

**Learning from Land Use Reforms:
Housing Outcomes and Regulatory Change**

Here Come the Tall Skinny Houses: Assessing Single-Family to Townhouse Redevelopment in Houston, 2007-2020

Jake Wegmann, Aabiya Noman Baqai, and Josh Conrad,
University of Texas at Austin

Abstract

Recent research has documented a recent and widespread boom in the construction of “townhouses,” or land-efficient single-family houses, both detached and attached, in Houston. Contrary to popular portrayals of Houston as a Wild West of unrestricted land use, this townhouse boom was in fact made possible by a deliberate reform in 1998, subsequently extended in 2013, that drastically reduced permissible minimum lot sizes citywide. In this article we build on this emerging body of literature to specifically focus on cases in which formerly single-family parcels were subdivided into small lots for townhouse construction between 2007 and 2020. We argue that Houston’s phenomenon of single-family-to-townhouse, or what we stylize as “SF2TH,” redevelopment offers a glimpse of what other U.S. cities might expect to take place were they to repeal large lot single-family zoning and other binding restrictions so as to allow for the widespread construction of a widely desired small-lot single-family housing product in formerly low-density neighborhoods. We find that SF2TH redevelopment accounts for less than a fifth of overall townhouse development; that it tends to take place on larger lots in the urban core occupied by small, old houses; that it produces relatively reasonably priced houses; and that it predominantly takes place in neighborhoods that had higher than average house values prior to the period analyzed. The latter finding is inconsistent with a view of gentrification as a primary driver of SF2TH redevelopment. We also examine the pattern of “block votes,” or the pattern of usage of a petition mechanism that allows homeowners to opt out of townhouse development on their own blocks, and find that clusters of block votes generally adjoin clusters of SF2TH redevelopment but with relatively little overlap.

Introduction

What would happen if a large U.S. city decided to open up parcels on streets dominated by existing large lot, detached single-family houses to denser development? Furthermore, what if this redevelopment took the form of a replacement of existing freestanding houses with multiple houses on much smaller lots? Given the century-long dominance of single-family zoning in the United States, these questions might seem like an exercise in alternative history.¹ But in this article, we argue that, in fact, the recent experience of Houston provides instructive answers.

Despite its libertarian image as the only big American city without zoning, Houston is decidedly in the business of regulating land use. Starting in the late 1990s, policymakers made a deliberate decision to drastically reduce required minimum lot sizes for houses—at first only within the city’s urban core (15% of the city’s land area), and later citywide. As a foundational article by Gray & Millsap convincingly demonstrates, this sea change in land use regulation set off an urban townhouse boom that led to the construction of tens of thousands of tall, skinny houses in less than two decades, introducing a new housing product type and changing the urban landscape of entire neighborhoods in the process.² The resulting houses are locally known as *townhouses* regardless of whether they are attached (i.e., they touch on their side walls) or are technically, if barely, freestanding. They sit on lots that are miniscule by typical U.S. standards—even by big city U.S. standards. Notably, however, Houston-style townhouses are usually owned “fee simple,” i.e., homeowners own their house and the land underneath it. In this regard, Houston townhouses represent a different outcome than what other U.S. cities have been recently pursuing in relaxing land use regulations on residential blocks, where planners have tended to work towards redevelopment into small-lot, medium density multifamily (“missing middle”) development.

We therefore have the opportunity to examine the results of Houston’s townhouse boom, learn from it, and possibly apply its lessons to other cities contemplating something similar. In this article, we build on Gray & Millsap’s research and focus on a subset of Houston’s townhouse phenomenon: townhouses that were developed via the acquisition and teardown of an existing single-family parcel and the subsequent resubdivision

1. Sonia A. Hirt, *Zoned in the USA: The Origins and Implications of American Land-Use Regulation* (Cornell University Press, 2015).

2. M. Nolan Gray and Adam A Millsap, “Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston’s 1998 Subdivision Reform,” *Journal of Planning Education and Research*, July 15, 2020, 0739456X2093515, <https://doi.org/10.1177/0739456X20935156>.

of the parcel to accommodate multiple new townhouses. This is an example of the type of redevelopment—which we shorthand as single-family-to-townhouse (SF2TH) redevelopment—that some proponents of single-family zoning repeal hope—and that detractors fear—will happen in zoned cities.

The rest of this article proceeds as follows. We begin by reviewing debates over single-family zoning and note recent developments that suggest its longstanding impregnable status—the “zoning straitjacket” in the memorable formulation of legal scholar Robert Ellickson³—is weakening. We next rely on Gray & Millsap and others to provide a brief overview of the regulatory system, and reforms to it, that have allowed SF2TH townhouses to take root in Houston. After introducing our data sets and methods, we present various descriptive statistics and logistic model results in three successive sections that allow us to answer basic questions about the quantity, timing, physical characteristics, and spatial patterns of SF2TH townhouses, plus their association with neighborhood change. We also present results about the extent of “block votes,” an only-in-Houston regulatory mechanism that allows homeowners to opt out of townhouse redevelopment on their own block—but *only* on their own block—and that arguably paved the way for the reforms to be broadly acceptable to the public in the first place.⁴ We end with a summary of our topline findings and some reflections on what they might mean for other U.S. cities contemplating the end of single-family zoning.

In brief, we find that SF2TH redevelopment is comparatively rare on the citywide scale, but concentrates in particular locations, particularly within the urban core—much more so than townhouse development in general. The most likely parcels for SF2TH are large (when controlling for other characteristics) with old, small existing single-family houses on them. New SF2TH townhouses are, while not cheap, on the whole relatively modestly priced in the median case. Contrary to many common assumptions, gentrification is not a particularly illuminating framework for predicting where SF2TH will concentrate. Also contrary to common assumptions, SF2TH does not appear to be associated with a gain in children despite the relative spaciousness of the new houses and their desirable locations—in fact, locations with concentrations of SF2TH redevelopment lost children more rapidly than the city as a whole in the last two decades. The unexpectedness of some of our findings underscores that research on Houston’s unique land use trajectory is a rewarding enterprise with lessons for other cities. We accordingly close with several suggestions for further research.

3. Robert Ellickson, “The Zoning Straitjacket: The Freezing of American Neighborhoods of Single-Family Houses,” *Indiana Law Journal* 96, no. 2 (2021).

4. Gray and Millsap, “Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston’s 1998 Subdivision Reform.”

Background

Single-family zoning: no longer untouchable?

If an outside observer were asked to identify the single characteristic that best distinguishes how land use is regulated in the United States compared to its peer countries, chances are high that single-family zoning (shorthand here as “R1”⁵) would win out.⁶ The concept certainly is not unique to the United States, but it has arguably been taken further here than anywhere else, even compared to other high-income, sparsely populated countries such as Canada and Australia.⁷ ⁸ Concerted action from the emerging professionalized real estate industry⁹ and the federal government starting about a century ago led to the rapid adoption of R1 in most localities, a process that was largely complete after just several decades.¹⁰

In the 1960s, the concept of R1 and related regulatory tools, such as minimum lot sizes, particularly in suburbs, experienced a serious challenge on the grounds of racial exclusion. The efforts of the advocacy planner Paul Davidoff and others led to a series of “anti-snob zoning” reforms in locations such as New Jersey, where it was imposed by the courts, and Massachusetts, where it was legislated. Some local governments, beginning with Montgomery County in Maryland, adopted inclusionary zoning ordinances as a means of counteracting the exclusionary effects of single-family zoning and related land use regulations such as minimum lot sizes. And yet the net effect of this wave of reforms was to leave R1 almost entirely unchallenged by the time it had receded.¹¹

The status quo persisted for decades more, right up until the present day. A recent *New York Times* analysis of 11 mostly large cities shows that the percentage of residentially zoned land reserved for single-family uses only is startlingly high in most of them,

5. The terminology refers to a common (though not universal) shorthand for the most restrictive single-family zones in municipal zoning ordinances; Michael Manville, Paavo Monkkonen, and Michael Lens, “It’s Time to End Single-Family Zoning,” *Journal of the American Planning Association* 86, no. 1 (January 2, 2020): 106–12, <https://doi.org/10.1080/01944363.2019.1651216>.

6. Hirt, *Zoned in the USA: The Origins and Implications of American Land-Use Regulation*.

7. Ibid.

8. Andrew H. Whittemore and William Curran-Groome, “A Case of (Decreasing) American Exceptionalism: Single-Family Zoning in the United States, Australia, and Canada,” *Journal of the American Planning Association* 88, no. 3 (2022): 335–51, <https://doi.org/10.1080/01944363.2021.1985591>.

9. Marc Allan Weiss, *The Rise of the Community Builders: The American Real Estate Industry and Urban Land Planning* (New York: Columbia University Press, 1987).

10. Andrew H. Whittemore, “Exclusionary Zoning,” *Journal of the American Planning Association* 87, no. 2 (April 3, 2021): 167–80, <https://doi.org/10.1080/01944363.2020.1828146>.

11. Ibid.

such as 81 percent in Seattle and 79 percent in Chicago.¹² Of the 11, only New York City, the great *sui generis* exception to the general U.S. patterns of low-density land uses and auto-mobility reliance,¹³ and to a lesser extent Washington, DC stand apart as cities with less than a majority of their residential land zoned R1. The predominant status quo in most places, such as the suburbs of Chicago, is one in which a demolished single-family house is replaced (if it is replaced at all) with the only economically viable option under R1: a new single-family house much larger and pricier than the one it supplants.¹⁴ Trends over the decades toward public participation mechanisms of greater frequency and scope have largely served to amplify the most vocal nearby homeowners' objections to any net gain whatsoever in units on an R1 parcel.^{15,16}

But something has shifted within just the last half decade or so; cracks in the firmament of R1 have begun to grow and spread. Whittemore argues that this time, unlike in the 1960s, the critique has originated from the urban economics literature, and has also emphasized racial exclusion and housing unaffordability within large cities, as contrasted with the suburban emphasis in Davidoff's heyday.^{17,18} Academics have recently launched direct attacks on R1,¹⁹ and several zoned cities, most notably Minneapolis but also the likes of Olympia and Walla Walla (both in Washington), have repealed it within their boundaries. Most dramatically of all, entire states, including Maine, California, and Oregon, now require a large number of their jurisdictions to jettison R1.

It would be a mistake to conclude from these recent trends that the disappearance of R1 throughout the United States in the medium term is a foregone conclusion. Its eradication is still opposed or at least viewed with trepidation even by many planning academics

12. Emily Badger and Quoc Trung Bui, "Cities Start to Question an American Ideal: A House With a Yard on Every Lot," *The New York Times*, June 18, 2019, <https://www.nytimes.com/interactive/2019/06/18/upshot/cities-across-america-question-single-family-zoning.html>.

