Occasional Studies

The Impact of an Increasing Housing Supply on Housing Prices

The Case of the District of Columbia, 2000 -2018

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Introduction

Following a decades long period of population decline ending in the late 1990s, Washington, DC's net population increased by over 100,000 people between 2000 and 2018. To accommodate a growing population, the city added a net amount of over 40,000 rental units since 2000. But despite adding over 2,100 rental units annually, the city is still generally seen as having an undersupply of housing of all types, particularly for relatively low-income residents.

This paper seeks to answer two questions concerning housing in the District of Columbia. First, what has been the impact of the substantial increase in the supply of rental housing in recent years on average apartment rents in the city? And second, what is the estimated impact of a substantial increase in the planned number of rental housing units on apartment rents as of 2025? We answer these two questions by way of three economic model estimations. The first determines the effect of the actual increase in the number of apartment units in the city on rents for years 2000 to 2018. The second estimation simulates the average citywide apartment rents in 2018 if the city had not doubled the rate of new additions beginning in 2012. And, the third estimation simulates average rents in 2025 under the Mayor's recent plan to stimulate an exceptionally large number of new rental units beginning in 2020.

This study finds that if the delivery of the markedly large number of new apartment units in recent years had not occurred, average city apartment rents may have been 5.84 percent higher in 2018. That is, the average citywide monthly apartment rent could have been $3,207 in 2018 rather than the actual average of $3,030. This study also finds that if the planned increase in new additions (under the Mayor's 2019 Housing Initiative) does not occur, then average city apartment rents are estimated to be 5.53 percent higher in 2025. That is, the average citywide monthly apartment rent is likely to be $3,261 in 2025 instead of $3,090 under the Initiative. This situation suggests that even though the city's demand for rental units is growing (as a product of a growing population, a growing number of jobs and growing incomes), the actual increases in supply is helping to mitigate the annual appreciation rates of apartment rents. In essence, the city is likely to continue experiencing modest annual growth rates in rents in the near term and, as a result, lower average levels of rent in the medium and longer terms.

Data

The economic models used in this study use quarterly data spanning the period 2000Q1 to 2018Q4. The CityRent variable is the citywide average per square foot asking monthly rent for apartment units, and the NewUnits variable represents the total number of new apartment units added each quarter of the study period. These data variables are quarterly time series for citywide mid- and high-rise class A and class B apartment buildings with 20 or more units, built as early as 1960. The source of the apartment data is CoStar, a real estate information firm. The model also uses quarterly data for the mean per capita income, population and unemployment variables from the Office of the Chief Financial Officer, Office of Revenue Analysis (ORA). The housing price index is from the U.S. Bureau of Labor Statistics and is for all urban consumers in the Washington metropolitan region.

Monthly per square foot rents rose from $1.68 psf (per square foot) in 2000 Q1 to $3.05 in 2018 Q4, an 81.5 percent increase over the period (Table 1). The study period started with a citywide total of 16,476 class A and B units in multifamily buildings and grew 236.3 percent to a total of 55,414 units. A total of 38,938 new units of this type were added, with an average of 2,049 new units added per year. Over the same time, the city's resident population grew 24.8 percent from 567,136 to 707,647. In total, 140,511 people were added during this time period.

