FISCAL IMPACTS OF RESIDENTIAL DEVELOPMENT PATTERNS IN THREE TEXAS CITIES

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COMMISSIONED BY TEXAS 2036

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Study premise

At present, in Texas and throughout the United States, vigorous debates are underway on the benefits and drawbacks of real estate developments that differ from the norm over the past century of low-density, automobile-dominated configurations. Compact developments especially, including ones that are residential-only or at least residential-heavy—are cited by proponents for their environmental sustainability, contribution to moderating or reducing rising housing costs, and other benefits, such as improved physical and mental health from walkable daily living environments. These compact developments might mean the construction of single-family houses on 5,000 square foot lots rather than half acre lots, or duplexes or townhouses rather than freestanding houses, or small apartment buildings rather than houses. Detractors of such denser development forms note increased traffic congestion, disruption to the character of existing neighborhoods, and other quality of life impacts as reasons to be skeptical of or opposed to them.

In recent years, the **Strong Towns** advocacy organization has drawn attention to an additional possible benefit of more compact development that previously had garnered relatively little attention: fiscal impacts. Strong Towns' contention is that some forms of denser development in already built-up areas of towns and cities build financial strength for local municipal governments, since they generate municipal revenues at a faster pace over the long term relative to the added cost burdens they place on cities for their responsibility to maintain and eventually replacing publicly-owned facilities such as streets and parks. Strong Towns' emphasis on fiscal conservatism at the local level has contributed to a broadening of the base of support for compact development to fiscal hawks. This argument has found resonance around the nation with advocates, elected officials, developers, and others who may have been unmoved by earlier arguments related to environmental sustainability, housing affordability, public health, and the like.

As an organization concerned with finding solutions with bipartisan appeal that address Texas' enduring challenges, at both local and statewide governmental levels, **Texas 2036** is interested in an empirical study analyzing the actual, real-world fiscal impacts of specific, recently-built residential developments, in the Lone Star State, to their host municipalities. This charge is the motivation for this study.

Principles underpinning the study

This study is intended to adhere to a number of principles that have informed how it was designed and conducted. These are:

Use of established analytical method
Rather than "reinventing the wheel," this study uses an established method (described further in the "analytical method" section below) developed by an expert with years of domain knowledge on the topic of the fiscal impacts of development and modifies it where appropriate.

An open mind
This study builds on foundational insights developed over many years by highly respected and successful professional consulting firms such as Verdunity (discussed in the Analytical method section below) and Urban3, and the advocacy organization Strong Towns, as discussed earlier. All of these entities are led by internationally influential thought leaders. Led by a tenured academic based at a Texas public university, the authors of this report were strongly influenced and informed by the insights of these organizations and their leaders, but also free to report whatever results emerged from this study. This was true irrespective of whether these results confirmed the basic Strong Towns contention that more compact development patterns in built-up areas yield fiscal benefits to municipalities. Although no one can be said to be truly free of bias, the authors of this report were in a good position to "call balls and strikes" as they saw them.

Transparency
As with the products of any analysis of a complex phenomenon, the results presented in this study reflect many decisions made by its authors. Any number of these could be reasonably disputed or questioned. For that reason, the financial models upon which the conclusions are based—a series of conceptually simple and easy-to-understand Excel spreadsheets—can be downloaded from the Texas 2036 website. This report seeks to steer an adequate balance between brevity and a useful description of how the results were obtained.

Peer review
In order to increase confidence in the findings of this study, two expert Peer Reviewers have been engaged to review its findings and provide their comments. The first of these Peer Reviewers is **Kevin Shepherd, PE**, principal and founder of Verdunity, and originator of the analytical method that formed the basis for this study. (However, Mr. Shepherd was not involved in the application of his method to the specific cases discussed in this report, nor in any of the modifications to his firm's method.)

The other Peer Reviewer is **Michael Oden, PhD.** He is a recently retired planning faculty member at the University of Texas at Austin School of Architecture, with training as an economist, and a career's worth of professional practice and research in the areas of international and economic development. By way of disclosure, Dr. Oden was both a faculty colleague to Jake Wegmann, the report's lead author, and a faculty mentor to Dr. Haijing Liu, one of its coauthors.

Comments from both of the Peer Reviewers, along with the authors' responses to their comments, are included as Appendix B.

Prior research on effects of development patterns on local fiscal health

There are two sides to the debate on the impact of increased density on public service costs. On one side, proponents argue that higher density can reduce per capita expenditures due to economies of scale. As residents are clustered closer together, the average cost of providing services, such as utilities or public safety, decreases since fewer resources are needed to serve a more concentrated population.* This is the core of the "economies of scale" argument, where more compact development is seen as cost-effective.

* Carruthers, John I., and Gudmundur F. Úlfarsson. 2008. "Does `Smart Growth' Matter to Public Finance?" Urban Studies 45(9): 1791–1823. doi:10.1177/0042098008093379.