13. David A. King, Michael Smart, and Michael Manville, "The Poverty of the Carless: Toward Universal Auto Access," *Journal of Planning Education and Research* 42, no. 3 (2022): 464–81, <https://doi.org/10.1177/0739456X18823252>.

14. Suzanne Lanyi Charles, "Understanding the Determinants of Single-Family Residential Redevelopment in the Inner-Ring Suburbs of Chicago," *Urban Studies* 50, no. 8 (June 1, 2013): 1505–22, <https://doi.org/10.1177/0042098012465908>.

15. Katherine Levine Einstein, David Glick, and Maxwell Palmer, *Neighborhood Defenders: Participatory Politics and America's Housing Crisis* (Cambridge University Press, 2019), <https://doi.org/10.1017/9781108769495>.

16. Anika Singh Lemar, "Overparticipation: Designing Effective Land Use Public Processes," *Fordham Law Review* 90, no. 1083 (February 15, 2021), <https://ir.lawnet.fordham.edu/flr/vol90/iss3/2>.

17. Whittemore, "Exclusionary Zoning."

18. See also John Mangin, "The New Exclusionary Zoning," *Stanford Law and Policy Review* 25, no. 1 (January 1, 2014): 91, https://journals.law.stanford.edu/sites/default/files/stanford-law-policy-review/print/2014/01/mangin_25_stan_1_poly_rev_91.pdf.

19. Manville, Monkkonen, and Lens, "It's Time to End Single-Family Zoning."

20. Jake Wegmann, "Death to Single-Family Zoning...and New Life to the Missing Middle," *Journal of the American Planning Association* 86, no. 1 (January 2, 2020): 113–19, <https://doi.org/10.1080/01944363.2019.1651217>.

on various grounds, from infrastructural impacts²¹ to inequitable outcomes such as gentrification²² to unaffordable post-redevelopment housing²³ to the lack of an aspirational housing package with the same universal appeal as large-lot single-family living.²⁴ Among the voting public, R1 may be more popular still. And the sheer weight of the status quo means that even if a stronger consensus around the benefits of doing away with R1 were to emerge, it would be acted upon unevenly across jurisdictions and slowly in the aggregate. One helpful historical analogy is with minimum off-street parking requirements. Thanks to foundational research by Donald Shoup and others, the concept retains few principled defenders today.²⁵ But under the sheer weight of status quo bias and the popularity of parking among ordinary people, parking requirements continue to remain the law of the land in most cities, suburbs, and towns in the United States.

One of the obstacles to the further spread of R1 repeal is a paucity of evidence about its actual effects. One reason is a classic chicken-and-egg problem: it has happened in few places, and in those very recently, with a global pandemic drastically upending housing development in the U.S. since early 2020. What limited evidence exists does not show dramatic results. Kuhlmann used a clever research design that exploited boundary effects between Minneapolis and its neighboring suburbs to find that the much-ballyhooed recent city-wide replacement of R1 with zones permitting triplex construction had modestly boosted land prices but yielded few triplexes.²⁶ It is possible that the zoning reform was a necessary but not sufficient condition to induce the actual construction of a novel housing product type. After all, while the city increased the number of units that can be accommodated on a formerly R1 parcel, it did not appreciably increase the total square footage that can be built on one of those parcels. If one thinks of the envelope of a new building on a previously R1 lot in Minneapolis as a box, the box can be now split into three, but the box cannot be any bigger.

21. Glen Searle and Peter Phibbs, "Ending Single-Family Zoning: Is There a Plan B?," *Journal of the American Planning Association* 86, no. 1, January 27, 2020, <https://doi.org/10.1080/01944363.2019.1689013>.

22. Arnab Chakraborty, "Calls to End All Single-Family Zoning Need More Scrutiny," *Journal of the American Planning Association* 86, no. 1 (January 27, 2020): 123–24, <https://doi.org/10.1080/01944363.2019.1689015>.

23. Lane H. Kendig, "Eliminating Existing Single-Family Zoning Is a Mistake," *Journal of the American Planning Association* 86, no. 1 (January 27, 2020): 124–25, <https://doi.org/10.1080/01944363.2019.1689016>.

24. Harley F. Etienne, "The Detached Single-Family Home Genie and Its Bottle," *Journal of the American Planning Association* 86, no. 1 (January 27, 2020): 126–27, <https://doi.org/10.1080/01944363.2019.1689018>.

25. Donald Shoup, *The High Cost of Free Parking: Updated Edition* (Routledge, 2017).

26. Daniel Kuhlmann, "Upzoning and Single-Family Housing Prices," *Journal of the American Planning Association* 87, no. 3 (February 16, 2021): 383–95, <https://doi.org/10.1080/01944363.2020.1852101>.

In the specific case of Minneapolis, it may be that there is not sufficient demand for three small units rather than one large house on a parcel.²⁷ It is also possible that triplexes, an example of so-called “missing middle” (or low-rise, middle density) housing²⁸ suffers from a perception among buyers that it is “stuck in the middle” in that it offers neither the privacy and individualized ownership and control of a single-family house nor the amenities, security, and views of an apartment or condo in a large midrise or high-rise development.²⁹ Another possibility that must be considered is that the reform is in its early days and small builders will take a while to pivot to building a product type unfamiliar to both them and their buyers.³⁰ Time should soon tell.

At any rate, we are left with vanishingly few empirically documented cases demonstrating how housing developers might respond to R1 repeal in cases where it is a binding constraint for builders’ decisions.³¹ The average American now lives in a census tract with less than 15 percent of the tract-level population-weighted density that prevailed in 1940.³² Not surprisingly, cases in which densities within a neighborhood, let alone a whole city, have increased rather than decreased are rare, and even rarer in areas previously developed with housing as opposed to former industrial or commercial lands.^{33,34} One possibility is to turn to historical analogues, such as instances of the replacement of single-family houses with what are sometimes called “dingbat” apartments in Oakland during the 1960s.^{35,36} But these comparisons suffer from the obvious drawback of the vast changes to both the supply and demand sides of housing development that have unfolded over the past half century or more.

27. Emily Hamilton, “What’s a Stickplex?,” *Market Urbanism*, October 2, 2020, <https://marketurbanism.com/2020/10/01/whats-a-stickplex/>.

28. Daniel G. Parolek, *Missing Middle Housing: Thinking Big and Building Small to Respond to Today’s Housing Crisis* (Island Press, 2020).

29. Salim Furth, “Stuck in the (Missing) Middle,” *Market Urbanism*, April 15, 2021, <https://marketurbanism.com/2020/09/08/missing-middle-critique>.

30. Kuhlmann, “Upzoning and Single-Family Housing Prices.”

31. C. J. Gabbe, “How Do Developers Respond to Land Use Regulations? An Analysis of New Housing in Los Angeles,” *Housing Policy Debate* 28, no. 3 (May 4, 2018): 411–27, <https://doi.org/10.1080/10511482.2017.1368031>.

32. King, Smart, and Manville, “The Poverty of the Carless: Toward Universal Auto Access.”

33. Issi Romem, “Can U.S. Cities Compensate for Curbing Sprawl by Growing Denser?,” *BuildZoom*, 2016, <https://www.BuildZoom.com/blog/can-cities-compensate-for-curbing-sprawl-by-growing-denser>.

34. Some of the most striking cases—above all in California—of cities in which densities have increased rather than decreased since the 1960s can be attributed at least to a substantial degree to widespread densification via the addition of unpermitted housing, through either conversion or construction. See Jake Wegmann, “Research Notes: The Hidden Cityscapes of Informal Housing in Suburban Los Angeles and the Paradox of Horizontal Density,” *Buildings & Landscapes: Journal of the Vernacular Architecture Forum* 22, no. 2 (January 1, 2015): 89, <https://doi.org/10.5749/buildland.22.2.0089>; and Jake Wegmann and Sarah Mawhorter, “Measuring Informal Housing Production in California Cities,” *Journal of the American Planning Association* 83, no. 2 (April 17, 2017): 119–30, <https://doi.org/10.1080/01944363.2017.1288162>.

35. Wallace Francis Smith, *The Low-Rise Speculative Apartment* (Center for Real Estate and Urban Economics, Institute of Urban and Regional Development, University of California, 1964); Reyner Banham, *The Architecture of Four Ecologies* (Penguin Press, 1971).

36. The construction of dingbats in Oakland and other California cities largely took place in cases where zoning already permitted higher density construction on what had been originally developed as single-family lots; thus the historical analogue with R1 repeal today only goes so far.

Houston, however, provides an instructive, albeit counterintuitive, case to learn from. Although it is famously the only large unzoned city in the United States, it engaged in a large-scale effort to increase the permitted density of residential development, and it did so relatively recently but also long enough ago that its on-the-ground effects are observable. Recent scholarship has done a great deal to illuminate this heretofore underreported story in U.S. big city land use reform, to which we turn in the next section.

The unique case of Houston

There is a tradition of scholarship on Houston's unique system of land use regulation, dating back to at least Bernard Siegan's seminal book *Land Use Without Zoning*, published in 1972.³⁷ Alone among U.S. cities, Houston put zoning adoption to a plebiscite on three occasions, in 1948, 1962, and 1993, and its voters found it wanting each time.³⁸ A powerful narrative has developed in which Houston's voters, confronted with a choice between an orderly but restrictive regulatory regime versus a messier but more dynamic pro-free enterprise system, opted for the latter, perhaps in keeping with the city's general ethos and nationwide reputation.³⁹

However, it would be a mistake to assume that Houston lacks land use regulation. Instead, it regulates land use not with zoning, but with a series of citywide ordinances that restrict much of what is regulated in any other US city, such as minimum lot sizes and off-street parking requirements, but without reference to zone districts. Furthermore, private deed restrictions are viewed as a central mechanism deployed by the city to control land use. Texas state law includes a special provision that grants special powers to Houston (and to no other Texas city) to use its regulatory and enforcement machinery to encourage and enforce private deed restrictions. These deed restrictions are not transparent in the same way as zoning, and so their scope is much more difficult to quantify than in zoned cities, but one informed observer estimated that about a quarter of private parcels in Houston are covered by private deed restrictions.⁴⁰

37. As an indication of the resurgent interest in Houston's unique system of land use regulation, Siegan's book was recently reissued in an updated edition by George Mason University.

38. Gray and Millsap, "Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston's 1998 Subdivision Reform."

39. Ibid.

40. Teddy M. Kapur, "Land Use Regulation in Houston Contradicts the City's Free Market Reputation," *Environmental Law Reporter* 34, no. 10045 (2004).