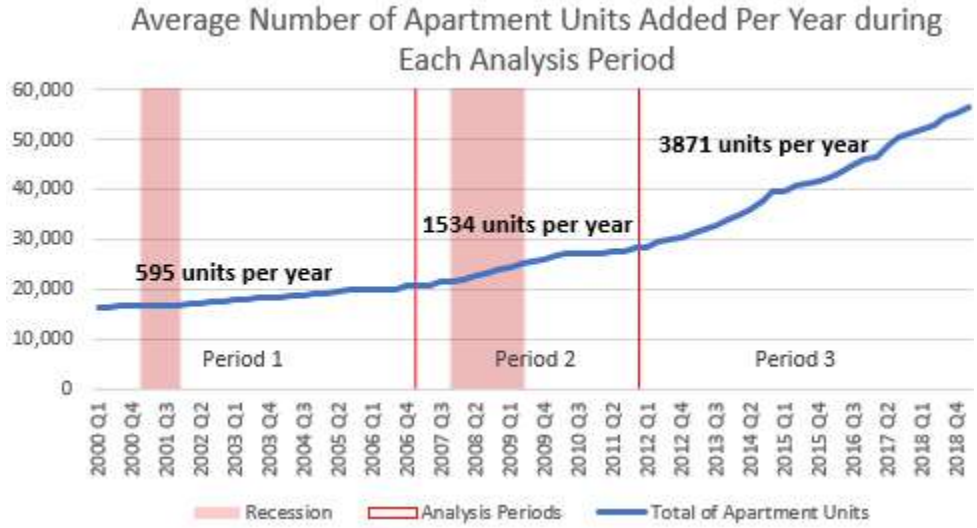
Table 1

Summary Statistics for Dataset				
	Mean	Standard Deviation	Minimum	Maximum
Per SF Rent	$2.32	$0.44	$1.68	$3.05
New Units	11,896	11,317	0	38,938
All Units	28,372	11,317	16,476	55,414
Population	615,048	48,154	567,136	707,647

Source: CoStar and Office of Revenue Analysis

At the outset, the whole study period from 2000 to 2018 is separated into three subperiods (Figure 1). In period 1 (2000-2006), an average of 595 new units were added per year. In period 2 (2007-2011), an average of 1,534 new units were added per year; and in period 3 (2012-2018), an average of 3,871 new units were added per year. For the same three periods, the annual average growth in rents were 0.62 percent, 1.03 percent and 0.70 percent, and population grew at average annual rates of 0.003 percent, 0.46 percent, and 0.41 percent respectively. With a homeownership rate of 38.4 percent and a rentership rate of 61.6 percent as of 2018, we estimated that 38,028 net new renter households were added to the city in years 2000 to 2018.[1]

Figure 1



Source: CoStar

[1] There is not a one-to-one ratio between population and demand for housing and pinning down the exact household number is difficult. However, using the latest population to housing ratio number of 2.276, we estimate that approximately 61,735 households were added.

Methodology: A Housing Model

When analyzing a housing market, it is important to note how housing is different from the general idea of a typical good. Housing is classified as a composite good, meaning that it is a basket of different attributes or features purchased all together. Size, quality, location, neighborhood amenities and distance from the city center are all key attributes of housing that impact its market price. Following are key variables used in our model.

The demand for housing is a function of several factors. Like all other goods, income plays a major part in determining demand. Income level determines the budget each household has, and this budget is allocated between spending on housing, and spending on all other goods. Market rents continually adjust to attain equilibrium where demand and supply of rental housing are equal to each other.[2] In line with the classic city model, housing units tend to be occupied by households willing and able to afford the highest rent for such units.[3] Because permanent changes in household incomes can affect the total amount each household is able to spend, controlling for changes in income is important in uncovering the impact of supply on price.

The level of unemployment in a housing market also impacts demand for housing. Higher levels of unemployment tend to reduce the demand for housing, while lower levels of unemployment tend to increase the demand for housing. And just as when the average income levels of an area decrease, higher levels of area unemployment often spur some shifting of housing demand from more expensive forms of housing to less expensive forms of housing in some cases and outmigration in other cases. A single-family home, townhouse, condominium and apartment rental are housing alternatives. Single-family homeownership tends to be the most expensive form of housing and apartment rentals tend to be the least expensive. Changes in the price of one alternative form of housing often causes the price for the alternative forms to become either relatively cheaper, or relatively more expensive. Hence a change in the price of one form of housing tends to prompt a substitution with another type of housing. In the model, changes in the price of alternative goods is captured in the housing price index (HPI) for the Washington-Arlington-Alexandria area.

The size of the population competing for the available stock of housing is also seen to impact demand. More households mean more demand and thus greater competition for housing. When the total demand for housing increases, we expect the price for housing to rise. Higher housing prices crowds some potential purchasers out of the market and increases the number of units as more suppliers will find it profitable to produce more housing. As such, the citywide number of apartment units in each time period is the independent variable of interest in the model.