On the other side, critics highlight the "harshness" of the urban environment, where higher density can lead to increased per capita costs. Urban areas, by their nature, require additional infrastructure—such as more traffic lights and pedestrian equipment—to ensure safety and functionality. Furthermore, higher land prices in dense areas can drive up the cost of public services that rely on land, such as fire stations or schools. Thus, while increased density can offer some savings, these are often offset by the additional expenses required to maintain services in a dense urban setting.[*]

The empirical findings to date largely support the "economies of scale" argument, showing that low-density, "sprawling" development is more expensive to maintain than compact development.[**] However, density alone is not the sole factor at play. Goodman[*] notes that while increasing density may slightly raise per capita expenditures due to higher service delivery costs in denser areas, the effect is minimal. In contrast, reducing the spatial extent of development has a much more significant impact on lowering costs. Compact development reduces expenditures in categories with large fixed assets, such as schools, fire protection, and sewerage. According to this view—consistent with the position Strong Towns has popularized—infill development policies can help lower municipal spending, especially when they limit inefficient "sprawl."

The results for specific spending categories vary considerably. Key areas of local government spending that are significantly reduced with higher land density include total direct spending, education, parks and recreation, police protection, and roadways.[***] However, focused analyses on residential development suggest that less clustered residential forms lead to higher policing costs.[****] Rolheiser and Dai also highlight that low- to medium-density residential areas increase expenditures, particularly for fire protection.[*****] Additionally, more complex and winding residential road network patterns—often, though not always, associated with lower-density and more automobile-dominated development— raise costs further. Conversely, housing and community development spending rises with density due to higher land acquisition and construction costs in densely built areas.[***]

There are several research gaps in the current analysis of urban development and municipal expenditures. First, most existing studies focus on specific regions or states, such as Massachusetts or Wyoming, or rely on national datasets, which often fail to capture the unique land use dynamics present in Texas. Consequently, the relevance and applicability

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* Goodman, Christopher B. 2019. "The Fiscal Impacts of Urban Sprawl: Evidence From U.S. County Areas." Public Budgeting & Finance 39(4): 3–27. doi:10.1111/pbaf.12239.

** Carruthers and Úlfarsson (2008); Goodman (2019); and Burchell, Robert W., and Sahan Mukherji. 2003. "Conventional Development Versus Managed Growth: The Costs of Sprawl." American Journal of Public Health 93(9): 1534–40. doi:10.2105/AJPH.93.9.1534.

*** Carruthers and Úlfarsson (2008); Rolheiser, Lyndsey A., and Chengzhen Dai. 2019. "Beyond Density: Municipal Expenditures and the Shape and Location of Development." Urban Geography 40(8): 1097–1123. doi:10.1080/02723638.2018.1546499.

**** Lieske, Scott N, Donald M McLeod, Roger H Coupal, and Sanjeev K Srivastava. 2012. "Determining the Relationship between Urban Form and the Costs of Public Services." Environment and Planning B: Planning and Design 39: 155–73. doi:10.1068/b37099.

***** Rolheiser, Lyndsey A., and Chengzhen Dai. 2019. "Beyond Density: Municipal Expenditures and the Shape and Location of Development." Urban Geography 40(8): 1097–1123. doi:10.1080/02723638.2018.1546499.

of these findings to Texas remain unclear. Second, previous research on residential development has produced mixed results, especially regarding the fiscal impacts of different residential patterns, highlighting a need for further exploration to better understand how various forms influence costs. Third, the concepts of density and "sprawl" can be abstract and difficult for policymakers to interpret, making it challenging to apply these measures to specific residential development patterns. These gaps underscore the need for more focused research on Texas that provides clearer, more actionable insights into the fiscal impacts of different residential patterns.

Fiscal Impact Analysis and average versus marginal cost analysis

The structure of a Fiscal Impact Analysis (FIA), such as what is presented in this study, consists of model types and cost considerations. FIAs use both off-the-shelf and custom-built models. Off-the-shelf models, developed in the late 1970s, made FIAs accessible by providing methods and data for jurisdictions of all sizes.* While cost-effective, they often don't reflect local dynamics. Custom-built FIAs better capture specific conditions but are expensive and time-consuming due to the need for detailed data, which can be difficult to access.**

In the literature on Fiscal Impact Analyses (FIAs), there is a debate between analyzing average versus marginal costs. Average costs, based on standardized data, make analysis easier but assume a linear relationship between investment and outcomes, potentially oversimplifying impacts. Marginal costs, based on local data, provide a more accurate picture by accounting for indirect and downstream effects.* For example, a single new residential development may tip a city over the threshold into needing to build a new firehouse. While marginal costs offer a more precise assessment, they require detailed data and are better suited for complex developments.*** Our approach follows the average, rather than the marginal, cost approach, because it is conceptually simpler to understand, and because it reasonably models what might be expected to unfold over a long period if a common development pattern is repeated.

Fire protection

In Texas, fire services are structured and funded at the local level, primarily through property taxes, and supplemented by other local revenue sources. Texas municipalities can impose impact fees for infrastructure improvements, such as new fire stations, but these fees cannot be used for ongoing operational costs like staffing and equipment maintenance.****

Fire service planning in Texas is handled locally, with municipalities adjusting strategies based on population density, response times, and hazard types. High-hazard occupancies, like schools and hospitals, require more resources, while medium-hazard areas, such as apartments and offices, present moderate risks. Low-hazard areas, including small residential units, need fewer resources.