Legal scholars such as Lewyn⁴¹ and Kapur⁴² have argued that what might be termed “Houston exceptionalism” is overblown, and that in fact, on-the-ground land use patterns seen there differ little from other automobile-dominated Sunbelt cities that similarly grew explosively in the postwar era. Pendall and his coauthors, in presenting a taxonomy of land use regulatory regimes across the United States, viewed the cities and suburbs of Texas as belonging to a distinctive category of land use regime, but did not see fit to exclude Houston from it.⁴³ For the purposes of this article, however, Houston really is a place apart in one critical way: it has seen a boom in townhouses since the turn of the millennium, likely unique among big cities in the United States in its scale and extent.

Gray & Millsap⁴⁴ provide the definitive account of the twenty-first century Houston townhouse boom, with Park & Guajardo⁴⁵ and Hamilton⁴⁶ subsequently adding important empirical and historical perspectives. The brief summary that follows relies heavily on their accounts.

As Stephen Fox notes, from a nadir in the local oil and gas sector, “the recovery of Houston’s economy in the second half of the 1990s resulted in a boom in new, expensive, inner-city row house construction.”⁴⁷ Gray & Millsap observe that the townhouse boom preceded the City of Houston’s seminal townhouse-promoting reform in 1998.⁴⁸ This initial shift in market conditions was then augmented by those legal reforms. After 1998, townhouse development could proceed more smoothly in a “by right” fashion. Developers no longer had to undergo the more costly and uncertain process of seeking variances to the subdivision ordinance.

The heart of the 1998 reform was a reduction in the required minimum lot size for detached single-family houses from 5,000 square feet down to 3,500 square feet inside the Interstate 610 freeway, an area generally regarded as the city’s urban core or “Inner Loop.” Furthermore, in cases where developers provided compensating open space within a redevelopment or else met several performance standards, the resubdivided house lots could get as

41. Michael Lewyn, “How Overregulation Creates Sprawl (Even in a City without Zoning),” *Bepress Legal Series* 50 (January 1, 2005): 636, <https://joshblackman.com/blog/wp-content/uploads/2012/10/Lewyn-Houston-Sprawl.pdf>.

42. Kapur, “Land Use Regulation in Houston Contradicts the City’s Free Market Reputation.”

43. Rolf Pendall, Robert Puentes, and Jonathan Martin, “From Traditional to Reformed: A Review of the Land Use Regulations in the Nation’s 50 Largest Metropolitan Areas,” Brookings Institute, August 2006, https://www.brookings.edu/wp-content/uploads/2016/06/20060802_Pendall.pdf.

44. Gray and Millsap, “Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston’s 1998 Subdivision Reform.”

45. John Park and Luis Guajardo, “Re-Taking Stock: Understanding How Trends in the Housing Stock and Gentrification Are Connected in Houston and Harris County,” Kinder Institute, Rice University, 2021, <https://doi.org/10.25611/MHBK-WQ06>.

46. Hamilton, “What’s a Stickplex?”

47. Stephen Fox, “The Houston Townhouse: It’s Been Architects Versus the Market Since the Beginning. Today, the Marketing Is Winning.,” *Architecture and Design Review of Houston*, 2000, 23, https://offcite.rice.edu/2010/03/TheHoustonTownhouse_Fox_Cite49.pdf.

48. Gray and Millsap, “Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston’s 1998 Subdivision Reform.”

small as 1,400 square feet.⁴⁹ To put these sizes in context, one recent analysis shows that the median area for new single-family house lots in U.S. metros ranges from 6,098 square feet in El Paso to 43,560 (or exactly one acre) in Bridgeport, Connecticut.⁵⁰

The reduced minimum lot sizes exist alongside other regulations that are highly permissive, such as a citywide height limit of 75 feet for structures adjacent to single-family houses, and a requirement of a scant three feet of separation (even less under some conditions) for a detached townhouse from its neighbor to the side.⁵¹ Required front setbacks range from none at all to 25 feet, depending on the type of street.⁵² Although the required off-street parking of two spaces per unit is not unusually permissive, it is easily accommodated in a “tuck-under” (first story) garage in a typical townhouse and in any case aligns with many homebuyers’ expectations.

The upshot of the lot size reforms and their interaction with other key regulations was that developers could now build, by right, a housing product that they wanted to build and that their customers wanted to buy. Townhouses could not be built quite everywhere—for instance, pre-existing deed restrictions and more recent “block votes” (explained in detail below) preclude some single-family parcels from being redeveloped into townhouses. Still, an enormous area was opened to by-right townhouse development.

Despite their locally used moniker, many of these so-called “townhouses” are in fact technically fully-detached houses; for this reason Park & Guajardo dub them “detached townhouses.”⁵³ Nevertheless, even the detached variant of townhouses à la Houston are unlikely to be confused with the popular image of a typical American single-family detached house. They are much taller—commonly three stories tall and sometimes four or even five stories, as permitted under a generous citywide 75-foot height limit—occupy comparatively tiny footprints and sit on tiny lots, very often with minimal or nonexistent yard space (Figure 1).

49. Hamilton, “What’s a Stickplex?”

50. Michael Kolomatsky, “Which States Offer the Largest Lot Sizes for Home Buyers?,” *The New York Times*, September 8, 2022, <https://www.nytimes.com/2022/09/08/realestate/lot-size-states-metros.html>.

51. Hamilton, “What’s a Stickplex?”

52. Ibid.

53. Park and Guajardo, “Re-Taking Stock: Understanding How Trends in the Housing Stock and Gentrification Are Connected in Houston and Harris County.”

Figure 1. Various examples of townhouse developments in the Greater Heights area of the Inner Loop to the northwest of Downtown Houston.



Photos by Sandra Wegmann.

Houston's minimum lot size reforms were so well-received in the housing market and in the political arena that in 2013 they were extended to all areas inside the city served by sewers.⁵⁴ It is an intriguing, and to date unanswered, question, as to why such substantial reforms passed to begin with and were subsequently expanded. Gray & Millsap make a convincing argument that the key to success was providing homeowners with a mechanism to opt out of townhouse development on their own blocks, thus defusing what would otherwise be a potent source of opposition.⁵⁵

In Houston, homeowners can petition for their own residential block to be incorporated into one (or both) of two types of special districts, Special Minimum Lot Size (SMLS) and Special Minimum Building Line (SMBL) district, that consist of either one or two adjoining block faces. These districts peg land use regulations to pre-existing lot sizes or setbacks,

54. Hamilton, "What's a Stickplex?"

55. Gray and Millsap, "Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston's 1998 Subdivision Reform."

rather than the citywide standards. Both SMLS and SMBL districts thereby severely constrain or altogether halt economically viable subdivision of existing large parcels containing single-family houses into smaller parcels appropriate for townhouses. These districts are formed by city ordinance, rather than private deed restrictions, and thus can be thought of as a form of opt-in zoning. Formation of one of these districts is a straightforward process requiring at least majority support of the affected homeowners (the specifics vary), but at a minimum, the proposed regulation must match what exists on at least 70 percent of the existing lots (or 60% in a historic district). Forming a SMLS or SMBL district is loosely analogous to the homeowner-initiated process commonly used to form historic districts in many cities, but the former is more bottom-up: whereas new historic districts normally need the approval of an elected or appointed body, a proposal for a new SMLS or SMBL district in Houston is highly likely to pass if supported by enough property owners. Upon formation, both types of districts—hereafter jointly referred to as “block vote” districts—automatically sunset after 40 years, whereupon a new petition would be required to renew them.

Gray & Millsap argue that block votes force homeowners to weigh the tradeoffs between maintaining the physical character of their own block and the possibility of increased property values unlocked by future townhouse redevelopment. By contrast, in conventional zoning, a citywide elected body votes on whether or not to change zoning on a given parcel or in a particular district, and so a homeowner’s ability to act upon their preferences for their own block is less direct. In Houston, the homeowners who most vehemently object to townhouse redevelopment near them have a hyperlocal mechanism they can turn to, which may reduce their motivation for changing the rules that prevail beyond their own blocks.

Estimates of how many townhouses were built since the seminal reform in 1998 vary according to the exact time periods and methodologies used, but it is clear that the number is large. Gray & Millsap found over 25,000 townhouses built between 1999 and 2016; Park & Guajardo found almost 39,000 from 2005 to 2018; and one of us found over 34,000 from 1998 to 2020.⁵⁶ Regardless of the details of the differing methodologies and estimates, what is clear is that the scale is considerable; for instance, the last of these analyses found that post-1998 townhouses now account for four percent of all housing units citywide, eight percent inside the Inner Loop, and no less than 43 percent of net housing units added citywide since 1990.⁵⁷ The transformation is not evenly distributed—

56. Jake Wegmann, “Bayou City Townhouse Boom: Does Houston Have Something to Teach Us About Pro-Climate Transformation?,” Platform (University of Texas School of Architecture, 2020), <https://issuu.com/utsoa/docs/platform-forweb-singlepg-102820>.

57. Ibid.

some neighborhoods remain untouched by townhouse redevelopment, while others, like Rice Military, three miles north by northwest from Downtown Houston, have experienced a total transformation in their urban form in just two decades.⁵⁸

Although recent research has revealed a great deal about townhouse redevelopment in Houston, there is more to learn. After all, the studies mentioned above deal with townhouse redevelopment as a whole, whether it took place on large former single-family parcels, formerly commercial or industrial land, or other large nonresidential parcels. Arguably there is a need for a study that specifically examines the subset of Houston's post-1998 townhouse development activity in which formerly single-family parcels have been resubdivided into townhouse lots. This could provide additional clues as to how redevelopment might proceed in existing, built-out residential neighborhoods—neighborhoods that are the locus of both reformers' ambitions and much popular opposition—after reforms to land use regulations. This is the premise of the empirical investigation described in what follows.

A brief note on terminology

This article is premised on our claim that Houston's minimum lot size reforms represent one path other cities could take towards single-family zoning (R1) repeal. In actuality, this is not quite precise. Lot size requirements, on their own, are far from the only mechanisms enforcing the dominance of large lot single-family uses across the landscape, and removing them will not necessarily permit major changes to the status quo. Typical American land use regulations also include use restrictions (i.e., allowing but a single unit per parcel); setback requirements and impervious cover and height restrictions; elements of other, non-zoning, ordinances that favor large lot single-family housing over more land-efficient housing types; and procedural laws that do the same. The legal scholar Sara C. Bronin calls this status quo "zoning by a thousand cuts," with non-large lot single family housing being bled to death in her analogy.⁵⁹

Even so, we believe that the Houston reforms are a useful stand-in for R1 repeals. Houston, unlike most zoned cities, before 1998 lacked many of the mechanisms that in other cities limit the density of single-family housing. That left minimum lot size requirements as the sole binding constraint.⁶⁰ Once it was lifted, townhouse development ramped up

58. Gray and Millsap, "Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston's 1998 Subdivision Reform."

59. Sara C. Bronin, "Zoning by a Thousand Cuts," *Pepperdine Law Review* 50 (February 24, 2021), <https://doi.org/10.2139/ssrn.3792544>.

