrated Public Use Micro Data Series (IPUMS) from 1980 to 2010. We use a difference-in-differences specification comparing central cities that passed a restrictive ordinance to those that did not, before and after the regulation passes. Regardless of the city's regulatory structure, suburbs rarely regulated the process of converting rental units to condominiums, in large part because few suburbs had a housing stock conducive to conversions. As a third difference, we incorporate data on the suburban ring of each city, which allows us to control for common metropolitan level trends.

We start by documenting a strong OLS relationship between the percent of the housing stock made up of owner-occupied condominium units (which we call "condo density") and demographic characteristics of the city residents. A 1 percentage point increase in condo density (roughly the difference between Dallas and San Francisco) is associated with a 4 percent higher mean income for city residents. This pattern holds when following areas over time, looking at the association between *changes* in condo density and changes in the attributes of residents, and is also present (but smaller) when focusing only on the residents of the multi-family stock. Similar associations hold for the share of residents holding a Bachelor's degree and the share that are non-black.

We then turn to our causal analysis, which uses the passage of a restrictive ordinance as an instrument for condo density. Our first stage estimates confirm that condo density falls by 1 percentage point of the full housing stock (and 3 percentage points in the multi-family stock) after a city passes a restrictive ordinance, as compared to cities that did not regulate condo conversions,

and relative to the suburban ring in the metropolitan area. We use tract-level data from the Neighborhood Change Database to document that the effect of municipal regulation on condo density also holds at the municipal border between cities and suburbs.

In contrast to the correlation between condo density and residents' characteristics in OLS, the 2SLS coefficients are generally small and statistically insignificant. That is, despite a strong first stage, we find *no* causal impact of condo development on the income, education level or racial composition of city residents when using city regulations to instrument for condo density. The coefficient estimates drop by an order of magnitude, demonstrating no relationship between the availability of condo units and characteristics of urban residents.

By ruling out the importance of condominiums in attracting high-income residents to urban areas, our paper provides additional evidence that the primary factors behind gentrification reflect changes in the demand for urban living rather than housing supply. One group of related papers argues that gentrification is driven by the growing value that workers place on living close to their place of employment, a byproduct of rising work hours and increases in female labor force participation (Kahn, 2007; Edlund, Machado, and Sviatschi 2015). A second strand of the literature emphasizes the increased availability of local amenities in urban areas that are attractive to high income households, including restaurants, shopping, and other cultural venues, as well as proximity to other wealthy residents themselves (Glaeser and Gottlieb, 2006; Guerrieri, Hartley, and Hurst, 2013; Diamond, 2016; Couture and Handbury, 2017).[3] Our empirical strategy, which leverages changes in regulations to local housing markets, is most similar to a set of papers examining the effect of lifting rent control on housing prices and rents, crime rates and racial composition of residents in Cambridge, MA and San Francisco (Sims, 2011; Autor, Palmer, and Pathak, 2014, 2019; Diamond, McQuade, and Qian, 2018).

The rest of the paper is organized as follows. We start in Section II with a brief economic history of the condominium, which informs our empirical design. We then introduce our data, including a new dataset of city-level regulations on condo conversions in Section III. Section IV describes our research design and estimating equations. Section V contains results and Section VI concludes.

[3] Ellen and O'Regan (2010) and Foote (2015) find little empirical effect of falling crime rates on urban population since 1990.

II. The Condominium: A Brief Economic History

The condominium is a recent addition to the housing market in the United States. In a condominium, individual housing units within a multi-family dwelling are owned separately as a "divided" property interest, whereas common areas are owned collectively. The land under a residential building is considered to be common, as are any shared external surfaces, heating and plumbing, and other building infrastructure.

Beyond the condominium form, joint ownership of multi-family dwellings is only possible via informal partnership or housing cooperatives.[4] However, the transaction costs for these arrangements are high and so their use is relatively rare. In 1960, before the advent of the condo form, only 5 percent of units in apartment buildings (buildings with 5 or more units) were owner-occupied. With the exception of New York, Chicago (to a lesser extent) and a few other scattered locations, housing cooperatives were (and still are) very uncommon in the United States (Lasner, 2012).[5] In a cooperative arrangement, households do not hold title to the particular unit that they occupy, but rather own shares in the cooperative itself, which carry with them the right of occupancy of the unit as a leasehold. In historical cooperatives, these shares could not be used as collateral to qualify for a mortgage loan on the unit. Although these mortgage restrictions have moderated in recent years, resale of shares in a cooperative is still tightly regulated by the building's board of directors which typically sets stringent requirements for prospective residents and, ultimately, approves (or rejects) the sale. As a result, the bundle of property rights associated with cooperative occupancy is not as flexible as the condominium, which may explain cooperatives' relatively limited scope.

Although condominiums did not exist in the United States in the early twentieth century, the contractual form was already available in Europe, where its origins date back to twelfth century Germanic towns, before spreading to cities in Belgium, France and elsewhere (Leyser 1958;Ferrer and Stecher 1967; Lasner 2012, p. 41). The condominium form was included in the Napoleonic code in France in 1806, which influenced the legal structure of other civil law countries in Europe

[4] A third option is for a single individual to own a multi-family dwelling, live in one of the units, and rent out the others.

[5] The first co-op building, which was called "The Rembrandt," opened in 1881 and was located at 152 W. 52nd Street in Manhattan. An earlier project, "The Palace Home," was proposed before the Civil War for a location on the Upper West Side but was never built (Lasner, 2012).

and Latin America. The statutory basis for condo development was further strengthened by the passage of "enabling legislation" in the 1920s throughout Europe (Bennett 2011, pp. 251-52).

However, despite a rising urbanization rate – and, hence, a growing share of the population living in multi-family dwellings – there seems to have been little demand for establishing the condominium as a legal form in the United States prior to World War Two. When and why, therefore, did the condominium first enter the United States? According to Hansmann (1991), a key causal factor was the high marginal federal tax rate on income in the aftermath of World War Two. Using a simulation analysis, Hansmann shows that, by the late 1950s, the tax benefits of owner-occupancy were far higher than prior to World War Two. However, not all households aspiring to homeownership preferred to live in detached single-family dwellings and the cooperative apartment was too specialized a contractual form to be broadly useful.

The condominium emerged as an off-the-shelf solution to the rising demand for homeownership in the 1950s. Puerto Rico, a US territory with a civil law tradition, was the first area to authorize condominiums in 1951. The Puerto Rican real estate industry then successfully lobbied Congress to include Section 234(c) in the Housing Act of 1961, which legally recognized the condominium form and permitted the Federal Housing Administration to extend its mortgage insurance to condominiums (Bennett 2011, p. 254, 262). In the continental United States, enabling legislation at the state level followed soon after.[6] By 1963, six states had enacted enabling legislation that giving a statutory basis to condominiums, largely copying the language of the Puerto Rican law.[7] The FHA drafted a "model statute" that served as a further guide. By 1965, 43 states had enabling legislation and the last state – Vermont – followed suit in 1969.

[6] According to Berger (1963, p. 35) enabling legislation was unnecessary, because so-called "flat ownership" existed in Scotland and England, both common-law countries. Berger also highlights the handful of examples of condominium-like arrangements in the United States prior to the 1961 Housing Act. In 1947, a dozen veterans successfully persuaded the Veteran's Administration to issue separate loans for each unit in a multi-family building on the Upper East Side of Manhattan, and each received title to a specific unit with an undivided interest in common property. While the arrangement proved successful in the sense of lasting for several years, it does not seem to have spurred additional examples in Manhattan. In Los Angeles in the late 1950s, the local Real Estate Commissioner approved several apartment projects in which households could own, in fee simple, and finance separately their respective apartments; however, property taxes for the building were still undivided (unlike in a true condominium). However, such examples were rare suggesting that, as practical matter, enabling legislation did spur condominium development.