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* Paulsen, Kurt. 2014. "The Effects of Land Development on Municipal Finance." Journal of Planning Literature 29(1): 20–40. doi:10.1177/0885412213497982.

** Edwards, Mary M., and Jack R. Huddleston. 2010. "Prospects and Perils of Fiscal Impact Analysis." American Planning Association. Journal of the American Planning Association 76(1): 25–41. doi:10.1080/01944360903310477.

*** Robey, Jim, and Kathleen Bolter. 2020. Fiscal Impacts: A Literature Review. https://research.upjohn.org/reports/251.

**** Texas Commission on Fire Protection.

Fire departments plan accordingly, ensuring proper staffing and equipment to match the structure density and risk level.*

Police protection

In Texas, police services are primarily funded through local property taxes and the general funds of municipalities. These funds cover operational costs such as salaries, equipment, and maintenance for law enforcement. In larger cities, there may also be supplemental funding from sales taxes or public safety fees, but property taxes remain the core funding source.

Police expenditures are mainly driven by labor costs, which increase with larger populations since economies of scale do not apply well to policing. Crime levels also directly influence police spending, with higher crime rates demanding more resources. Jane Jacobs, in her landmark 1961 book *The Death and Life of Great American Cities*, suggested that denser, mixed-use neighborhoods with more pedestrian traffic could reduce certain crimes through increased "eyes on the street." However, studies show this may only reduce violent crimes, while non-violent crimes like robbery could rise in such areas. It's unclear if these shifts lead to higher police costs per capita.**

Roadways

Texas municipalities have the authority to charge property developers impact fees to cover the costs of new infrastructure, including roads.*** This can help offset the financial burden of road construction and maintenance on local governments. However, impact fees can only cover costs directly related to construction, expansion, and surveying, not ongoing maintenance. As a result, Texas municipalities may experience a stronger fiscal impact from road-related costs, especially in low-density, fragmented developments where more infrastructure is required per resident. In such developments, minimal infrastructure (e.g., no sidewalks or curbs, and sometimes gravel roads) may reduce upfront costs, but maintenance expenses can still accumulate over time.

Analytical method

This study adopts and minimally modifies an FIA method developed by **Kevin Shepherd, PE**, founder and principal of Verdunity, an engineering and fiscal analysis consulting firm based in Duncanville. (Mr. Shepherd is also one of this report's two Expert Peer Reviewers.) The method is used to analyze the revenues and costs that accrue to a municipality as a result of the construction of a housing development.

The revenue side of the analysis is quite simple and straightforward. Residential developments are assumed to generate revenues for their host cities purely via the city-collected portion of the property taxes assessed on the land parcels that lie within the developments. Typically, in Texas, this city share is less than a quarter of the property taxes collected from a given parcel. It is possible that residents of new housing developments may generate revenues for their cities in other ways, such as via sales taxes. However, sales taxes are collected from both residents and nonresidents and thus cannot be directly attributed to a particular development, as is the case for the city's share of property taxes. The same is true of other city revenue sources apart from property taxes.

The cost side of the ledger is more involved. The method deployed here distinguishes between two broad categories of increased costs to a city that can be directly attributed to a residential development. These are municipal services costs and roadway costs. The former refers to the added need for labor-intensive

* National Fire Protection Association (2015).

** Rolheiser and Dai (2019).

*** Texas Local Government Code, Chapter 395.

services provided by a city that is generated by the new residential development. These costs are typically dominated by police and fire departments, but also include libraries and parks and recreation, among others. The second captures the costs of both maintaining and eventually replacing roadways—both those that directly serve the new development as well as the city's overall circulatory network of arterial roads. It also includes the cost of capital replacement for any new water and sanitary sewer lines installed to serve the new development.

To make the fiscal analysis in this report both feasible and logically coherent, it is informed by several clearly stated basic principles. These principles are open to debate and revision, but for purposes of transparency they are listed and briefly detailed below in turn.

Only city revenues and costs are considered, with two partial exceptions

This analysis only considers fiscal impacts of residential development from the standpoint of incorporated cities, i.e., self-governing municipalities with their own elected leadership and independent authority to encourage or stymie various forms of market-rate housing development, chiefly (but not only) via land use regulation. Housing development, of course, impacts other local governmental entities—counties and Independent School Districts (ISDs), in every case, and other entities, such as community college districts or mosquito abatement districts, in a subset of cases. It also impacts, more indirectly, the finances of the State of Texas and even the federal government. However, this study focuses squarely on the fiscal consequences of housing developments for the governmental entities—cities—with the most direct authority to encourage or thwart them.

This study makes two partial exceptions to the focus on costs at the city level. It adds to the expense side of the ledger, as mentioned above, the *capital replacement costs of new water and sanitary sewer lines*. In one sense, these two types of costs are not exceptions to the study's focus on city costs and revenues—after all, all three of the studied cities are served by municipal water departments or other city divisions that maintain and periodically replace water and sanitary sewer lines. On the other hand, these costs are typically not funded out of municipal general revenues (typically dominated by property taxes)—instead, ratepayers fund these costs via charges on their utility bills. This differs from the maintenance and capital replacement of other roadway elements—sidewalks, asphalt repaving, street lamps, etc.—that are generally funded from cities' general funds.