60. Gabbe, "How Do Developers Respond to Land Use Regulations? An Analysis of New Housing in Los Angeles."

dramatically. For that reason, we maintain that the example of Houston is instructive, since it is analogous to what might happen if a typical zoned city simultaneously lifted the various interlocking barriers that prevent redevelopment of R1 lots into townhouses—which is what most proponents of R1 repeal have in mind.

Moreover, we recognize that the Houston reforms only represent one path away from R1 zoning: they still produce single-family housing (i.e., townhouses), just on smaller lots than before. Yet we consider this a meaningful path, even without reforms to legalize more multi-family housing. We would argue that Houston-style townhouses (as quantified later in the article) are such a dramatic departure from the R1 status quo that they are different in kind and not just degree from large lot single-family houses. They are not “missing middle” housing in the purist sense,⁶¹ but do meet Hamilton’s definition of “stickplex” housing, or housing forms that combine efficient use of land with inexpensive construction techniques. In this regard, they represent a singular case in the recent evolution of single-family dominated city neighborhoods in the US, one which we proceed to examine in detail.

61. Parolek, *Missing Middle Housing: Thinking Big and Building Small to Respond to Today's Housing Crisis*.

Data and Methods

This article poses the research question, “what are the observable characteristics of single-family-to-townhouse (SF2TH) redevelopments in Houston?” We tackle this research question by dividing it into several sub-questions:

- 1) What is the overall quantity of SF2TH redevelopment and incorporation of single-family parcels into block vote districts?
- 2) What is the temporal pattern of SF2TH redevelopment, i.e., how has it fluctuated over time?
- 3) What are the characteristics of SF2TH redevelopments in comparison to what they replaced?
- 4) What are the geographic patterns of SF2TH redevelopment and block votes, i.e., in what types of locations have they occurred?
- 5) How have the neighborhoods around SF2TH redevelopments changed over time?

To answer these subquestions, we rely on an analysis of property tax records from the Harris County Central Appraisal District (HCAD) for the years 2005 (the earliest available in electronic form) through 2020, inclusive.⁶² To identify parcels on which SF2TH redevelopments have occurred, we take advantage of a supplementary dataset maintained by HCAD known as a “tieback table,” in which for every year, lots that have been newly created via lot subdivision are noted, and linked to the property IDs of (now defunct) parcels from previous years. We identify SF2TH redevelopments as cases in which 1) a parcel initially classified by HCAD as one of the “residential” categories is 2) linked to later parcels occupying the same land area and where 3) each of the subsequent parcels is occupied by a house on a parcel of less than 5,000 sf (i.e., below the pre-1998 minimum lot size and therefore conforming to the vernacular definition of a “townhouse” in Houston). By collecting information on both the pre- and post-SF2TH parcels as linked groups of one parcel (pre-redevelopment) to two or more (post-redevelopment), it is possible to address research sub-question #3 above.

62. The vast majority of the City of Houston lies within Harris County, although small portions are in Fort Bend and Montgomery Counties. We ignore the latter two counties in this study as Houston’s territories within both are small and lie at the most distant fringes of the city, and thus are unlikely to have had significant SF2TH redevelopment.

We link all cases of SF2TH to a Geographic Information System (GIS) spatial representation (i.e., a shapefile) of all 2020 parcels, performed with QGIS software. We obtained, from the City of Houston’s website, shapefiles representing both forms of block votes (SMLS and SMLB).⁶³ We combined these block votes into a single layer, i.e., we make no distinction in our analysis between SMLS and SMLB. In our analysis of block votes, we only consider single-family parcels that as of 2007 (the year of the earliest identified SF2TH redevelopment in our dataset) were not then incorporated in a block vote district, and we only consider block vote districts that were either formed in 2007 or later or else were pending as of August 2022.

Some of our analyses rely on sociodemographic characteristics at the census tract level. For these, we obtain decennial Census data from the year 2000 (i.e., shortly after the enactment of the townhouse reforms, and the most recent available prior to the beginning of our analysis period in 2005) and five-year American Community Survey (ACS) data collected in the years 2015–2019. We opt for the latter over the more recent 2016–2020 ACS data due to difficulties in data collection during the pandemic year of 2020 as well as considerable missingness in reported 2016–2020 ACS data. Our analysis uses all Census tracts in Harris County that contain at least one parcel in the City of Houston in use as single-family housing as of 2005.

Some of the calculations summarized above provide two binary dependent variables: redevelopment of a given initially single-family parcel from 2007–2020, and its actual or pending incorporation into a block vote from 2007 to August 2022 for the logistic regression models described later. These models are performed with the `glm` command in the R programming language. Other calculations noted above create the dependent variables for each of the two models: one predicting SF2TH, and the other predicting block votes. (All of these variables’ values are summarized in Table A1 in the appendix.) We provide more detail on the two logit models in Appendix A.

63. As of October 6, 2022, these were available from https://www.houstontx.gov/planning/Min-Lot_Size-Min_Bldg_Line.html.

Hypotheses for models

For Model 1, we hypothesize that large original lots, old original houses, and small original houses will be associated with greater probability of redevelopment into townhouses, as all of these characteristics would be expected to increase the likelihood that homeowners sell to developers. We expect a negative relationship with CBD distance, i.e., for parcels closer to downtown Houston to be likelier to redevelop. We hypothesize a quadratic relationship with tract house prices in the year 2000 based on Gray & Millsap's finding that overall Houston townhouse development was most concentrated in middle income neighborhoods. These are areas that have property values high enough to support redevelopment but low enough that their residents are less likely to have initiated or maintained deed restrictions that would restrict redevelopment.

The relationships with sociodemographic variables test the proposition that townhouse redevelopment in Houston is a story of gentrification. If gentrification is a dominant mechanism then we would expect a greater likelihood of redevelopment in tracts that had higher Black and Hispanic populations, more children, and a less college educated population in 2000, prior to the period we examine. We, on the other hand, hypothesize that Houston's unusually permissive land use regulations allow small-lot redevelopment to concentrate in more privileged neighborhoods (as measured before the time period under analysis) than would be typically seen in a large U.S. city.

Because we expect block votes to occur in reaction to SF2TH redevelopment (although our models as structured can only detect associations rather than a causal relationship), we expect the coefficients for Model 2 to be broadly similar to those in Model 1. For the added variable of SF2TH units within the same census tract, we include a quadratic relationship because we anticipate a saturation effect; i.e., more SF2TH redevelopment nearby leads to a greater likelihood of a block vote in response, but only up to a point. Once the area nearby is sufficiently saturated with townhouse redevelopment, according to this view, enacting a block vote is less worthwhile, and thus becomes less likely past the threshold.

Results

In this section, we report our results in three parts. First, we report descriptive statistics that shed light on the first three sub-questions listed in the prior section, i.e., on the quantity of SF2TH redevelopment and block votes (#1), the timing of SF2TH redevelopment (#2), and a comparison of pre- versus post-redevelopment characteristics of parcels (#3). Next, we report the results of the two logit models, in order to shed light on sub-question #4, on the geographic patterns of SF2TH redevelopment and block votes. Finally, we analyze sociodemographic trends from 2000 to 2015–2019 to answer sub-question #5, i.e., to show how neighborhoods containing SF2TH redevelopment concentrations have changed over time.

Basic characteristics of townhouse subdivisions and block votes

Using the methods described in the previous section, we identify 1,392 single-family-to-townhouse (SF2TH) redevelopments in the HCAD data spanning 2005 to 2020, yielding a total of 5,359 identified townhouse units, each lying on its own new parcel, produced via the SF2TH process. The earliest of these townhouse units were built in 2007 and the most recent in 2020. We caution that our method has not identified all SF2TH townhouses in Houston; those whose lots were subdivided prior to 2005 would not be identified by our method. It is also possible that our technique relying on tieback tables may have missed some SF2TH subdivisions due to inaccurate or incomplete records.

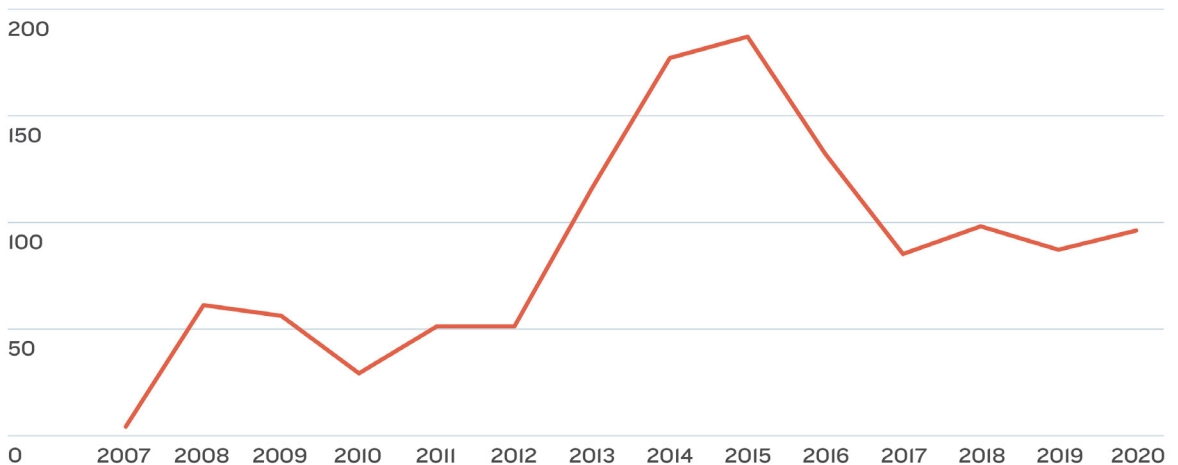
Our figure of 5,359 SF2TH townhouses is not directly comparable with Gray & Millsap's (2020) finding that 25,269 townhouse-style parcels were created between 1998 and 2016, since the time periods do not entirely overlap. Still, a very rough comparison suggests that SF2TH redevelopments yielded less than a fifth of the total post-1998 townhouses developed in Houston. Presumably the remainder have been constructed on larger parcels, many of them commercial or industrial rather than residential. Our results further suggest that notwithstanding Houston's twenty-first century townhouse boom, SF2TH redevelopment is a relatively rare event. Out of 282,770 identified single-family parcels in our dataset not included within a block vote district as of 2007, only 0.5 percent underwent SF2TH subdivision between 2007 and 2020. A considerably higher, but still small, number of parcels, or 13,302 (4.7% of the total), were incorporated into block vote districts during the same period.