[7] These first states were Arkansas, Hawaii, Arizona, Kentucky, South Carolina, and Virginia.

Yet, with some exceptions, the initial flurry of enabling legislation did not produce an immediate supply response; Census data suggests that, to a first approximation, there were hardly any condominiums in the US in 1970. Condominium density rose to 1.5 percent of the housing stock in 1980 and to 3 percent in 2010, the most recent census year. As illustrated in **Figure 1**, the diffusion of condos has been uneven across locations. In cities like Oklahoma City, OK or San Antonio, TX, condos are a minimal presence, accounting for less than one percent of housing units. By contrast, in Atlanta, condos represent 15 percent of the housing stock.

The variation in condominium density across metropolitan areas depends on both the demand for and supply of housing units. The focus of this paper is on differences in the supply conditions for condominium development across cities. Units can be added to the housing stock either by constructing a new building or by converting an existing rental building into condos. The supply of new condominiums therefore depends on the costs of new construction and on the suitability of the existing stock of multi-family housing for conversion. Our identification strategy is motivated by the observation that condominium supply was affected by specific municipal legislation designed to restrict conversions. In particular, the first wave of condominium conversions in the 1970s prompted a "tenants' rights" backlash that led some cities to place restrictions on the conversion process.[8] We discuss the history of this movement in the next section, alongside our description of the dataset of municipal ordinances.

III. Data

3.1 City-level data

We use Census data to calculate the condo density and residential characteristics of central cities and suburbs by decade. We focus on metropolitan areas that are anchored by one of the 100 largest cities and whose central city and suburban ring can be consistently identified in the public use Census data from 1980 to 2010. Unfortunately, we are not able to incorporate data from 1970 because we cannot separately identify the central city and suburban ring of each metropolitan area in that year. These restrictions leave us with a sample of 54 metropolitan areas, with two observations for each area in each decade (one for the central city and one for the suburban ring).

[8] There was also a second wave of enabling legislation in some states directed at technical problems with the original legislation (Bennett, 2011, pp. 264-65).

For each observation, we use the underlying micro data to measure condo density and a series of characteristics of the local residents, including mean income (and income at different percentiles), share of residents with a Bachelor's degree or higher, and the share of residents who are black. We calculate these characteristics for the full housing stock and, separately, for residents of multi-family units, where our definition of "multi-family" includes single-family attached units (town houses), along with duplexes, triplexes and larger buildings. In 1980, the Census only asked about condominium status for owner-occupied units. To ensure consistency across years, we define condo density as the share of housing units made up of owner-occupied condominiums in all years.[9]

Table 2 presents summary statistics of our condo density measure and of residential characteristics of household heads living in central cities or suburbs in our sample from 1980 to 2010. Condo density was increasing in central cities from 1.2 percent of housing units in 1980 to 3.7 percent in 2010. In each year, condo density was slightly higher in the suburban ring, reaching 4.5 percent of the housing stock in 2010; many condos in the suburbs are centered around common space, such as a park or golf course. Socio-economic status gaps between city and suburban residents are as expected: Residents of central cities earned a lower mean income than residents of suburbs through this period (gap of 29 log points). These values exclude household heads reporting zero income. The share of household heads (25 years or older) holding a Bachelor's degree steadily rose in central cities from 20 percent to 32 percent of household heads; suburban household heads were around 2 percentage points more likely to hold a Bachelor's in each year. Central cities had a larger black population share than suburbs, rising to 27 percent black by 2010 (in comparison, the suburbs were only 9 percent black in that year).[10]

3.2 Municipal Condominium Ordinances

Prevailing local regulations are one factor that may affect the cost of converting a rental building to a condominium. We collected archival data on a series of municipal ordinances passed between 1970 and 2010 governing aspects of the condo conversion process.

[9] In 1990, the first year that condo status was asked about all units, 62.7 percent of condo units in our estimation sample were owner-occupied.

[10] In years with multiple race options, we define anyone who reports being black and any other race as black.

The political economy of restrictive condo ordinances was influenced by rapid initial conversions in the context of a tight housing market, giving rise to a strong tenants' rights movement. Between 1970 and 1976, 106,000 units were converted from rental housing to condominiums. In the following three years the pace of conversions more than doubled, to 260,000 units (U.S. Department of Housing and Urban Development 1980). This first generation of condo conversions coincided with the lowest rental vacancy rate nationwide since the Census Bureau began collecting the data in 1960, and was often met with public opposition (Judson, 1983). Local officials were concerned about reductions in the rental housing stock and the displacement of current tenants. For example, the Mayor of Washington D.C. testified to the Senate Committee on Banking, Housing, and Urban Affairs in 1979 that "[t]he conversion of rental apartments to condominium ownership has become a national phenomenon which has reached crisis proportions" (96th Congress, 1st Session § 9). Newspapers blared alarmist headlines about "Condomania in Chicago" (Tamarkin, 1978) and "The Condo Squeeze" in Boston (Klibanoff and McNamara, 1981).

To address these issues, some cities passed ordinances to control the conversion process. These regulations included provisions that required notice periods for tenants of the upcoming conversion, rights of first refusal for existing tenants to purchase their units, or relocation assistance for existing tenants to move elsewhere (Fine, 1980).

We construct a new data set of municipal condominium ordinances coded by degree of restrictiveness. The ordinances apply to the conversion of existing rental housing stock to condominium ownership, not to the construction of new condominium buildings, a process that was far less regulated. To identify ordinances related to condo conversions, we reviewed the municipal codes of each of the 100 largest cities as of 2016 searching for the word "condominium" in the municipal code and identifying any local laws restricting condominium construction or conversion.[11] We also searched the Proquest newspaper archive for the terms "condominium" and "ordinance" together with each city name to identify any earlier ordinances that could have been enacted and subsequently repealed.[12]

Once condominium provisions were identified in the current municipal code or in Proquest, we used the name of the ordinance to obtain the original regulation from online city records or to

[11] The municipal codes are available from each city's website and are electronically searchable.
[12] http://www.proquest.com/products-services/newsarchive.html

search through Proquest to identify the dates on which the ordinance was passed or amended. For instance, the Detroit, Michigan Municipal Code governs the conversion of dwelling units to condominium ownership and requires that prior to the transfer of title of any building containing 4 or more residential units to a developer undertaking a condominium conversion, the owner shall give the tenants of a majority of the rental units a joint right of first refusal to accept the owner's offer of sale or the right to match any third party developer's offer of purchase (Detroit Municipal Code § 26-6-4). The ordinance allows senior citizens residing in subsidized or otherwise low-rent apartments to elect to executive a lifetime lease for their unit, with limited rent increases (Detroit Municipal Code § 26-6-5). The ordinance also requires owners to provide the mayor, the city planning commission, and each tenant with 120 days' notice of the intent to convert apartments to condominium ownership, prohibits evictions without cause during the notice period, and grants the tenants a 60-day right of first refusal to purchase their dwelling units as condominium estates ((Detroit Municipal Code §§ 26-6-6, 26-6-7, 26-6-10)). Finally, it requires relocation assistance payments equal to one month's rent to be paid to any tenant of a subsidized or otherwise low-rent apartment (Detroit Municipal Code §§ 26-6-11). The notes to the code indicate that these provisions were enacted by Ordinance 400-H of 9180. Archives of the Detroit Free Press confirm that the ordinance was approved 4-1 by the Detroit City Council on July 30, 1980. Mayor Young vetoed the ordinance, objecting that, "A potential investor might go to a city that does not have such an ordinance," but the council voted 9-0 to override the veto on August 7 (Jackson 1980a: 4C; Jackson 1980b).