Even if water and sanitary sewer maintenance and capital replacement costs are "off budget" from the standpoint of a typical city, we include them because i) these are costs directly imposed on city ratepayers by new development and ii) one way or another, they will need to be paid by city residents—via their utility bills instead of via the sources (such as property taxes) that contribute to municipal general fund revenues. For these reasons, we consider these costs to be part of the overall fiscal impact of new residential development. We assume that any needed upgrades to the water or sewer networks beyond the bounds of the new development will have been covered by impact fees or other mechanisms imposed as conditions by the host cities for approving the developments.

Local and arterial roadways are analyzed separately

This study embraces the insight, associated with Strong Towns, Verdunity, and others—that there is a meaningful distinction between *local* and *arterial* roadways from a fiscal standpoint. In traffic engineering, this distinction is typical, and it is also commonplace to have a third, intermediate category, *collector roads*. From an FIA standpoint, the distinction is slightly different: local roads are newly built

to serve a new housing development, and *they largely only serve the new development's residents, visitors, and providers of services*. By contrast, this study assumes that each city has a network of *citywide arterial roads that are collectively used by all city residents and visitors*. In other words, this study considers publicly-maintained local roads internal to a new housing-only development to be a brand-new maintenance and eventual capital replacement obligation that a city takes on. By contrast, the arterial roadway network is a citywide resource on which the new development imposes costs.

This logic dictates how the study calculates increment costs for local versus arterial roads. For local roads, the new cost of maintenance and capital replacement is assumed to scale up with the number of lane-miles of new local roads built as part of the development. For arterial roads, the cost of maintaining the citywide network at a constant level of quality is assumed to grow proportionately with the number of households added by a residential development (see below for discussion of households as a unit of analysis). In other words, if a residential development adds new housing units equivalent to 1% to a city's existing number of households, then the analysis assumes that the city will have to permanently spend an extra 1% of the existing budget devoted to maintenance and capital replacement of the arterial roadway network to keep it functioning as it has been. It should be noted that low-density developments always include new local roads; by contrast, medium- and high-density residential developments, by virtue of their spatial efficiency, can be built with relatively few new local roads or in some cases none whatsoever (i.e., on parcels bordered by arterial roads, and without any need for new internal streets).

Households are the unit of analysis for municipal services

This study makes a simple assumption for calculating the cost of scaling up municipal services (police, fire, parks, etc.) to meet the needs of new residents brought by a new residential development. This is that these costs increase from current spending levels in proportion to the number of households (i.e., housing units) added by the development. Thus, the study makes no allowances for differing household sizes or configurations, their varying propensities to occupy different types of housing units (e.g., families with children more likely to occupy single-family houses versus multifamily apartments), or the varying levels of consumption of municipal services by different types of households. This assumption is analytically simple but is also consistent with an ideal: a successful, healthy municipality is occupied by the full spectrum of household types, using municipal services in varying proportions, and ideally with a wide variety of housing types to choose from. Cities are assumed to not be putting their "thumbs on the scale" by denying or approving housing developments on the basis of household composition.

Only maintenance and capital replacement costs are considered for costs related to publicly-owned local streets

This analysis assumes that, from the standpoint of the initial capital costs of newly-built local roadways (i.e., those serving only the new development), "new development pays for itself." In other words, no capital costs for the internal streets serving a new residential development—as well as the new water and sanitary sewer lines underneath them—are assumed to be borne by the city's taxpayers. Instead, it is assumed that these costs are paid by the developer and then passed on to the development's homebuyers or renters.

The essence of the Strong Towns critique of contemporary development patterns is that even if "development pays for itself" with respect to the initial capital costs of new publicly owned facilities, above all streets, municipalities do not sufficiently account for the *operations and eventual capital replacement costs* of the new local roadways. The core insight is that the

initial capital costs, but not the future costs, are typically rolled into the cost of new development. For that reason, the analysis in this study accounts for both the maintenance of local streets, as well as for an annual capital replacement cost of 4% equivalent to the total (i.e., equivalent to an assumption of a design life of 25 years for a new roadway and its associated water and sewer pipes). not sufficiently account for the operations and eventual capital replacement costs of the new local roadways.

The fiscal productivity bottom line is reported in two ways

The fiscal analysis of each of the nine developments examined in this study results in a bottom line expressed in dollars— each development is found to be either an incremental fiscal cost or burden to its host city. Because the developments vary in scale, to put them on the same analytical footing it is necessary to normalize them in some manner. Because there are at least two reasonable ways to do so, results are reported in both ways.

The first normalization measure is *net fiscal benefit (or burden, if negative) per unit of new housing* added to the local market by the development. The second is *net fiscal benefit (or burden) per acre* occupied by the development. One can make arguments for either measure; if it is taken as a given that a given city "needs" an additional unit of housing in order to satisfy demand, then the per-unit measure measures the fiscal benefit (or burden) of delivering that unit via a particular residential development, or one just like it.