SF2TH subdivision over time

Figure 2 shows the number of SF2TH redevelopment events by year between 2007 and 2020. Starting from a miniscule number (just four), the phenomenon rises in the latter part of the decade of the 2000s, and then declines (though by no means disappears) during the Great Recession after 2008. (Note that the very low number for 2007 should be treated with caution, since the dataset does not include redevelopments of parcels classified as “residential” prior to 2005; our analysis would have missed any 2007 redevelopments linked to parcels before 2005.) But it quickly resumes its upward growth after 2010 and proceeds to skyrocket through 2015. After 2015, there is a large decline—though not to anywhere close to zero—perhaps as a delayed effect of a downturn in the locally important oil and gas economy (of which Houston is regarded as the global capital) due to a collapse in global crude prices during 2014. From 2016 to 2020, activity is relatively steady.

Figure 2. Completed single-family-to-townhouse redevelopments by year in Houston, 2007 to 2020.

Note that the figure for 2007 may be low because the data set does not include subdivided parcels that link to unsubdivided parcels from before 2005.

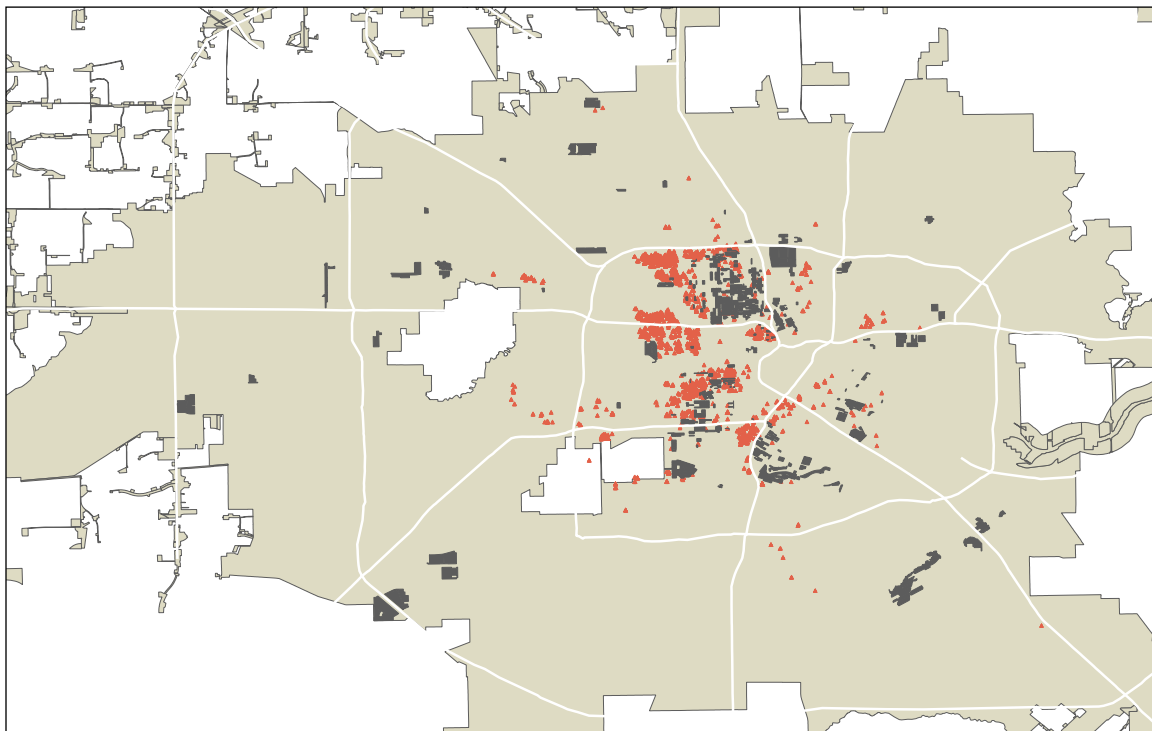


Geography of SF2TH subdivision

Figure 3 shows the locations of SF2TH units completed from 2007 to 2020, along with the block votes enacted during that period. Immediately notable is that SF2TH is overwhelmingly concentrated inside the Inner Loop (visible as the white roadway circling around Downtown Houston). Only a miniscule number of SF2TH townhouses (just 3.4% of the total) lie beyond the Inner Loop. This is in contrast to prior results in which one of us found that only 53 percent of townhouses overall built from 1999 to 2015 were within the Inner Loop.⁶⁴ Thus, SF2TH appears to be a more intensely urban phenomenon than townhouse development in Houston in general. Reasons could include higher land prices in the Inner Loop that make custom-built designs built in small increments more feasible for builders, or a lower prevalence of homeowners' associations that might serve to thwart such development.

Figure 3.

Single-family-to-townhouse redevelopments are shown in red; block votes are shown in dark grey; freeways are shown in white; and the Houston city limits are shown in yellow. Some fringe areas of the city that contain no redevelopments or block votes are omitted from view. For reference, Downtown Houston, containing no block votes or redevelopments, is located inside the smallest freeway loop visible. The Inner Loop, commonly regarded as Houston's urban core and containing the bulk of redevelopments and block votes, is the area inside the larger of the two visible complete freeway loops.

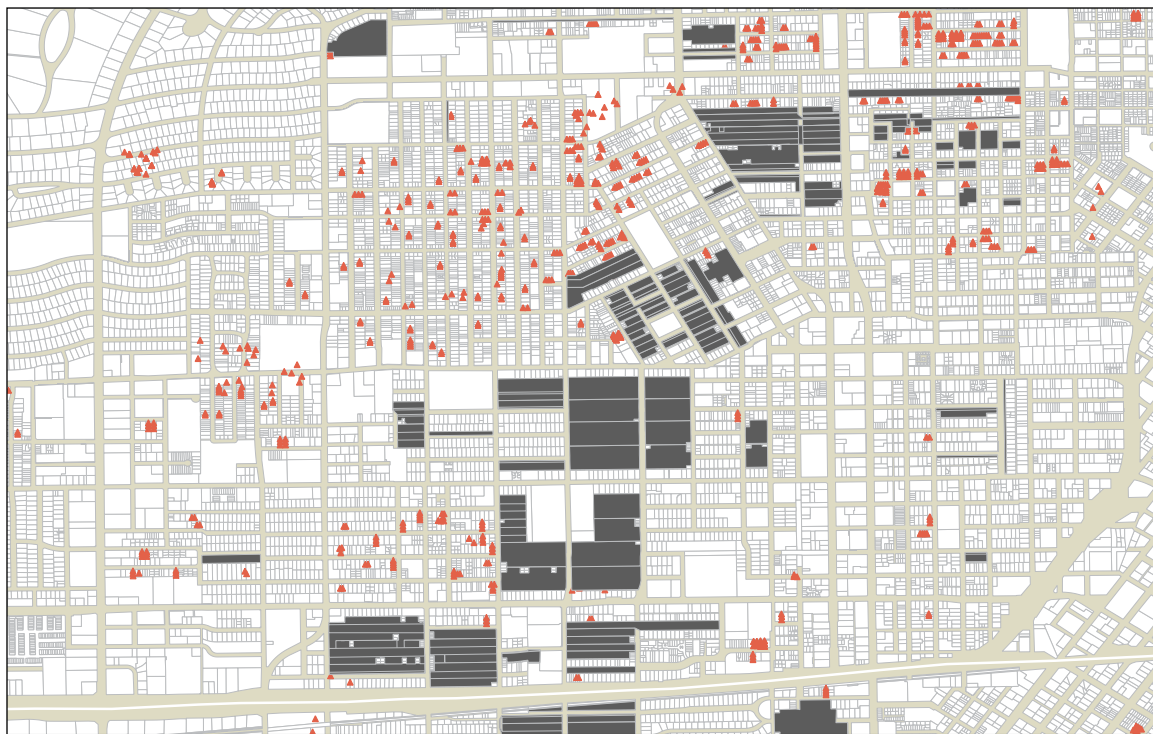


64. Wegmann, "Bayou City Townhouse Boom: Does Houston Have Something to Teach Us About Pro-Climate Transformation?"

Block vote districts are mostly, though not exclusively, located close to large concentrations of SF2TH townhouses, although there is little overlap between the two. Indeed, the dissimilarity index for block votes and SF2TH at the tract level is just under 0.84.⁶⁵ Instead, clusters of SF2TH townhouses and nearby large patches of block votes seem to exist within clumps of roughly 1 to 4 miles in diameter primarily to the northwest, west, and south of Downtown Houston. In the macroscale, these clusters are spatially concentrated, in the sense that only 121 of the 660 Harris County census tracts in Houston have either at least one SF2TH townhouse, at least one block vote, or both. One could summarize the spatial pattern by remarking that block votes and SF2TH townhouses are clustered together when one is zoomed out, but separated from each other in mostly homogenous clusters when zoomed in. (Figure 4 provides an illustrative example.)

Figure 4.

Single-family-to-townhouse redevelopments are shown as red dots, while block votes are shown in dark grey, in a swath of the northwest quadrant of Houston's Inner Loop. Note that both redevelopments and block votes tend to group together in clusters that are relatively near each other but mostly non-overlapping.



65. The dissimilarity index, commonly used as a measure for residential racial segregation, ranges from 0 (perfectly unsegregated) to 100 (perfectly segregated). Intuitively, the index of 0.84 means that 84 out of 100 block vote parcels would have to move to different tracts in order to achieve a perfectly proportionate balance of block votes and SF2TH townhouses by tract.

A small though nontrivial number of block votes are located beyond the Inner Loop, and in some cases a considerable distance from any identified SF2TH redevelopments. It is possible that the formation of these districts was motivated by nearby (non SF2TH) redevelopment, as a pre-emptive measure to prevent it in the future, or perhaps as a means of restricting or altering other forms of anticipated redevelopment (such as single-family teardown/replacements).

Pre- versus post single-family-to-townhouse redevelopment

Having examined the macro characteristics of the SF2TH redevelopments—their number, their temporal pattern, and their geographic distribution—we now turn to characteristics of the redevelopments themselves. First, their scale: redevelopments are mostly very small. If we think of a redevelopment as an event that begins with the demolition of one or more existing structures on a single-family lot and then results in a number of townhouses built on smaller lots subdivided from the original lot, then the most common version of this event yields only two townhouses. The median redevelopment event yields 4 townhouses. Notwithstanding the small net gain in units, Houston is a rare example—beyond the still relatively small number of cities in which permitted Accessory Dwelling Units have been built in nontrivial numbers—in which small-lot redevelopment processes yield net gains in housing units. The typical counterfactual in many other large cities is a one-for-one replacement of a (small and deteriorated) single-family house with a (large and new) single-family house.