Central cities in our analysis sample are listed in **Appendix Table 1**, alongside the year that the city passed a restrictive condo ordinance (if such an ordinance was passed). We also develop a three-point ranking to classify the severity of local ordinances, which is listed beside each city and summarized in **Appendix Table 2**. Ordinances that recognize or facilitate condominium conversions but do not provide any protections for tenants or impose costs on developers are ranked as a "0." Ordinances that set out time frames and requirements for tenant notification of condominium conversions or offer tenants the right of first refusal are ranked as a "1." Ordinances that went further to require tenant relocation assistance or tenant relocation payments are ranked as a "2." Ordinances that went still further to impose a cap on the number of permissible annual condominium conversions, to establish a minimum city-wide rental vacancy rate before conversions were permitted, to grant some categories of tenants' lifetime leases, to

require the replacement of low-income rentals elsewhere, or to require tenant approval for condominium conversion are ranked as a "3."

For our main analysis, we categorize any municipality with an ordinance score of one or higher as having passed an ordinance. Any city with an ordinance that does not include tenant protections (coded as "0") is grouped with cities that have no ordinance at all. Our reading of the municipal codes leads us to conclude that suburban towns rarely passed restrictive condo ordinances, which applied only to the conversion of existing rental stock (few suburban areas had a relevant rental housing stock in 1970). To the extent that some inner-ring suburbs passed a relevant ordinance (and if such passage is correlated with the legislative activity of the neighboring city), our first stage estimates will be biased against finding an effect of regulation on condo density.

Figure 2 plots the number of ordinances passed each year from 1973-2015. Newark, NJ was the first city to successfully pass a condo ordinance in 1973, followed by Indianapolis, IN in 1975 and Washington, DC in 1976. The pace of local legislation accelerated in earnest after 1980. Of the country's 100 largest cities, 34 cities had passed some sort of municipal ordinance by 2015. In our analysis sample of 54 metropolitan areas, 17 cities passed a restrictive ordinance. Eight of these regulations were passed in the 1970s, before our data begins, and so these cities function as part of our control group. Our difference-in-differences specification thus compares the nine cities that passed an ordinance during our sample period ("treated") to the eight cities that passed a regulation in the 1970s ("always treated") and the 37 cities that have no such ordinance today ("never treated").

Appendix Figure 1 maps the central cities with and without an ordinance as of 2015. Cities with a condo ordinance are larger and more coastal, including Boston, New York City, Philadelphia and Washington, DC on the East Coast, and Seattle, San Francisco and Los Angeles on the West Coast. Cities in the Midwest and the South were less likely to pass an ordinance. Cities with a larger demand for development, as well as those with a larger rental population who would oppose the conversion of rental buildings, are more likely to pass such restrictions. As a result of these clear cross-sectional differences, our preferred specification includes city and decade fixed effects to focus on changes in condo density within a city over time.

IV. Empirical Strategy and Estimation

Our goal is to understand whether the development of condominium units has a causal effect on attracting residents of high socioeconomic status to central cities. Let $condo_{cmt}$ be the condominium density of the housing stock in the central city (or suburb) *c* of metropolitan area *m* in decade *t*. Outcome variables (*y*) include the income (in logs) of the mean resident, the share of the population with a college degree and the black share of the population. We formalize this relationship in the following regression specification:

$$y_{cmt} = \alpha_{cm} + \beta condo_{cmt} + \delta_{mt} + \varepsilon_{cmt} \qquad (1)$$

A metropolitan area-by-decade fixed effects (δ_{mt}) captures any regional trends that are shared between the central city and suburb of the same metropolitan area (e.g., a growing or declining industrial base). We also add a time-invariant local fixed effects (α_{cm}) to control for distinct attributes of the city and suburb of the same metropolitan area (e.g., the density of the housing stock as of 1970). Our condo density measure varies at the local area (city or suburb) by decade level, and so this specification is fully saturated.

If condominiums were randomly assigned to cities, β would indicate the effect of adding more condo density on the characteristics of city residents. In reality, condo development is a function of local supply and demand conditions. If high income residents have a stronger demand for condos relative to rental units, developers may anticipate larger profits – and thus, be more willing to undertake – conversion projects in cities that are attractive to high-income residents for other reasons. Cities with positive (unmeasured) amenities or levels of productivity have high values of the idiosyncratic error term, ε_{cmt}. Developer behavior will then lead to an association between a city's condo density and the error term, $E\left(condo_{ijt} \middle| \varepsilon_{ijt}\right) \neq 0$, leading to over-estimates of the true effect of condo availability on resident attributes.

One solution to this classic simultaneity problem is to find a supply shifter that changes the cost of building condos in some neighborhoods relative to others. Our approach is to use local regulation, which can increase the cost of condo conversions, as a variable that will shift the supply of condominium units. The presence of a municipal ordinance can then become an instrument for condo density in a two-stage least squares model.

We estimate the first stage relationship, or the association between municipal regulation and condo density, using the following equation:

$$condo_{cmt} = \alpha_{cm} + \delta_{mt} + \pi_1 ORD_m \; x \; POST_t \; x \; CITY_c + \; \nu_{ijt} \qquad (2)$$

The dependent variable $condo_{cmt}$ is the percent of housing units that are condominiums in central city (or suburb) *c* of metropolitan area *m* in year *t*. We define an indicator (ORD_m), which is equal to one for both the central city and suburbs of a metropolitan areas in which the central city passed an ordinance. Our main right-hand side variable of interest is thus a triple interaction between $ORD_m \; x \; POST_t \; x \; CITY_c$, which contrasts central cities and suburbs in metropolitan areas that are anchored by a central city that passed a restrictive condo ordinance (and those that are not), before and after the regulation's passage. We saturate the specification with two sets of fixed effects. The vector α_{cm} allows for fixed differences between each central city (or suburban ring) in the sample, so that larger cities with high-skilled industries like New York City are not directly compared with smaller cities. The vector δ_{mt} allows each metropolitan area to have its own housing market trends over time that are shared between central city and suburb. These fixed effects absorb the main effects and double interactions (e.g., ORD_m and $CITY_c$ are absorbed into α_{cm}).[13] Our identifying assumption is that the housing market in the city and suburbs of the same metropolitan area follow similar trends. We cannot include central city-by-metropolitan area time trends, as that would absorb our identifying variation.[14]

[13] In addition, the indicator for being in a decade after the regulation's passage ($POST_t$) is absorbed into the metropolitan area by decade fixed effects (δ_{mt}). Being the central city of a metropolitan area with an ordinance ($CITY_c \; x \; ORD_m$) is captured by the city-by-metropolitan area fixed effects α_{cm} and being in a metropolitan area with an ordinance after passage ($POST_t \; x \; ORD_m$) is captured by the metropolitan area-by-decade fixed effects δ_{mt}. Note that the third double interaction $CITY_c \; x \; POST_t$ cannot be separately identified from $CITY_c \; x \; POST_t \; x \; ORD_m$ because $POST_t$ is always equal to zero in metropolitan areas that do not pass an ordinance (when $ORD_m = 0$).