An obvious critique of the per-unit measure of fiscal benefit is that a city government does not directly control the free-market provision of housing—rather, housing is built by profit-motivated entities—developers—
operating within a market economy and responding to price signals that indicate demand for the product they aim to build. The per-acre perspective reflects the view of a city official deciding how to regulate a given tract of land under the city's purview. If a given area of a fast-growing city adjacent to its downtown is zoned for midrise multifamily housing, versus for low density single-family housing, what will be the fiscal impact to the city of that decision assuming that new developments conforming to that zoning are eventually built? The per-acre perspective is useful for answering that question.

"3x3"—three developments in each of three cities—framework for case selection

The analytical method used in this study requires a deep dive into each city's municipal budget. This study attempts to balance its limited scope with a drive for representativeness by examining three cities of different scales, all located within the state's highly urbanized *Texas Triangle* megaregion. Within each of these three cities, the study analyzes three recent residential developments, selected to be of *low, medium, and high-density* within each of the three cities' local context. This *3x3 analytical framework*—three developments within each of three cities—allows for comparison of the fiscal impacts of residential development both within cities and across cities.

Selected cities

This study analyzes one representative of three different types of municipalities located within the Texas Triangle, the state's highly urbanized heart and its economic engine, home to 23 million people in 2020.* These three types are a big city, a small city, and a small, fast-growing suburb. The municipalities selected are all

* Zhang, Ming. 2021 (July). "Modeling Urban Growth of the Texas Triangle Megaregion: Executive Summary." University of Texas/Cooperative Mobility for Competitive Megaregions. URL: https://sites.utexas.edu/cm2/files/2021/08/CM2-Executive-Summary-Zhang-Modeling-Urban-Growth-of-the-Texas-Triangle-Megaregion.pdf

places with substantial growth pressures, i.e., they face robust demand for new housing and therefore for new residential development. As a consequence, their elected leaders and staff leadership must grapple with regulatory and other decisions concerning how and where to allow new residential developments to be built.

Fort Worth (population 977k)* is the big city selected for this study. It is one of the two urban anchors for North Texas' Dallas- Fort Worth (DFW) metropolitan region (population 8.1 million), also sometimes referred to as the Metroplex. As is typical for big cities in Texas, Fort Worth contains within its borders the full range of both established and new developments, ranging from a big city downtown to low-density subdivisions on the city's periphery (but still under its jurisdiction). Fort Worth anchors and serves as the county seat for Tarrant County but also extends into four other adjacent counties.

College Station (population 125k) is the representative small city, located entirely in Brazos County in the eastern portion of Central Texas. Best known as the location of the main Texas A&M University (TAMU) campus (enrollment 79k**), the largest higher education campus in the state and one of the largest in the United States, it co-anchors the Bryan-College Station metropolitan area (population 281k). The rapid growth of TAMU in recent years has created substantial demand for housing of a variety of types, including relatively high-density student-oriented private development close to the TAMU campus that would otherwise be unusual in such a relatively small Texas metro.

Finally, **Fate** (population 21k)***, in Rockwall County, is the representative small, fast-growing suburban municipality. Like Fort Worth, Fate lies within the DFW Metroplex, but about 30 miles northeast of Downtown Dallas, and within roughly 10 miles of the Metroplex's rural-to-urban transition (as of early 2025) to the northeast along Interstate 30. Fate's current elected mayor, David Billings, and city manager, Michael Kovacs, have been unusually forthcoming in public settings about their concerns about the long-term fiscal viability of low-density housing development. They have engaged extensively and thoughtfully with Strong Towns, Verdunity, and other thought leaders on the relationship between development patterns and long-term municipal fiscal health.

Selection of residential developments within each city

Per the 3x3 framework discussed above, the study team sought to identify three existing, recently-completed, market-rate, and 100% housing developments inside the boundaries of each of the three cities. These developments were selected in order to facilitate comparisons between low-, medium-, and high-density development within each city. Selecting low-density developments—i.e., automobile-dominated subdivisions of detached single-family houses on their own fee simple parcels—is straightforward, as recently-built examples of this form of development exist within virtually every municipality in the state that has experienced substantial population growth.

The selection of medium- and high-density developments in the three cities required more discernment—this type of development is much less common, and is altogether absent within certain cities, including some fast-growing

* American Community Survey (ACS) one-year population estimate, 2023; all population figures from here forward are from this source unless otherwise noted.

** Reported for Fall 2024 as of March 2025, via https://www.tamu.edu/about/facts.html.

*** ACS five-year population estimate, 2019-2023. Fate's small size (for the time being) necessitates reporting its population figures with five- rather than one-year ACS estimates.

cities. Thus, the "medium" and "high" densities were determined within the context of each individual city, but as a baseline principle medium-density development entails, at minimum, a more spatially compact form of housing development than a subdivision of standard detached single-family houses. (Units per acre was used as metric to quantify relative densities within each city.) The research team also opted to avoid selecting very tall buildings of over 10 stories. This type of development is vanishingly rare in Texas apart from big city downtowns and close-in mixed-use districts; thus, we opted to exclude it from consideration, even in Fort Worth.