In Table 1 below, we summarized a number of metrics that in various ways compare conditions before and after SF2TH redevelopment for all 1,392 parcels in our dataset on which it occurred. The unifying theme is a drastic intensification in the use of these parcels, as one would expect; after all, for a builder to expend the capital to acquire an existing property, demolish its existing use, and replace it with new housing units, requires a substantial increase in value. Table 1 allows for this dynamic to be quantified via various indicators.

Table 1

Indicator	Pre-redevelopment	Post-redevelopment
Median house construction date	1936	2014
Median lot size	6,500 sf	2,105 sf
Median built floor area	1,348 sf (pre-redevelopment parcel)	2,483 sf (all newly-created townhouse units)
Ratio of new total built square footage to previous total built square footage	1	4.2 (median; 1st quartile = 2.2; 3rd quartile = 6.6)
Improvement-to-land (I/L) assessed value ratio	0.14 (median)	2.14 (median)
Ratio of new assessed property value to previous property value	1	3.2 (median; 1st quartile = 1.7; 3rd quartile = 5.1)
Total citywide taxable property value	\$319 million	\$1.914 billion

First, in the median case, an old house (built in 1936) is demolished and replaced with new townhouses (built in 2014). The median lot of 6,500 square feet is split into new, smaller lots with a median size of just 2,105 square feet. The original, relatively small house with a median of 1,348 square feet of floor area is replaced with new townhouses that collectively have 4.2 times the floor area as the one single-family house demolished to make way for them. Furthermore, in the median case, each new individual townhouse unit includes considerably more living space than the original house that was torn down (2,483 sf vs. 1,348 sf).

According to one metric, the improvement-to-land ratio (“I/L ratio”), which measures the value of the building as assessed by HCAD compared to the assessed value of the land on which it sits—and whose significance is explained by Landis and collaborators⁶⁶—post-redevelopment sees the parcel far much more efficiently used. The I/L ratio leaps from 0.14 pre-development to 2.14 for the median townhouse created in the process—a 15-fold increase. Measured in a different way, the total assessed value on the parcel jumps more than threefold from before versus after redevelopment. Aggregated together, the SF2TH parcels represented \$319 million of taxable value for the city, county, school district, and other entities reliant on property tax revenues prior to redevelopment, as compared to

66. John D. Landis et al., “The Future of Infill Housing in California: Opportunities, Potential, and Feasibility,” *Housing Policy Debate* 17, no. 4 (January 1, 2006): 681–725, <https://doi.org/10.1080/10511482.2006.9521587>.

\$1.914 billion in value afterwards. Although this analysis does not attempt to quantify increased needs for municipal services generated by lot subdivision, it seems highly likely that SF2TH townhouses represent a considerable fiscal net positive for taxing entities including the city, county, and K-12 school district.

Affordability

The median SF2TH had an assessed value, as of 2020, of \$340,000 (\$133 per square foot)—much lower than the median citywide assessed value of single-family houses built 2007 or later on unsubdivided parcels, which was \$545,000 (\$176 per square foot). Assessed values (as opposed to sales price data) should be treated with caution, but rough comparisons are still instructive. Values of SF2TH varied greatly, with an interquartile range of \$213,000. This suggests that SF2TH townhouses in Houston span the full gamut from bargain to high-end products and everything in between.

When one considers that most SF2TH townhouses are easily spacious enough for a four-person household, their newness, and their predominant location inside the Inner Loop, \$340,000 is a comparatively modest price. Under a reasonable set of assumptions, it was affordable to a household earning 105 percent of the metropolitan median household income in October 2020, although of course there have been major changes in interest rates and other market conditions since then.⁶⁷ (This calculation also does not account for the likely understatement of HCAD’s assessed house values compared to real-world prices.) Compared to other big and growing U.S. cities, it is notable that a new-build, family-sized housing product with a central location is within reach of middle-income Houston households in the median case.

Summary

To summarize, SF2TH redevelopment on the citywide scale is a relatively rare event; the same is true of block votes—presumably mostly conducted in response to nearby SF2TH—although less so. Although precise quantification is not possible, it is clear that SF2TH represents a small share of townhouse development in Houston overall. After a slow start during and immediately following the Great Recession, SF2TH redevelopment has steadily produced new housing, albeit not without fits and starts. SF2TH redevelopment is

67. This calculation uses Fannie Mae’s Homebuying Mortgage Calculator (Fannie Mae, nd) and assumes the following: 5% downpayment, 2.8% interest rate for a 30-year mortgage, and no homeowner’s association fees (as is typical for Houston townhouses), but includes property taxes, homeowner’s insurance, and private mortgage insurance in addition to principal and interest. These costs are assumed to total no more than 30% of gross household income. In 2020 the median family income for Greater Houston was \$78,800 (US Department of Housing and Urban Development, 2020).

overwhelmingly concentrated in the urban core, more so than townhouse development as a whole. It represents a considerable intensification of urban land use, whether measured from a built form or property tax generation standpoint. Even so, the typical end product, while by no means cheap, is reasonably affordable to many middle-income homebuyers. Having reviewed some of the general characteristics of SF2TH redevelopment, we now turn to an analysis of the locational factors that predict where it—along with its close companion, block vote district formation—is most likely to take place.

Predicting townhouse redevelopment and block votes from 2007 to 2020

The two logit model runs, predicting SF2TH redevelopment (Model 1) and block vote incorporation (Model 2), are summarized in Table 2. We begin with a discussion of the results from Model 1.

Table 2

	Model 1 (SF2TH logit): Single-family parcel (as of 2007) undergoes subdivision into townhouse lots, 2007-2020			Model 2 (Block Vote logit): Single-family parcel not in a block vote district (as of 2007) is incorporated into a block vote, 2007-August 2022		
Intercept	-52.58	2.97	***	11.70	(1.01)	***
Original lot and structure characteristics						
Original lot size (acres)	0.51	(0.14)	***	0.47	(0.032)	***
Original structure year built	-0.028	(0.0015)	***	-0.011	(0.00051)	***
Original structure interior area (sf)	-0.00026	(0.000041)	***	0.00015	(0.000013)	***
Distance from CBD (miles)	-0.55	(0.022)	***	-0.059	(0.0048)	***
Tract-level characteristics, Year 2000						
Median house value (1999 USD)	0.000019	(0.0000024)	***	0.000026	(0.00000085)	***
Median house value (1999 USD), squared	-3.50E-11	(4.18E-12)	***	-5.56E-11	-1.73E-12	***
Population share under age 18	-1.71	(0.96)	.	-4.41	(0.26)	***
Population share Black non-Hispanic	-1.37	(0.35)	***	5.23	(0.10)	***
Population share Hispanic	-0.58	(0.44)		7.88	(0.13)	***
Share of people ages 25+ with bachelors or higher	-1.89	(0.60)	**	5.89	(0.17)	***
SF2TH townhouses in tract, built from 2007-2020						
SF2TH townhouses in tract				0.012	(0.00066)	***
SF2TH townhouses in tract, squared				-0.000057	(0.0000028)	***
n	282,742			282,742		
Nagelke pseudo r^2	0.293			0.259		

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; . $p < 0.1$

The four original lot and structure characteristic coefficients are all highly significant and have the expected signs. As hypothesized, parcels that are larger and that contain older and smaller existing houses, and that are closer to downtown, are all likelier to redevelop when controlling for the other variables in the model. The relationship of house value to redevelopment also behaves as expected. Confirming Gray & Millsap's finding that townhouse development in general is most common in upper-middle-income locations, the year 2000 median tract house value coefficient and its square in Model 1 point towards the likelihood of SF2TH redevelopment peaking, all else equal, in tracts with a median house value of \$271,000 (with a 95% confidence interval spanning from \$165,000 to \$442,000) in 2000. This compares to an overall year 2000 average tract-level median income house price of \$91,000 (Table A1).

The sociodemographic variable coefficients tell a somewhat mixed story. Tracts with fewer Black residents in 2000 are more likely to redevelop, cutting against the notion that SF2TH is a phenomenon of gentrification. On the other hand, parcels in tracts with lower college education levels are likelier to redevelop. There is a very weak negative relationship between the number of children in the tract and likelihood of SF2TH redevelopment; Hispanic population share has no relationship at all. Though these results are mixed, taken in tandem with the finding reported above about tract house prices, there is certainly no compelling reason to strongly associate SF2TH redevelopment from 2007 to 2020 with gentrification. Instead, it appears to concentrate in tracts that were less Black and had fewer college educated residents, but higher-than-typical house prices, as of 2000.

The Model 2 results bear many similarities to Model 1, suggesting that many of the basic factors that drive SF2TH redevelopment are also associated with greater likelihood of a given parcel being incorporated into a block vote district. For instance, as with SF2TH, block votes are likelier on larger parcels, with older houses, closer to downtown, and in neighborhoods with above-median house prices as of 2000 (peaking at \$233,000, as compared to \$271,000 for Model 1).

The differences between Model 2 and Model 1 are instructive. Unlike SF2TH, block votes are more likely on parcels that contain *larger* houses; perhaps their owners (being themselves less likely to resubdivide their own lot) are more motivated to act to prevent what they regard as out-of-scale townhouse redevelopment from taking place nearby. Block votes are more likely to take place in tracts that have more children and college-educated adults; one could imagine neighbors organizing to thwart SF2TH in the name of maintaining a

tranquil, child-friendly atmosphere. One could also imagine more educated residents having more ability to navigate the block vote district formation procedures. Intriguingly, parcels in tracts with more Black and Hispanic residents are sharply more likely to join a block vote district.

Model 2 has a variable not present in the SF2TH model (Model 1), along with its squared term: the number of SF2TH townhouse units built during the 2007 to 2020 time period within the same census tract as the parcel in question. As discussed earlier, the supposition here is that the presence of SF2TH nearby may spur homeowners to organize a block vote as a defensive measure against townhouse redevelopment on their own street, although our analysis ignores the relative timing of these events and thus can only yield a loose association. The sign and significance of the squared term suggest, as with the house value variable, a quadratic relationship between SF2TH townhouses and block vote likelihood. The probability of a block vote covering a parcel between 2007 and 2022 peaks with 104 townhouse units created in the same census tract from 2007 to 2020 (with a 95% confidence interval from 84 to 115). Below that amount, block votes, all else equal, are less likely, presumably because townhouse encroachment is a less alarming prospect. Above 106 townhouses per tract, block votes also become less likely, suggesting a critical level of townhouse saturation past which homeowners begin to calculate that it is no longer worthwhile to bother with organizing a block vote.

Models 1 and 2 have Nagelke pseudo r^2 values of almost 0.29 and 0.26, respectively. Thus, they are reasonably predictive, given that many factors governing lot-by-lot redevelopment and block vote formation, such as a given homeowner household's readiness to sell, the presence of nearby blighted properties, or social relations on a given residential block, are idiosyncratic.