[14] Intuitively, our specification is a staggered difference-in-differences design where metro areas are treated at different points in the sample period (Athey and Imbens 2018, Goodman-Bacon 2018). Our main results also hold in a simple difference-in-differences design, presented in **Appendix Tables 3** and **6**, where we treat 1980 as the "pre-period" for all metro areas and focus on cities that adopted an ordinance in the 1980s as our treated observations. These cities constitute the majority of the sample (see **Appendix Table 1**).

Our second stage equations consider the effect of predicted condo density, rather than actual condo density, on residential characteristics.

$$y_{cmt} = \alpha_{cm} + \delta_{mt} + \theta_1 \widehat{condo}_{cmt} + \mu_{ijt} \qquad (3)$$

Our instrument for condo density is the triple interaction ($CITY_c \; x \; POST_t \; x \; ORD_m$), which compares central cities that passed an ordinance to those that did not, before and after the passage of the regulation, and relative to the suburban ring of the metropolitan area.

Finally, in a parallel analysis, we use data from the Neighborhood Change Database (NCDB) to provide further evidence on the efficacy of restrictive condo ordinances in limiting condo density. Notably, these data are mapped into consistently defined census tract areas, which allows us to compare the evolution in condo density over time at the neighborhood level, and to sharpen our comparison by limiting attention to neighborhoods on either side of the city-suburban boundary. We supplement the published NCDB database, which only has information on condo density in 1980, with a special tract-level extract specially prepared for us by the Census Bureau containing information on condo density at the tract level in 2010. Formally, we estimate a long difference regression, stacking data from 1980 and 2010 at the tract level,:

$$condo_{icmt} = \rho_i + \vartheta_{mt} + \varphi_1 Post_{cmt} \times Ordinance_{cm} + \omega_{icmt} \quad (4)$$

where *i* indexes tracts, *c* indexes central cities (or suburbs), *m* indexes metro areas, and *t* indexes years.[15] We estimate equation (4) using tracts that are near the city-suburban border using an increasingly narrow set of comparisons (starting at 2000 meters and running to 200 meters). The variable of interest is $Post_{cmt} \times Ordinance_{cm}$, which is equal to one in all tracts of a central city in the years after the passage of a condo conversion ordinance, and zero otherwise. That is, the variable is always equal to zero in suburban tracts and in cities that never passed an ordinance, and is additionally equal to zero in central city tracts before the passage of an ordinance. To compare tracts within the same metropolitan area and to control for broader metropolitan area trends, we

[15] As with equation (2), the time-invariant area fixed effects, ρ_i, absorb the indicator for ever passing an ordinance. Moreover, $Post_{ctm}$ is perfectly collinear with the DiD term of interest. For expositional purposes, we report the interaction of $Post_{cmt} \times Ordinance_{cm}$.

include metro by year fixed effects ϑ_{mt}. Intuitively, this identification strategy compares the evolution of condo density in otherwise similar census tracts, where tracts in some center cities were exposed to condo conversion ordinances, and tracts in neighboring suburbs were not. This research design is similar to spatial regression discontinuities that have been used to estimate the willingness to pay for school quality (Black and Machin, 2011) and for varying land use regulations or school desegregation regimes across city-suburban borders (Boustan, 2012; Turner, Haughwout and Van Der Klaauw, 2014).

V. Effect of Condo Development on Resident Characteristics

5.1 Correlation between condo density and resident characteristics

We start by estimating the correlation between condo density and residential characteristics of a location using OLS. **Table 3** documents that areas with more condo units also have higher income residents who are more likely to hold a college degree and are less likely to be black. Columns 1 and 2 consider all housing units in the area. A one-percentage point increase in condo density is associated with an increase in mean personal income of 3.6 percent, a 1.7 percentage point increase in share of residents with a Bachelor's degree or higher, and a 2.3 percentage point decrease in the black share of population. When we weight our estimates by number of household heads in each metro-city-year cell in Column 2, we continue to find strong correlations between condo density and resident characteristics in the full stock of housing units.

More than 90 percent of condo units are in a multi-family structure and so we expect the relationship between condo density and residential characteristics to be stronger in this subsample. Columns 3 and 4 focus on housing units in multi-family buildings, including single-family attached dwellings. Contrary to our predictions, we find that the associations between condo density and resident characteristics are only 20 to 30 percent as large as in the full housing stock (yet, they are still statistically significant). Weighting these correlations by the number of households yields precisely estimated zeroes, suggesting no relationship between condo development and resident characteristics within the multi-family housing stock.

The lack of a correlation between condo density and resident characteristics in the multi-family housing stock is our first indication that the broader correlation with residents' socio-economic status may be driven by reverse causality – that is, condo developers are more likely to

build condo units in areas with high income residents. We consider this possibility in more detail in the next sections, which introduce an instrument for condo density based on municipal regulations.

5.2 First stage relationship between local ordinances and condo density

By raising the costs associated with condo development, municipal ordinances that regulate the process for converting rental housing into condominiums should reduce the condo density in the local housing stock. **Table 4** presents estimates of our first-stage equation (equation 2), which relates condo density to the passage of local ordinances. In the full housing stock, the passage of an ordinance is associated with a nearly 1 percentage point decrease in central city condo density (Column 1), a large effect relative to an average density of around 2 to 3 percentage points reported in Table 2. Weighting this estimate by the number of household heads heightens the estimated decline to 1.4 percentage points (Column 2).

Panel B documents larger effects of restrictive ordinances on the multi-family housing stock, which was the likely target of such regulation. The passage of an ordinance decreases central city condo density by 3.4 percentage points, or by approximately 50 percent, relative to the sample mean (column 1). Weighting the estimates by number of households increases the estimate to a 5.7 percentage point decrease (column 2). In Columns 3 and 4 we explore the potential for intensive margin effects using the 0-3 coding developed in Appendix Table 2. These results are smaller and less precise, suggesting that the important margin is passage of a restrictive ordinance, not the gradations of severity in the ordinance text.[16]

Anecdotal evidence suggests that the push to convert buildings from rental to condo was stronger in the first half of our sample period, when the pool of rental buildings conducive to condo conversion was still large.[17] To allow for this possibility, we estimate a simpler version of our first stage which focuses on the cities that adopt restrictive ordinances in the 1980s. This specification compares the seven cities that passed a regulation in the 1980s ("treated") to the 37 cities that never

[16] We note that this intensive margin specification assumes a linear relationship across ordinance severity levels. We do not have enough variation in the sample to test the importance of specific regulations.

[17] In the case of Boston, for example, an official city document (*Condominium Trends*, published in 2000) suggests that the peak of conversions occurred in the 1980s, before undergoing a steep decline in the 1990s.

passed a regulation ("control"), dropping the eight cities that passed a regulation in the 1970s and the two cities that passed a regulation later in the sample period. We estimate a standard difference-in-differences that treats 1980 as the "pre-period" and 1990 as the "post-period." These estimates, presented in **Appendix Table 3**, are similar in magnitude to the main results and statistically significant in the weighted regressions, suggesting that the ordinances had an immediate and binding impact on condo conversions.

In some cases, suburbs might follow different housing market trends than their central city. Suburban Detroit, for example, has experienced stable or rising housing prices, as the central city has declined dramatically. This concern is mitigated at the city-suburban border where the housing stock was built around the same period at the same density in neighborhoods that have similar amenities. **Table 5** thus compares neighborhoods on either side of city-suburban borders using tract data from the Neighborhood Change Database (NCDB).