Table 1 below details the approximate density ranges used to select the 3x3 developments. In the case of Fate, the medium- and high-density developments are similar according to the units per acre criterion, since true high-density developments, according to these criteria, do not exist within Fate. In fact, the selected high-density development is slightly lower on the units per acre metric than the selected medium-density development. However, the high-density category selected includes a rare example of a three-story building built to the sidewalk with ground-floor retail space, perhaps indicative of future development trends in Fate, particularly within areas targeted for a livelier atmosphere with significant pedestrian activity. The retail space represents an intensified use of the land, even though this is not reflected in the units per acre density metric. By contrast, the medium-density development in Fate is a typical example of a garden apartment development of the sort that can be found throughout the state in urban, suburban, and rural communities alike.

Figures 1 and 2, also below, provide aerial and street views (all sourced via Google Maps) of the selected developments. Identified local streets internal to the developments, where present, are indicated via yellow lines.

The team initially selected a development, the Coho Apartments at 312 W. Terrell Avenue in Fort Worth, for the medium-density case that later proved, upon further analysis, to be firmly within the high-density category in terms of the units per acre metric. This realization led to its replacement with a different development, Linwood Townhomes, for the medium-density case. In the interest of transparency, and because the Coho Apartments case is instructive, its analysis is discussed in Appendix A for the interested reader.

Table 1. Density Range for Each Development Type

	Low Density	Medium Density	High Density
Density range for each development type	Less than 5 dwelling units per acre of development parcel	15-30 dwelling units per acre	Over 30 dwelling units per acre

Figure 1. Selected 3x3 developments (aerial view); source: Google Maps.

low density | medium density | high density

The Crossing at Lick Creek
Spanish Moss Dr. 77845
3.3 units/acre

Berkeley House at College Station
801 Wellborn Rd. 77840
28.7 units/acre

The Standard
315 Boyett St. 77840
140.5 units/acre

College Station

Spring Meadow
103 Daisy Dr. 75189
3.5 units/acre

Jameson Apartments
255 Williamsburg Pkwy. 75189
26.2 units/acre

E. Fate Main Pl. 75087
24.0 units/acre

Fate

Figure 2. Selected 3x3 developments (street view); source: Google Maps.

low density — medium density — high density

The Crossing at Lick Creek
Spanish Moss Dr. 77845
3.3 units/acre

Berkeley House at College Station
801 Wellborn Rd. 77840
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Jameson Apartments
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26.2 units/acre

E. Fate Main Pl. 75087
24.0 units/acre

Fate

Findings and discussion

The basic "bottom-line" findings for the 3x3 analysis are presented on the next page, according to the two metrics used in this report. Per-acre (Figure 3) and per-unit (Figure 4) fiscal productivities are shown for the low, medium, and high-density developments in each of the three cities.

For College Station and Fort Worth, the general contention, associated with Strong Towns and with some prior academic studies, that more compact developments are more fiscally productive mostly holds true. Measured both ways, the medium- and high-density developments are net positives both in absolute terms and relative to the low-density developments in each city. Fort Worth departs from the pattern slightly, in that the high-density development is less fiscally positive—again, measured in both ways—than the medium-density development. The reason for this discrepancy likely has to do with the revenue side of the ledger: Fort Worth's medium-density development is appraised at $545k per unit versus only $179k per unit for the high-density development. And yet the latter is still a fiscal net positive despite appraising for substantially less than the low-density development ($294k per unit).

The pattern in Fate is different—the medium-development is less fiscally productive per acre than the low-density development. The likely culprit here is that Fate's city property tax rate is simply much lower than in the other two cities: 0.002642 per dollar of appraised value as compared to 0.0051309 in College Station and 0.006725 in Fort Worth. Alternatively stated, Fate's property tax rate is set at only 51% and 39% of the rates in the other two cities, respectively.

Suppose that we were to rerun the models, but now assuming that Fate had adopted the same city property tax rate as Fort Worth. In that case, the results would revert to the same pattern as in College Station: the medium-density development outperforms the low-density one by $2,387 per acre, and the high-density development by much more ($14,870 per acre). The same general pattern, in this hypothetical scenario, though more muted, holds with the per-unit metric (by $392 per unit for medium-density, and by $916 per unit for high-density).

A consistent finding is that low-density developments incur far more costs than the other two development types for maintenance and capital replacement of new, city-maintained internal streets built to serve the developments, plus the ongoing costs of maintaining and replacing the water and sanitary sewer lines that run under them. Averaged across the three cities, the new local streets plus their associated pipes account for a whopping 63% of the total added costs to the city for low-density developments, only 4% for the medium-density developments, and nothing at all (0%) for the high-density developments. What likely prevents the "bottom line" findings from being more stark than they in fact are is that the cost of new streets, while important, is not everything—the incremental costs of providing more municipal services (police, fire, parks, etc.) are substantial and impact the modeled fiscal productivity for medium- and high-density development as well. This is particularly true given that the FIA approach used for this analysis makes no assumptions about the types (or sizes) of households that will occupy the new units in all scenarios.

Figure 3. Fiscal productivity per acre.