Townhouse redevelopment and neighborhood change

Although some of the model results reviewed above relate, at least indirectly, SF2TH redevelopment with gentrification, it is also useful to use simple descriptive statistics in order to build a portrait of how the neighborhoods in which this type of townhouse development predominates have changed during this century. These changes, from 2000 in the decennial census to 2015–2019 in the ACS, are captured in Table 3. Sociodemographics in the mean census tract containing SF2TH townhouses (middle column) are compared to the same for the mean census tract containing unsubdivided single-family parcels

(right column). To provide a concrete example from the top row of Table 3: the average parcel that underwent SF2TH redevelopment was located in a census tract in which the share of the population under age 18 dropped by 7.4 percentage points between 2000 and 2015–2019 (center column). Meanwhile, the average single-family parcel that did not undergo SF2TH redevelopment was in a tract whose under 18 share dropped by only 2.3 percentage points during that same period (right column). So SF2TH parcels tended to be located in parcels that lost children at a faster rate than single-family parcels that were not redeveloped into townhouses.

**Table 3: Average Parcel-Level Change from 2000 to 2015-2019
For Subdivided vs. Unsubdivided Parcels**

	Change within parcel's census tract from 2000 to 2015-2019	
	Subdivided parcels	Unsubdivided parcels
Percent of population under age 18	-7.4 pp	-2.3 pp
Percent of population over age 65	-0.2 pp	+1.8 pp
Percent of population non-Hispanic Black	-3.8 pp	-5.2 pp
Percent of population non-Hispanic white	+16.8 pp	-6.4 pp
Percent of population Hispanic	-21.0 pp	+10.7 pp
Median Family Income (nominal dollars)	+\$109,667	+\$29,520
Percent of adults 25+ with bachelor's degree or higher	+38.3 pp	+6.2 pp
Percent of occupied housing units owner-occupied	+11.6 pp	-3.1 pp
Median owner-occupied house price (nominal dollars)	+\$315,401	+\$134,195
Population density per square mile	+1,986	+270
Number of parcels	1,371	281,400

pp = percentage point change

The mean SF2TH townhouse in our dataset is located in a census tract that in the twenty-first century has, by all indicators, disproportionately gained in Houston's most historically advantaged populations. Whites are up by 17 percentage points, while Black and Hispanic residents are down by four and 21, respectively. These demographic trends took place in the context of substantial densification: the median density of the average SF2TH tract leapt by almost 2,000 extra people per square mile (an increase of almost 39%), compared to less than 300, on average, in the unsubdivided parcels' tracts.

The average SF2TH's tract gained in median family income (MFI) by a whopping almost \$110,000 compared to under \$30,000 for the tract housing the average unsubdivided single-family parcel. The median house price shot up by \$315,000 in the former versus just \$134,000 in the latter. Homeownership rate trends diverged, increasing by almost 12 percentage points in the former compared to a drop of three in the latter.⁶⁸

The share of elderly households in the mean SF2TH tract remained basically unchanged versus a slight increase (1.8 percentage points) in the tract of the mean unsubdivided parcel. The divergence was greater for children, as noted earlier, i.e., a 7.4 percentage point drop for subdivided versus drop of 2.3 for unsubdivided parcels.

Do these changes represent gentrification as it is commonly understood? In the average case, no: the mean SF2TH is located in a tract that in 2000 was substantially whiter, essentially identical in income, and had considerably higher median house values than for unsubdivided parcels (40% white vs. 30%; \$48,000 vs. \$47,000 of MFI; and \$128,000 vs. \$90,000 of house value, respectively). SF2TH townhouse redevelopment, it appears, disproportionately took place in somewhat advantaged tracts near the urban core and helped those neighborhoods grow their advantaged populations. Compared to the typical pattern in most growing U.S. cities, such as nearby Austin, where land use regulations largely shield advantaged neighborhoods from infill development and housing unit densification and instead shunt it to historically marginalized (and less heavily regulated) areas in the urban core,⁶⁹ thus fueling gentrification, Houston represents an entirely different trajectory.

68. Here it is worth recalling that Table 3 presents simple associations between parcel status (subdivided into townhouses or not) and the various sociodemographic and other indicators shown. Causation cannot be inferred directly. Still, the simplest explanation for the observed trends is that locations with rapidly increasing incomes and property values were, all else equal, likely more attractive for redevelopment, including SF2TH, where regulations and private deed restrictions allowed.

69. Eliot Tretter, *Shadows of a Sunbelt City: The Environment, Racism, and the Knowledge Economy in Austin* (University of Georgia Press, 2016).

Takeaways and Lessons

How should we summarize the Houston experience of SF2TH redevelopment—something we might think of as Houston’s two-decade long experiment in repealing R1 via allowing redevelopment into townhouses? Though it is of course important to be cautious about generalizing from one city to another, some of the topline takeaways from the empirical findings presented above may be instructive for other large, hot market, U.S. cities, or at least those seeking to legalize townhouse-style redevelopment of large single-family lots. We summarize these takeaways below.

The removal of binding constraints can spur change

At the risk of stating the obvious, the removal of a binding constraint on a form of development can greatly speed up the proliferation of that form of development.⁷⁰ Just as prior research has demonstrated that minimum lot size requirements have altered the quantity and character of greenfield suburban development throughout Texas⁷¹ and townhouse redevelopment in Houston in general,⁷² the 1998 reforms appear to have facilitated substantial SF2TH redevelopment in Houston. Our results do not permit a comparison before and after the 1998 reforms, since our data only spans the period from 2005 to 2020, but SF2TH redevelopment in Houston accelerated post-Great Recession to a pace likely not seen in any other U.S. city in recent times.

Single-family-to-townhouse redevelopment is a comparatively rare event on the citywide scale

Even though the 1998 lot size reforms and their later extension could be viewed as major success stories in spurring the production of townhouses, townhouse development on formerly single-family lots is relatively rare even under Houston’s near-ideal conditions. Although we recognize that our estimates are likely not perfect, we found that only 0.5 percent of single-family lots underwent SF2TH redevelopment between 2007 and 2020. Even ambitious and successful reforms to R1 such as Houston’s, in other words, are unlikely to spur rapid transformation in the single-family stock at the scale of a whole U.S. city. Most single-family housing is likely to stay single-family housing in the first decades after reform.

70. Gabbe, “How Do Developers Respond to Land Use Regulations? An Analysis of New Housing in Los Angeles.”

71. M. Nolan Gray and Salim Furth, “Do Minimum-Lot-Size Regulations Limit Housing Supply in Texas?,” Mercatus Center Research, George Mason University, May 1, 2019, <https://doi.org/10.2139/ssrn.3381173>.

72. Gray and Millsap, “Subdividing the Unzoned City: An Analysis of the Causes and Effects of Houston’s 1998 Subdivision Reform.”

The same might not be true, however, at the neighborhood scale. Certain neighborhoods may be ideally situated for redevelopment and face more rapid change. Indeed, certain Houston neighborhoods, such as Rice Military and Montrose, were radically transformed by SF2TH during the period we analyzed.

In Houston, townhouses on formerly single-family parcels are less numerous than those built on formerly nonresidential parcels

The share of overall post-1998 townhouse development in Houston that took the form of redevelopment of formerly single-family parcels was likely less than 20 percent although due to data limitations we cannot calculate precisely. This likely reflects multiple factors. The economies of scale achievable on larger tracts may be attractive to developers. Existing residential neighborhoods may be subject to restrictive covenants limiting redevelopment. And even in a liberal regulatory regime, opposition from neighbors may still impede the redevelopment of parcels in established single-family neighborhoods. Moreover, the specific design of Houston's lot size reduction ordinances likely incentivizes the acquisition of larger parcels—developers can reach smaller townhouse lot sizes, for instance, if they provide common open space in their developments. This could spur them to prefer larger, commercial parcels over smaller, residential ones in many cases. Whatever the exact reason, it is obvious that even where the development of a given housing product is allowed on both commercial and residential land, Houston's experience shows that it is not an inevitability that the latter will predominate.

Single-family-to-townhouse redevelopment represents a significant intensification of land use and fiscal yield where it occurs

Although SF2TH redevelopment represents a less dramatic physical transformation than, say, the replacement of a single-story strip mall with a midrise apartment building, it still results in a notable increase in how intensively the affected parcels are used. The median SF2TH redevelopment produces 4.2 times more floor area on the parcel than what existed before the prior single-family house on it was torn down. Notably, redevelopment increased both the density and the unit sizes of housing compared to what existed on the same parcels pre-redevelopment. These redevelopments provided more housing per household, not only per acre.

The increased valuation for property taxation purposes for all of the properties that underwent SF2TH redevelopment was fully six-fold higher post-redevelopment compared to pre-redevelopment, suggesting that SF2TH is almost certainly a fiscal winner for the city and other taxing districts even when considering additional demand for municipal services.

Single-family-to-townhouse redevelopment is much likelier in the urban core and on certain parcels (large lots with old, small existing houses)

Notwithstanding the rarity of SF2TH redevelopment on the citywide scale, in Houston, it has concentrated in particular locations. It is intensely concentrated in the urban core—much more so than townhouse development in general, which already has a notable urban tilt. Likely, the acquisition and teardown of an existing single-family house requires considerable land values for it to be justified for SF2TH. It is most likely to take place on larger single-family parcels where the existing house is small and old, or low in value relative to the land on which it sits. This last finding, of course, has implications for those concerned about historic preservation in Houston or in other cities contemplating repealing R1.

Block votes are comparatively rare citywide but apparently effective in keeping SF2TH out of certain neighborhoods

Block votes are comparatively rare on the citywide scale; only 4.7 percent of single-family lots not in a block vote district as of 2007 came to be covered by one, or had one pending, by 2022. This percentage is higher than the share of such parcels that underwent SF2TH (0.5%), but it is obvious that providing the block vote mechanism did not come anywhere close to halting SF2TH on the citywide scale. If one takes a “zoomed out” perspective, then block votes do not impede SF2TH redevelopment.

However, a “zoomed in” perspective gives a more nuanced interpretation. Areas with heavy concentrations of block votes tend to border on, but mostly not overlap with, areas with a lot of SF2TH redevelopment. Thus, we can infer that certain sizable areas of the city that might otherwise be expected to have market conditions favorable for SF2TH redevelopment seem to have many blocks where this redevelopment has been

thwarted.⁷³ We see this in a patchwork spatial pattern of large areas of concentrated townhouse redevelopment adjoining other large areas that are thick with block votes. Our findings buttress Gray & Millsap's supposition that block votes allow homeowners to confront tradeoffs between property values and their aversion to immediately proximate redevelopment, with varying results according to the particular mix of life situations and preferences of homeowners on a given block.