Each column of **Table 5** contains sets of tracts that are progressively closer to the border. The first column, for example, only contains tracts whose centroids are within two hundred meters of border, the second column contains tracts within five hundred meters, and so on. The final column contains all tracts in the metropolitan area. We focus on neighborhoods that are substantially "at risk" of condo development due to the presence of multi-family housing.[18] Our two definitions of neighborhoods "at risk" of condo development include tracts with a sizeable share of single-family attached and multiplex (2-4) units (Panel A) or tracts with a sizeable share of larger multi-family buildings with 5+ units (Panel B). We find that, consistent with the full city analysis, restrictive ordinances lowered condo density by 3-6 percentage points in both neighborhood types. This relationship is more statistically precise in neighborhoods with smaller multi-family buildings, even up to the tightest bounds around the border (within 200 meters).

5.3 Causal effects of condo development on resident characteristics

Municipal laws restricting condo conversions were effective in reducing condo density. We now use these laws to consider the causal effect of condo density on the attributes of residents in an area. **Table 6** presents our two-stage least squares results. In contrast to OLS estimates, 2SLS estimates suggest a minimal effect of condo density on resident characteristics. First, the

[18] Results using the full sample of tracts are presented in **Appendix Table 4** and find little effect of restrictive condo ordinances on the full housing stock.

relationship between condo density and all resident characteristics in the multi-family housing stock completely disappears after instrumenting for condo density (Panel B). Second, in the full housing stock, the estimated effect of condo density on income is completely eliminated and the effect on education falls by 70 percent when weighting by population (Panel A, column 2). Third, even the largest 2SLS estimates on income (unweighted regressions, Panel A, column 1) fall by 40 percent and are not statistically different from zero. The only 2SLS estimates that are similar in magnitude to OLS (if imprecise) are unweighted estimates of the effect of condo density on educational attainment and black population share.

We also explore causal effects of condo density on resident characteristics in the border sample. In **Appendix Table 5**, we present two-stage least squares results for both "at risk" subgroups of tracts. These estimates should be interpreted with caution due to a weaker first stage in smaller bandwidths. As in the metro analysis, we see no evidence that condo density is causally related to residents' income or educational attainment. However, at many bandwidths, areas with more condo density have fewer black residents, such that a one percentage point increase in condo density is associated with a 2-3 percentage point decrease in the black share of the population.

For completeness, **Appendix Table 6** estimates two-stage least squares results for the simple difference-in-differences that focuses on the cities that passed regulations in the 1980s**.** Note that the first stage is only strong in the weighted specification (see **Appendix Table 3**). As in the main estimates, we find no association between predicted condo density and any residential characteristics in the weighted specification, with all of the point estimates are very close to zero.

Investigating causal effects at the mean might mask heterogeneity in treatment effects across the income distribution. To further investigate income effects we estimate equation (3) at different ventiles of the income distribution. In **Appendix Figure 2**, we plot the estimated two-stage least squares coefficients along with 95 percent confidence intervals. In the full housing stock (Panel A), we see some evidence that higher condo density increases resident income in the lower part of the distribution. Specifically, resident income increases between 5 and 10 percent in the lowest fifth of the distribution. Similarly, in single-family attached and multi-family units (Panel B), resident income also increases by 2 to 3 percent in this lower part of the distribution. There is little evidence of meaningful effects in either panel throughout the rest of the income distribution. Higher income at the lower end of the income distribution might be an indication that condo conversions eliminate rental units previously occupied by low-income city residents.

Taken together, our causal estimates of condo density suggest little evidence that condo development attract high-income residents. These null results are in contrast to naïve OLS estimates which yielded strong correlations between condo density and resident characteristics in the full housing stock. The positive association between condo development and resident income seems to be driven by reverse causality, whereby developers choose to convert rental units into condo buildings in areas with pre-existing concentrations of well-to-do residents.

VI. Concluding Remarks

In recent years, some central city neighborhoods reversed decades of population decline, a phenomenon known as gentrification. This paper considers – and ultimately rejects – a plausible "supply side" explanation for gentrification: the diffusion of condominiums, which enabled higher-income households to own and occupy multi-family units in the urban core. We find strong correlations in OLS between condo density and resident income, education, and race in the full housing stock, but these associations are reduced in a sample of multi-family units.

To further explore the role of condominium development in the gentrification process, we develop an instrumental variable strategy that exploits the passage of restrictive municipal-level condo ordinances in some central cities. Our first stage specification, which compares cities that passed regulation to those that did not, relative to their neighboring suburbs, shows that these ordinances largely functioned as their proponents intended – namely, to reduce condo density throughout the city and at the city-suburban border. If condo development facilitated gentrification, we should see a strong association between predicted condo density and resident characteristics. Instead, the estimated effects of condo density on resident income and education in our 2SLS analysis are very small in magnitude and statistically insignificant (although we do see a continued relationship between condo density and racial composition in some specifications).

Our results suggest that most central city condo development is driven by the demand for urban residential location, bolstering the previous literature in economics on the causes of gentrification. Developers respond to the demand for downtown living by providing condo units. However, the condominium form itself and the resulting ability of urban households to owner-occupy *per se* does not seem to have attracted high-income households to cities and may have reduced available rental units for the poor.

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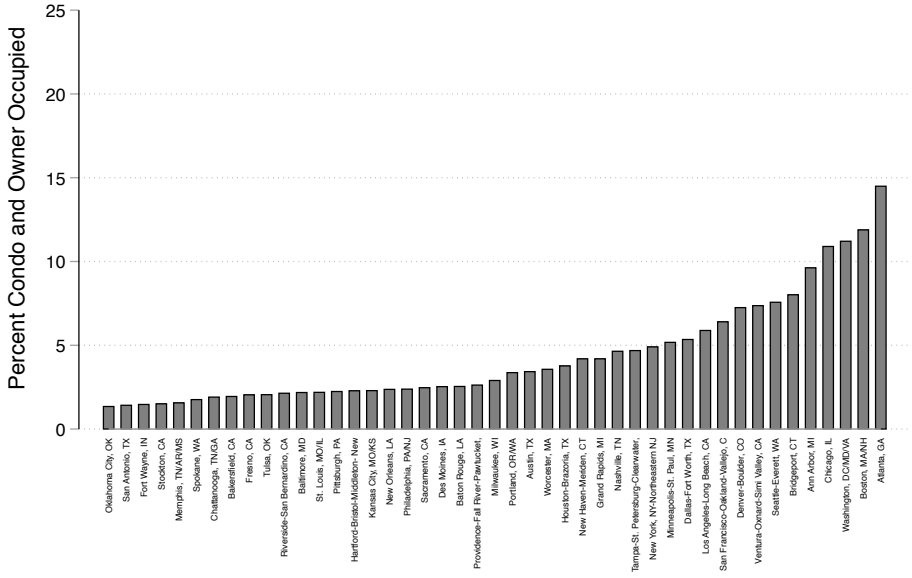
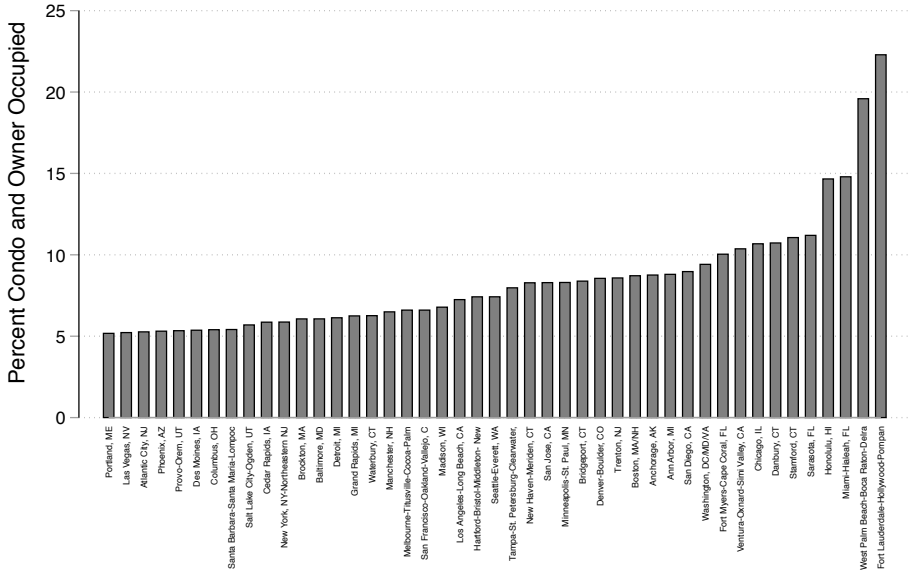
Figure 1: Percent Condo and Owner Occupied in 2010