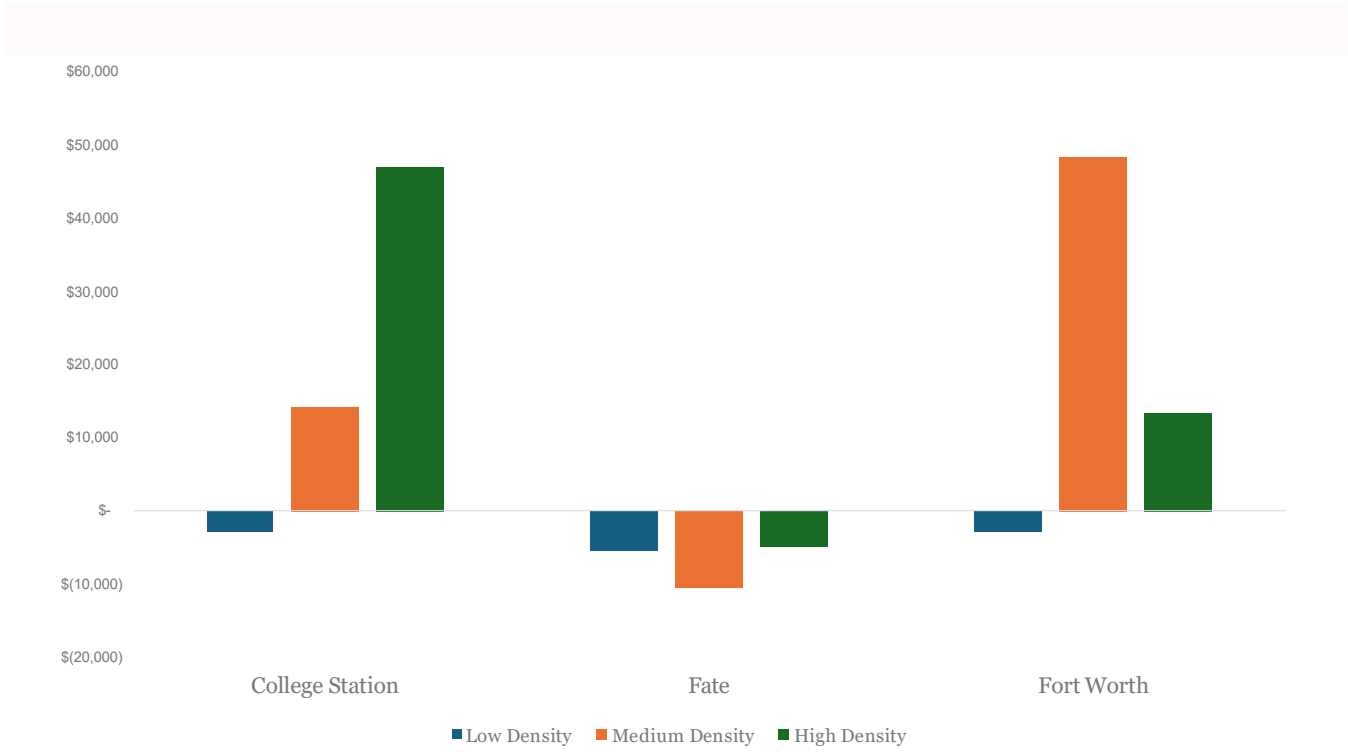
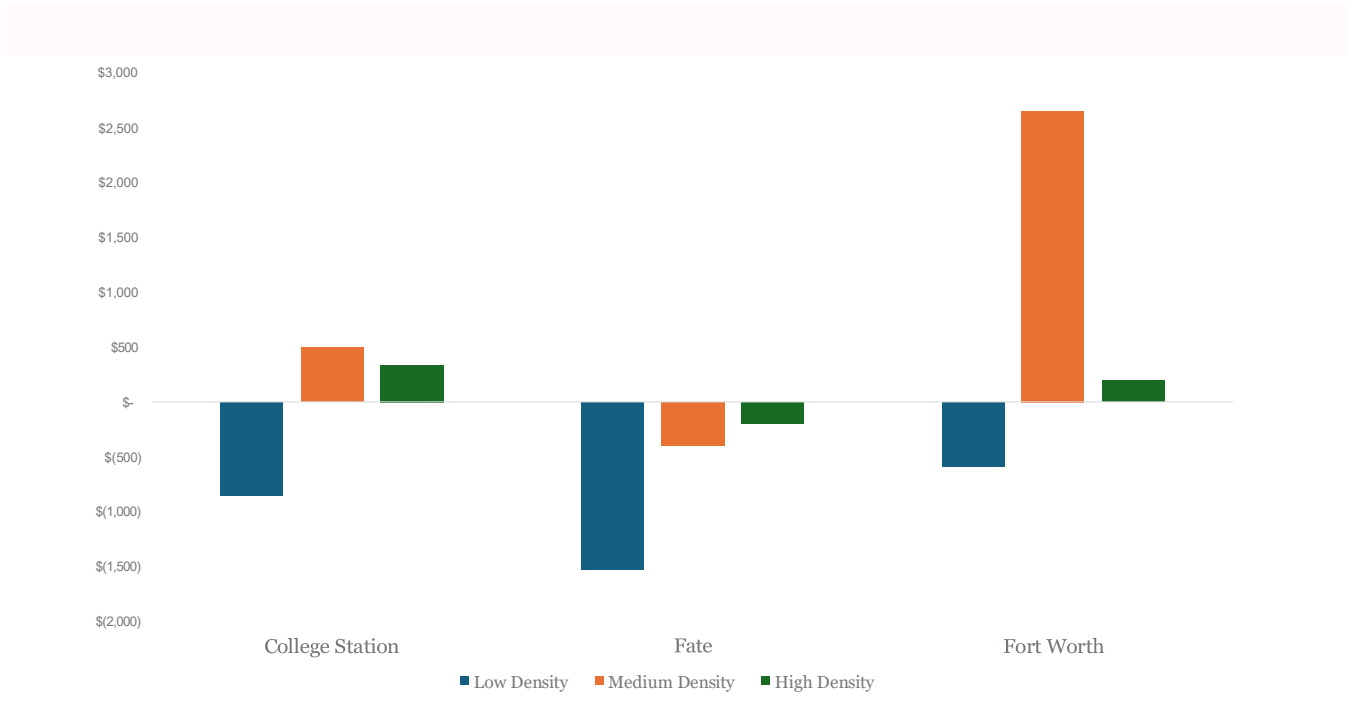