The spatial patterns of SF2TH redevelopment are not consistent with gentrification as a primary explanatory factor

The hypothesis that gentrification was a primary driver of SF2TH redevelopment does not fit well with our empirical results. For a neighborhood to be commonly understood to be gentrifying over a given time period requires two ingredients: 1) a population that, at the beginning of the time period, includes an over-representation of historically marginalized groups; and 2) a trajectory of change over time in which the share of advantaged groups increases. To be sure, SF2TH redevelopment in Houston is consistent with the second requirement; it is concentrated in tracts that from 2000 to 2015-2019 lost children, Black and Hispanic residents, and gained in whites, college educated adults, owner-occupied housing share, and house values. But it does not meet the first requirement: when controlling for other relevant factors, SF2TH redevelopment was more likely to occur in neighborhoods with above-average (though not the highest) property values, and with fewer Black residents, as of 2000.

In other words, the pattern of SF2TH redevelopment is not consistent with a narrative that an influx of townhouse development led to Houston's historically disadvantaged groups having to leave their neighborhoods. Instead, it seems instead to have been a case of neighborhoods that were modestly wealthy to begin with getting wealthier. Low-house value neighborhoods may have had insufficient land values to attract developers or homebuyers, and the highest-cost blocks may have been more likely to already have protective deed restrictions in place. Block votes may have played some role in the latter although they were similarly most likely to be used in neighborhoods in the upper middle,

73. Some evidence in favor of this supposition: generally speaking, parcels with lower I/L ratios are being less intensively used in relation to their land value and thus can be expected to be more prone to redevelopment (Landis et. al, 2006). Among the parcels in our data set with valid property values, we find that unsubdivided properties incorporated into block votes during the time period we analyzed had a median I/L ratio of 0.94, significantly lower than for unsubdivided properties never incorporated into block votes, or 1.90. As a point of reference, parcels that underwent SF2TH had a median I/L ratio of 0.14 (Table 1) versus 1.85 for those that did not. These results are consistent with the idea that block votes are likely suppressing at least some SF2TH redevelopment. The authors thank Emily Hamilton for suggesting this comparison.

rather than the top, of the citywide distribution of house values. It seems plausible that high-income blocks are more likely to have already had deed restrictions in place, and thus to have less need for block votes, but this can only be conjecture on our part.

Although novel building forms, such as the tall and narrow dimensions of townhouses, often serve for many as a visual totem of gentrification by contrasting with existing familiar building types, the association is not strongly supported by the evidence in the case of Houston. Certainly, one can find examples of gentrifying neighborhoods, such as Third Ward immediately south of Downtown Houston, that experienced a spate of SF2TH redevelopment from 2000 to 2015-2019, but this was not the predominant pattern. An implication for other U.S. cities is that a broad-based, citywide repeal of R1 that effectively sparks redevelopment may result in somewhat more advantaged neighborhoods soaking up some of the housing demand now channeled to gentrifying neighborhoods.

Single-family-to-townhouse redevelopment does not appear to be associated with a gain in children

Many observers have lamented the lack of new housing in urban cores that is suitable for families with children. Houston has vigorously addressed this issue by pursuing regulatory changes that have allowed for the construction of tens of thousands of relatively spacious single-family towns that in principle *could* accommodate families with children. However, the tracts that have seen SF2TH at the highest rates have lost children faster since 2000 than the city as a whole. It is impossible to know from our results if this loss of children is due to other factors, such as fear of crime or perceived low quality of public schools, or if townhouses are still not viewed in Houston as family-friendly housing (perhaps because of a lack of yard space or vertical layouts) despite their comparative spaciousness vis-à-vis apartments or other land-efficient housing types. It is also possible that the availability of townhouses resulted in a slower decline in the child population than would otherwise have been the case. However, one takeaway for cities contemplating R1 repeal is that townhouse redevelopment may not on its own be a panacea for attracting children to the urban core.

What we still don't know

Although our research sheds light on the twenty-first century phenomenon of single-family-to-townhouse redevelopment in Houston, there is much more to be learned. While we produced a reasonable estimate and portrait of SF2TH transformations, it would be valuable to more precisely compare these to other forms of townhouse redevelopment in Houston, such as those originating from commercial or industrial parcels. It would also be valuable to compare the various forms of townhouse redevelopment to other forms of small lot redevelopment, above all the teardown and one-for-one replacement of single-family houses, or the construction of single-family houses on vacant lots. Property tax data may offer opportunities to make inferences about the characteristics of the people who sold SF2TH parcels versus the incoming townhouse buyers. Finally, the recent proliferation of impactful scholarship from political scientists delving into land use regulation⁷⁴ suggests the potential for new insights from analyzing block vote patterns against traditional precinct-level election data. Of course, more broadly, we cannot say how the lessons learned from this path away from R1 zoning extend to other reform strategies focused on “missing middle” housing or higher-density development.

74. Jessica Trounstein, *Segregation by Design: Local Politics and Inequality in American Cities* (Cambridge University Press, 2018); Einstein, Glick, and Palmer, *Neighborhood Defenders: Participatory Politics and America's Housing Crisis*.

Conclusion

What should other cities contemplating R1 repeal learn from Houston's experience of having allowed townhouses to appear on single-family-dominated blocks a quarter century ago? Houston shows that there can be a robust supply response provided that market conditions are ripe and the new land use regulations allow for the construction of a product that builders want to build and homebuyers want to buy (one or both of which seems to have been absent in Minneapolis' recent much-celebrated repeal of R1). At the same time, R1 repeal is unlikely to transform the face of an entire city over a short time period. Instead, its rough equivalent in Houston proceeded incrementally, lot by lot, in certain areas much more than others, but at a pace and scale that was relatively modest in the aggregate. Houston's experience suggests that R1 repeal is unlikely, on its own, to exacerbate gentrification; there is even reason to think that it might alleviate it by channeling a higher share of new development to middle-income neighborhoods.

Small-lot townhouse development may also open up new possibilities, such as allowing for below market, family-friendly homeownership opportunities by nonprofit builders. The relatively modest prices of many new SF2TH townhouses implies that the public subsidies needed to bring them within reach of below median households would not be outlandish. Even in its purely market-driven form, townhouse redevelopment on single-family parcels offers considerable benefits, such as intensified usage of urban land, an increased tax base, and the production of new-build, well-located, family-sized housing units that in the median case are much cheaper than large lot single-family equivalents.

Ultimately, one must weigh the drawbacks and benefits of SF2TH in Houston against the status quo that exists in other high-demand large cities. Precisely the types of locations where single-family-townhouse redevelopment in Houston has been likeliest to take place—on spacious, centrally-located parcels, occupied by small, old houses, in neighborhoods that lean affluent—are where we might expect to see the demolition of single-family houses and their replacement with large, new, and expensive single-family houses in many other U.S. cities. If the loss of older, deteriorated single-family housing stock in such locations is difficult, impossible, or perhaps even undesirable to halt, then it is worth asking what is a worthwhile replacement. The recent experience of Houston offers an intriguing and, within the context of the US, unusual answer.

Appendix A

Model specifications

The model for redevelopment is as follows:

$$\text{logit}(p_{SF2TH}) = \beta_0 + \beta_1 X_{ORIG} + \beta_2 x_{CBDdist} + \beta_3 x_{thv00} + \beta_4 x_{thv00}^2 + \beta_5 X_{tsd00} + \varepsilon$$

Model 1 predicts p_{SF2TH} , or the probability that a given single-family parcel in Houston undergoes redevelopment into townhouse lots at any point between 2007 and 2020. β_0 is the y-intercept, and X_{ORIG} is a vector of original lot and house characteristics (original lot size, year original structure was built, and original structure floor area). To account for location we include $x_{CBDdist}$, the “as the crow flies” distance in miles from the centroid of the parcel’s tract to Houston’s City Hall. x_{thv00} is the median house value, as of 2000, in the parcel’s tract; the model also includes a squared term since we hypothesize a quadratic relationship between tract house value and probability of redevelopment (as described further below). Finally, the model includes x_{tsd00} , a vector of tract sociodemographic characteristics in the year 2000 (population share under age 18; percent Black non-Hispanic; percent Hispanic; and share of adults ages 25 and up with a bachelor’s degree or higher), plus an error term.

The model for block votes is almost identical to Model 1 but with one difference, noted below.

$$\text{logit}(p_{BV}) = \beta_0 + \beta_1 X_{ORIG} + \beta_2 x_{CBDdist} + \beta_3 x_{thv00} + \beta_4 x_{thv00}^2 + \beta_5 X_{tsd00} + \beta_6 x_{SF2TH} + \beta_7 x_{SF2TH}^2 + \varepsilon$$

Instead of modeling the probability of a lot undergoing redevelopment into townhouses, as in Model 1, Model 2 models p_{BV} , the probability that a lot that was not in a block vote district as of the beginning of 2007 is incorporated into a block vote district sometime between 2007 and August 2022, inclusive. The independent variables are all the same as in Equation 1, except we also include x_{SF2TH} , the number of SF2TH townhouse units built within the same census tract as the parcel at any time between 2007 and 2020, inclusive. We include a squared term for x_{SF2TH} .

Appendix B

	Mean	Median	Min	Max	Standard Deviation
Dependent variables					
Initially single-family lot as of 2005 underwent subdivision from 2007 to 2020 (dummy)	0.00484	0	0	1	0.0694
Initially single-family lot as of 2005 was incorporated into a block vote between 2007 and August 2022 (dummy)	0.0467	0	0	1	0.211
Original lot and structure characteristics					
Original lot size (acres)	0.212	0.174	0.0230	9.975	0.223
Original structure year built	1960	1959	1840	2016	19
Original structure interior area (sf)	1,731	1,521	300	9,992	887
Distance from CBD (miles)	8.25	8.00	0.29	26.64	3.98
Tract-level characteristics from US Census, Year 2000					
Median house value (1999 USD)	\$90,442	\$64,295	\$17,500	\$1,000,001	\$85,481
Population share under age 18	0.278	0.292	0.0296	0.471	0.0623
Population share Black non-Hispanic	0.281	0.101	0.000595	0.983	0.327
Population share Hispanic	0.366	0.301	0.00283	0.972	0.275
Share of people ages 25+ with bachelors or higher	0.221	0.132	0.00445	0.817	0.214
SF2TH townhouses in tract, built from 2007-2020					
SF2TH townhouses in tract	11.88	0	0	719.00	56.64



Acknowledgements

The authors are grateful to New York University's Furman Center and the Pew Charitable Trusts for their sponsorship of the research featured in this article. The Hogg Endowment also provided valuable support. We thank Noah Kazis for shepherding the article from start to finish as well as Ingrid Gould Ellen, Vicki Been, and Matthew Murphy for their detailed and insightful comments. Emily Hamilton also generously provided feedback.