Panel A: Estimation Sample - Central Cities

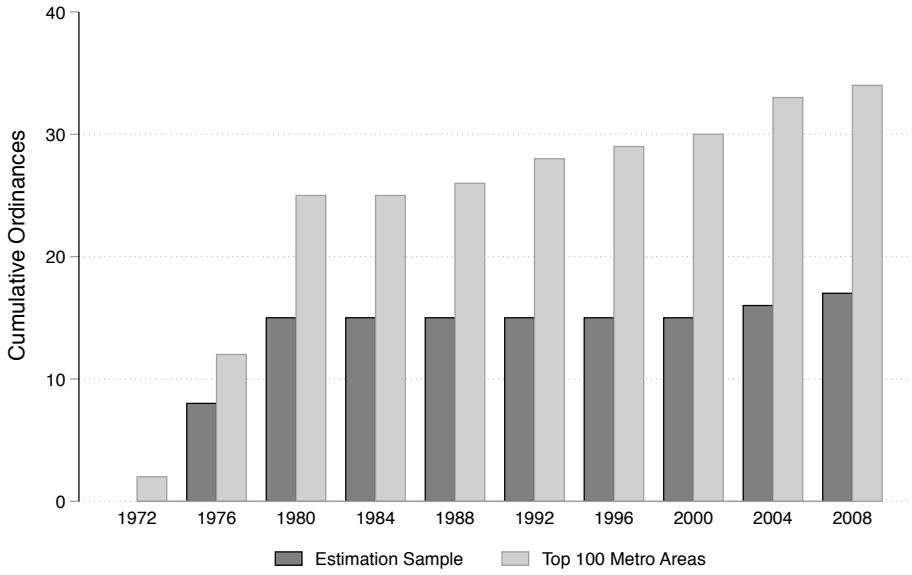


Panel B: All Metro Areas



Note: These figures report the the percent of housing units that are condo and owner occupied in 2010 for the top 45 highest condo density central cities in our estimation sample and the top 45 highest condo density metro areas. The samples include all housing units and both central city and suburban areas.

Figure 2: Cumulative Condo Ordinances Passed: 1973-2009



Note: This figure plots the cumulative condo ordinances for the 54 areas consistently identified metro areas and the top 100 largest metro areas in four-year bins.

Table 1: Homeownership Rates by Educational Status of Household Head, 1960 and 2010

	1960		2010	
	Owner	Renter	Owner	Renter
Panel A: Bachelor's or More	(1)	(2)	(3)	(4)
All Housing Units	0.641	0.359	0.729	0.271
Multi-Family	0.061	0.287	0.144	0.229
Single-Family	0.580	0.072	0.585	0.042
Panel B: Less than Bachelor's				
All Housing Units	0.575	0.425	0.587	0.413
Multi-Family	0.114	0.345	0.097	0.319
Single-Family	0.461	0.080	0.490	0.094

Note: This table reports aggregate trends in ownership for homeowners, separately by educational attainment. The sample includes household heads who are at least 25 years of age. Single-family includes single-family detached units. Multi-family includes single-family attached and all multi-family units.

Table 2: Aggregate Trends in Metro Areas: 1980-2010

Panel A: Central City	1980	1990	2000	2010
Share with Ordinance in Metro	0.241	0.278	0.278	0.315
Percent Condo and Owner Occ.	1.212	2.111	2.415	3.746
Log Mean Personal Income	10.221	10.341	10.440	10.401
Share Black	0.212	0.237	0.266	0.273
Share Bachelor's or More	0.195	0.241	0.276	0.323
Panel B: Suburbs				
Share with Ordinance in Metro	0.241	0.278	0.278	0.315
Percent Condo and Owner Occ.	1.574	2.774	3.199	4.550
Log Mean Personal Income	10.506	10.660	10.769	10.685
Share Black	0.047	0.054	0.067	0.085
Share Bachelor's or More	0.223	0.273	0.306	0.349

Note: This table reports aggregate trends in the 54 consistently identifiable metro areas, separately by city center and suburbs. All means are constructed from household heads and the sample includes all housing structure types. Income measured as total personal income and is reported using 2000 dollars.

Table 3: OLS Relationship Between Condo Density and Resident Characteristics at City/Suburban Level

	All Housing Units		SFA and All Multi-Family	
	(1)	(2)	(3)	(4)
Log Mean Personal Income	0.036***	0.028***	0.010***	−0.002
	(0.005)	(0.009)	(0.003)	(0.005)
	[10.307]	[10.433]	[9.996]	[10.171]
Share Bachelor's or More	0.017***	0.014***	0.003**	−0.000
	(0.002)	(0.003)	(0.001)	(0.002)
	[0.273]	[0.300]	[0.243]	[0.275]
Share Black	−0.023***	−0.023***	−0.007***	−0.002
	(0.003)	(0.005)	(0.001)	(0.002)
	[0.155]	[0.152]	[0.188]	[0.217]
Observations	432	432	432	432
Metro x CC Fixed Effects	Yes	Yes	Yes	Yes
Metro x Year Fixed Effects	Yes	Yes	Yes	Yes
Weighted	No	Yes	No	Yes

Note: This table reports ordinary least squares results of percent condo and owner occupied on various outcome measures. The samples contain the housing units listed in the column header. The dependent variables are listed in each row and are constructed using household heads. Dependent variable means are reported in brackets. Columns 2 and 4 weight by number of household heads. All specifications include metro-by-year and metro-by-central city fixed effects. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Table 4: First Stage Relationship Between Condo Ordinance Passage and Condo Density at City/Suburban Level

	Ordinance (0-1)		Ordinance (0-3)	
Panel A: All Housing Units	(1)	(2)	(3)	(4)
Ordinance × Post × Central City	−0.919**	−1.416***	−0.412	−0.673
	(0.380)	(0.260)	(0.803)	(0.438)
	[2.698]	[3.831]	[2.698]	[3.831]
Panel B: SFA and All Multi-Family				
Ordinance × Post × Central City	−3.390***	−5.713***	−1.481	−4.104***
	(0.880)	(1.327)	(1.867)	(1.022)
	[6.719]	[7.887]	[6.719]	[7.887]
Observations	432	432	432	432
Metro x CC FE	Yes	Yes	Yes	Yes
Metro x Year FE	Yes	Yes	Yes	Yes
Weighted	No	Yes	No	Yes