Figure 4. Fiscal productivity per unit.



Limitations and three takeaways to conclude

Before the study's takeaways are listed, it is important to note the limitations of this study. This study examined only three developments in only three cities. These represent but a tiny fraction of the vast number of recently-built residential developments in the State of Texas, arguably the engine room of the modern US economy. The techniques used to analyze these nine developments could reasonably be disputed along various dimensions. Nonetheless, the authors have done their level best to construct this limited study in such a manner than it can provide useful insights to local and state policymakers in Texas and other interested observers. With those caveats duly noted, three primary takeaways emerge from this study's findings.

First, the Strong Towns hypothesis that more compact development is more fiscally productive mostly holds true—with some caveats. The reason for this is primarily a geometric one—as density increases, although the costs of streets increase, they generally do so more slowly than the increase in revenues that cities garner from property taxes. The brand-new local streets necessary to make low-density, automobile-dominated subdivisions work are almost unambiguously fiscal drains for cities.

Second, new streets are expensive but so are new municipal services. The Strong Towns argument emphasizes the costs to cities of taking on the obligation to maintain and eventually replace new streets but places less emphasis on the added costs of adding police officers, firefighters, parks employees, new facilities (such as new police substations or firehouses or city parks), and the like. Now, it is entirely possible and perhaps intuitive that it might be possible to more efficiently serve compact development than low-density development—i.e., the same number of police officers and firefighters could plausibly protect a larger number of housing units if they were laid out in a more spatially compact form. However, this study is agnostic on that question, and prior research is inconclusive; for the time being, municipal service costs are substantial and prevent the costs of local streets from being the whole story in this report.

Third, and finally, the revenue side of the equation is important in addition to the cost side. If a city's property tax rate is low, as is the case in Fate, then it is possible that the city will not garner enough new revenue from a residential development to offset the added costs it imposes on the city, even if it is laid out in a compact spatial form. This is a difficult issue—many suburban areas near the fringes of metropolitan areas rapidly expanding outward were, almost by definition, very recently rural places, many of whose voters likely remember and appreciate low property taxes. There is no avoiding that urbanization and coping with rapid growth imposes difficult decisions on political leaders. It is still probably often the case, all else equal, that more compact development burdens cities with fewer fiscal obligations for decades into the future, particularly when the substantial costs of eventual capital replacement of streets are taken into account.

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Appendix A

The CoHo Apartments were initially selected as the medium density development for Fort Worth due to its modest height and number of units. The authors later realized that measured in units per acre—almost 135—the development is actually high density. They therefore removed the CoHo Apartments from the analysis and replaced them with Linwood Subdivision (a townhouse development). In the interest of transparency, however, some preliminary findings for CoHo Apartments are reported here.

CoHo Apartments yielded a strongly negative fiscal benefit per acre and a somewhat negative fiscal benefit per unit, despite having no internal streets. The reasons for this are interesting and instructive. CoHo Apartments is a rare example of a microunit multifamily rental development with unusually small units—under 350 square feet in every case. These small unit sizes explain both the very high density, as well as the very low appraised value per unit of under $102k per unit, despite being relatively recent construction in a near-downtown location (Fort Worth's Near Southside). Because this analysis assigns municipal services costs (i.e., police, fire, and the like) as proportionate to the number of units, the CoHo Apartments generated a very high estimate of the increment to this category of costs. Stated differently, the large number of very small units yielded a very high estimate of the costs of providing extra police officers, firefighters, and the like to serve the CoHo Apartments. Although, as discussed earlier, the study adopted a principle of treating all households equally with respect to municipal services, a microunit development like CoHo Apartments pushes this principle to its limits.

The results are not reported directly here, because the analytical technique used later underwent some further refinements and thus the CoHo Apartments analysis is not directly comparable to the final results reported in the main body of this report. The interested reader should contact the lead author (Wegmann) if interested in the details of this analysis.