Note: This table reports first stage results of a triple interaction on percent condo and owner occupied. Panel A reports results using all housing types and Panel B reports results using single-family attached and all multi-family units. Columns 1 and 2 utilize a 0/1 coding for condo ordinance, and columns 3 and 4 recode the ordinance to 0-3, depending on the severity of the ordinance. Columns 2 and 4 weight by number of household heads. All specifications include metro-by-year and metro-by-central city fixed effects. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Table 5: First Stage Relationship Between Condo Ordinance Passage and Condo Density at Census Tract Level

	<200 Meters	<500 Meters	<1000 Meters	<2000 Meters	All Tracts
Panel A: Share SFA and 2-4 Units > 40%	(1)	(2)	(3)	(4)	(5)
Post × Ordinance	−3.457*	−2.931*	−3.026**	−2.942***	−2.833***
	(1.900)	(1.582)	(1.282)	(1.023)	(0.679)
	[5.213]	[5.431]	[5.259]	[5.170]	[5.607]
Observations	1,500	1,832	2,642	4,278	8,858
Panel B: Share 5+ Units > 60%					
Post × Ordinance	−5.244	−6.544	−5.508*	−1.054	−5.926***
	(4.899)	(4.334)	(3.308)	(2.605)	(1.794)
	[23.906]	[24.033]	[24.103]	[23.031]	[20.845]
Observations	1,250	1,512	2,042	3,030	6,538
Tract FE	Yes	Yes	Yes	Yes	Yes
Metro x Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports first stage results of a post x ordinance interaction on percent condo using data from the Neighborhood Change Database. The sample contains all tracts whose centroids are within the distance to the city-suburban border listed in the column title and the baseline housing composition listed in the panel title. All specifications include tract and metro area-by-year fixed effects. Dependent variable means are reported in brackets. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Table 6: Two-Stage Least Squares Relationship Between Condo Density and Resident Characteristics at City/Suburban Level

	Ordinance (0-1)	
Panel A: All Housing Units	(1)	(2)
Log Mean Personal Income	0.021	−0.005
	(0.021)	(0.023)
	[10.307]	[10.433]
Share Bachelor's or More	0.016	0.005
	(0.010)	(0.006)
	[0.273]	[0.300]
Share Black	−0.021	−0.013
	(0.013)	(0.010)
	[0.155]	[0.152]
Panel B: SFA and All Multi-Family		
Log Mean Personal Income	−0.001	−0.006
	(0.008)	(0.007)
	[9.996]	[10.171]
Share Bachelor's or More	−0.000	0.001
	(0.004)	(0.001)
	[0.243]	[0.275]
Share Black	−0.004	0.001
	(0.003)	(0.001)
	[0.188]	[0.217]
Observations	432	432
Metro x CC FE	Yes	Yes
Metro x Year FE	Yes	Yes
Weighted	No	Yes

Note: This table reports two-stage least squares results of percent condo and owner occupied on various outcomes. Percent condo and owner occupied is instrumented for using the triple interaction of Central City x Ordinance x Post. The dependent variable is listed in each row and is constructed using data from household heads. Bachelor's of more includes only household heads aged 25 or more. Dependent variable means are reported in brackets. Panel A reports results using all housing types and Panel B reports results using single-family attached and all multi-family units. Column 2 weights by number of household heads. All specifications include metro-by-year and metro-by-central city fixed effects. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Does Condominium Development Lead to Gentrification?

Leah Boustan	Robert A. Margo	Matthew Miller	James Reeves	Justin Steil
Princeton & NBER	BU & NBER	Amazon	U Michigan	MIT

Online Appendix

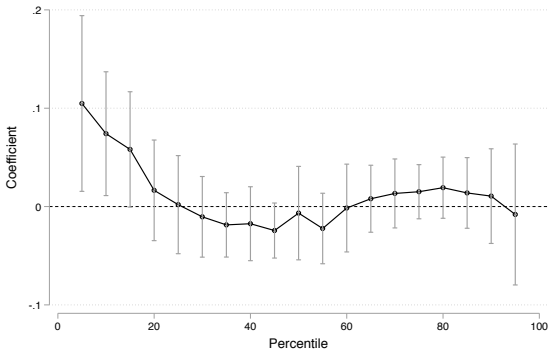
Appendix A: Additional Results

Appendix Figure 1: Geographic Dispersion of Metro Areas in Estimation Sample

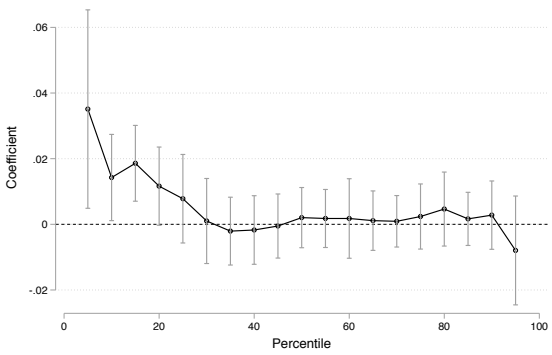
Note: This figure maps the metro areas in our estimation sample. Red dots indicate metro areas that ever passed a condo conversion ordinance as of 2015.

Appendix Figure 2: Treatment Effects Across the Income Distribution at City/Suburban Level

Panel A: All Housing Units



Panel B: Single-Family Attached and All Multi-Family



Note: These figures report two-stage least squares estimated coefficients of condo density on log personal income across the income distribution. Each point represents a separate regression and the associated 95 percent confidence interval. All regressions are weighted by number of household heads. See the notes to Table 4 for additional details on the sample and estimation.

Appendix Table 1: Condo Ordinances in Estimation Sample

	Year Passed	Severity
	(1)	(2)
Ann Arbor, MI		
Atlanta, GA		
Austin, TX		
Bakersfield, CA		
Baltimore, MD	1983	2
Baton Rouge, LA		
Boston, MA/NH	1979	2
Bridgeport, CT		
Buffalo-Niagara Falls, NY		
Chattanooga, TN/GA		
Chicago, IL	1977	3
Cleveland, OH		
Dallas-Fort Worth, TX		
Denver-Boulder, CO		
Des Moines, IA		
Detroit, MI	1980	3
Erie, PA		
Flint, MI		
Fort Wayne, IN		
Fresno, CA	1980	3
Grand Rapids, MI		
Hartford-Bristol-Middleton- New Britain, CT		
Houston-Brazoria, TX		
Kansas City, MO/KS		
Los Angeles-Long Beach, CA	1980	2
Memphis, TN/AR/MS		
Milwaukee, WI		
Minneapolis-St. Paul, MN	1979	1
Mobile, AL		
Nashville, TN		
New Haven-Meriden, CT		
New Orleans, LA		
New York, NY-Northeastern NJ	1982	3
Oklahoma City, OK		
Philadelphia, PA/NJ	1979	3
Pittsburgh, PA		
Portland, OR/WA	1980	2
Providence-Fall River-Pawtucket, MA/RI		
Riverside-San Bernardino, CA	2007	2
Rochester, NY		
Sacramento, CA	1980	3
San Antonio, TX	1979	2
San Francisco-Oakland-Vallejo, CA	1979	3
Seattle-Everett, WA	1978	2
Spokane, WA		
St. Louis, MO/IL		
Stockton, CA	2009	2
Syracuse, NY		
Tampa-St. Petersburg-Clearwater, FL		
Toledo, OH/MI		
Tulsa, OK		
Ventura-Oxnard-Simi Valley, CA		
Washington, DC/MD/VA	1976	3
Worcester, MA		

Note: This table reports the metropolitan areas in the estimation sample and the year it first passed an ordinance restricting condominium conversions.

Appendix Table 2: Condo Ordinance Severity

	Law Severity		
	1	2	3
	(1)	(2)	(3)
Vacancy Rate Minimum			X
Replacement of Low-Income Housing			X
Tenant Approval Required			X
Lifetime Lease			X
Annual Conversion Cap			X
Owner Occupancy Requirement		X	X
Tenant Assistance/Relocation Payments		X	X
Right of First Refusal	X	X	X
Notice of Conversion	X	X	X
FD/BC/Warranties/Right to Cancel	X	X	X

Note: This table reports the law components that we use to code ordinance severity.

Appendix Table 3: First Stage Relationship Between Condo Ordinance Passage and Condo Density in Simple DiD Framework at City/Suburban Level

	Ordinance (0-1)	
Panel A: All Housing Units	(1)	(2)
Ordinance × Post × Central City	−0.483	−0.993**
	(0.412)	(0.382)
	[1.782]	[2.421]
Panel B: SFA and All Multi-Family		
Ordinance × Post × Central City	−1.460	−3.340**
	(1.071)	(1.292)
	[4.855]	[5.031]
Observations	196	196
Metro X CC FE	Yes	Yes
Metro X Year FE	Yes	Yes
Weighted	No	Yes

Note: This table reports first stage results of a triple interaction on percent condo and owner occupied using only observations from 1980 and 1990 in a simple difference-in-differences framework. We drop metro areas that adopted a condo ordinance before 1979 and after 2000, and assume 1980 is the "pre-period" for all areas and 1990 is the "post-period" for all areas. See the text for additional details on the sample and specification. Panel A reports results using all housing types and Panel B reports results using single-family attached and all multi-family units. Column 2 weights by number of household heads. All specifications include metro-by-year and metro-by-central city fixed effects. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Appendix Table 4: First Stage Relationship Between Condo Ordinance Passage and Condo Density at Census Tract Level - Full Housing Stock

	<200 Meters	<500 Meters	<1000 Meters	<2000 Meters	All Tracts
	(1)	(2)	(3)	(4)	(5)
Post × Ordinance	0.782	0.888	0.116	0.255	1.516***
	(0.843)	(0.776)	(0.681)	(0.561)	(0.344)
	[5.799]	[6.036]	[6.227]	[6.297]	[6.714]
Observations	15,896	17,910	21,918	29,498	67,684
Tract FE	Yes	Yes	Yes	Yes	Yes
Metro x Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports first stage results of a post x ordinance interaction on percent condo using data from the Neighborhood Change Database. The sample contains all tracts whose centroids are within the distance to the city-suburban border listed in the column title. All specifications include tract and metro area-by-year fixed effects. Dependent variable means are reported in brackets. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Appendix Table 5: Two-Stage Least Squares Relationship Between Condo Density and Resident Characteristics at Census Tract Level

	<200 Meters	<500 Meters	<1000 Meters	<2000 Meters	All Tracts
Panel A: Share SFA and 2-4 Units > 40%	(1)	(2)	(3)	(4)	(5)
Log Mean Income	0.001	−0.003	−0.003	−0.016	−0.024**
	(0.012)	(0.013)	(0.010)	(0.012)	(0.009)
	[10.816]	[10.828]	[10.833]	[10.811]	[10.809]
Observations	1,344	1,672	2,472	4,090	8,338
Share Bachelor's	−0.011	−0.013	−0.010	−0.009	−0.010**
	(0.012)	(0.013)	(0.009)	(0.006)	(0.005)
	[0.197]	[0.199]	[0.200]	[0.193]	[0.190]
Observations	1,368	1,696	2,496	4,116	8,388
Share Black	−0.013	−0.024*	−0.031**	−0.026***	−0.006
	(0.010)	(0.015)	(0.014)	(0.010)	(0.003)
	[0.276]	[0.278]	[0.285]	[0.309]	[0.300]
Observations	1,500	1,832	2,642	4,278	8,858
Panel B: Share 5+ Units > 60%					
Log Mean Income	0.029	0.018	0.004	−0.123	−0.007
	(0.035)	(0.017)	(0.012)	(0.390)	(0.005)
	[10.876]	[10.862]	[10.837]	[10.817]	[10.796]
Observations	1,062	1,318	1,832	2,786	5,952
Share Bachelor's	0.009	0.002	−0.004	−0.053	−0.000
	(0.009)	(0.006)	(0.007)	(0.174)	(0.002)
	[0.364]	[0.364]	[0.357]	[0.349]	[0.312]
Observations	1,114	1,372	1,894	2,864	6,066
Share Black	0.004	0.005	0.007	0.055	0.009***
	(0.005)	(0.005)	(0.005)	(0.136)	(0.003)
	[0.172]	[0.179]	[0.189]	[0.214]	[0.217]
Observations	1,250	1,512	2,042	3,030	6,538
Tract FE	Yes	Yes	Yes	Yes	Yes
Metro x Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports two-stage least squares results of percent condo on the listed dependent variable. The sample contains all tracts whose centroids are within the distance to the city-suburban border listed in the column title and the baseline housing composition listed in the panel title. All specifications include tract and metro area-by-year fixed effects. Dependent variable means are reported in brackets. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.

Appendix Table 6: Two-Stage Least Squares Relationship Between Condo Ordinance Passage and Condo Density in Simple DiD Framework at City/Suburban Level

	Ordinance (0-1)	
Panel A: All Housing Units	(1)	(2)
Log Mean Personal Income	−0.055	−0.002
	(0.100)	(0.030)
	[9.915]	[9.989]
Share Bachelor's or More	−0.032	−0.001
	(0.043)	(0.010)
	[0.230]	[0.243]
Share Black	0.023	−0.003
	(0.042)	(0.016)
	[0.136]	[0.137]
Panel B: SFA and All Multi-Family		
Log Mean Personal Income	−0.020	0.003
	(0.033)	(0.009)
	[9.613]	[9.725]
Share Bachelor's or More	−0.014	−0.000
	(0.018)	(0.005)
	[0.211]	[0.219]
Share Black	0.007	0.001
	(0.014)	(0.005)
	[0.164]	[0.196]
Observations	196	196
Metro X CC FE	Yes	Yes
Metro X Year FE	Yes	Yes
Weighted	No	Yes

Note: This table reports additional two-stage least squares results of percent condo and owner occupied on various outcomes using observations from 1980 and 1990 in a simple difference-in-differences framework. We drop metro areas that adopted a condo ordinance before 1979 and after 2000, and assume 1980 is the "pre-period" for all areas and 1990 is the "post-period" for all areas. See the text for additional details on the sample and specification. Percent condo and owner occupied is instrumented for using the triple interaction of Central City x Ordinance x Post. The dependent variable is listed in each row and is constructed using data from household heads. Bachelor's of more includes only household heads aged 25 or more. Dependent variable means are reported in brackets. Panel A reports results using all housing types and Panel B reports results using single-family attached and all multi-family units. Column 2 weights by number of household heads. All specifications include metro-by-year and metro-by-central city fixed effects. Robust standard errors are reported in parentheses. *** = significant at the 1 percent level, ** = significant at the 5 percent level, * = significant at the 10 percent level.