We used an Ordinary Least Squares (OLS) regression to predict the dependent variable, CityRent, based on the independent variables and to estimate the effect of each independent variable on the dependent variable for each quarter[4]. The model includes a lagged new units

[2] DiPasquale and Wheaton, 1996

[3] Alonso 1964, Mills 1972, Muth 1969

[4] Analysis of the data reveals an upward time trend in the key variables of rent, units, and population. The data shows a very strong and significant positive correlation between rent and population, with a Pearson Correlation Coefficient of 0.98. The correlation between rent and inventory units is also very strong, significant and positive,

variable, a dummy variable for time period 2 and another dummy variable for time period 3. For the two dummy variables, period 1 is the reference point. And while the variables CityRent and NewUnits are the most important variables in the model, CityRent is the key variable of interest.

The empirical model is specified as follows:

$$\text{CityRent} = \beta_0 + \beta_1 \text{ lag NewUnits} + \beta_2 \text{ Income} + \beta_3 \text{ HPI} + \beta_4 \text{ Population} + \beta_5 \text{ Unemployment} + \beta_6 \text{ Period2Dummy} + \beta_7 \text{ Period3Dummy} + \varepsilon_{it} \quad (1)$$

Where

- CityRent is the model's dependent variable (DV) and represents each quarter's change (differenced year over year) in average city rent amount per square foot for apartment units.
- β_0 is the model constant
- β_1 is the change in the DV per an increase in new apartment units delivered to market in the previous quarter
- β_2 is the change in the DV per an increase in the city's per capita income
- β_3 is the change in the DV per an increase in the area's home sale price index for single family owner-occupied homes
- β_4 is the change in the DV per an increase in the city's population
- β_5 is the change in the DV per an increase in the city's unemployment rate
- β_6 represents the change in the DV for time period 2
- β_7 represents the change in the DV for time period 3, and
- ε_{it} is the error term.

The intent of this study is to explain changes in the city's apartment rents with respect to major demand factors. Theoretically, we aim to distinguish whether the increase in the number of housing units the city has experienced in recent years is due primarily to the increase in demand (with correspondent increases in rent), or due primarily to an increase in supply, which would lower rents or work to slow down the annual rent appreciations that tend to occur each year.

Model Results

Years 2000-2018

By way of the model specified in equation (1), the regression results in Table 2 indicate in general that as the number of new apartment units in the city, home prices and unemployment increase, the average city rents tend to decrease. The table also shows that as per capita income and population increase, the average city rents tend to increase. Additionally, the model results indicate that the growth in average city rents was lower in time period 2 (2007– 2011).

with a Pearson Correlation Coefficient of 0.96. The data was therefore first differenced to eliminate the trends in the data and ensure summary statistics of the data are not dependent on time.

Table 2

Citywide Regression Model Results For Years 2000 to 2018		
Variables	Coefficient	Standard Error
Constant	0.078***	(0.011)
New Units (YD)	-0.000016***	(0.00001)
Income (YD)	0.00001***	(0.000003)
HPI (YD)	-0.002***	(0.0004
Population (YD)	0.008***	(0.002)
Unemployment	-0.015***	(0.006)
Period 2	-0.74**	(0.028)
Period 3	-0.047	(0.037)

Note: Standard errors are shown in parentheses and statistical significance indicated at the 1%(***), 5%(**), and 10%(*)level.

Translating the regression results, we find that after controlling for key factors the average city rent (assuming a 1,000 square foot apartment) increased $0.08 psf every year in time period 1 and time period 2. For time period 3, city rents increased only by an average of $0.07 psf per year (Table 3). Table 2 and Table 3 present the core set of relationships between the variables and serve as the basis for the following policy simulations.

Table 3

Estimated Annual Average Change in Rent Per Square Foot	
Time Period	**Change in Rent**
Period 1 (2000-2006)	$0.08
Period 2 (2007-2011)	$0.08
Period 3 (2012-2018)	$0.07

Policy Simulation #1 (City added 16,000 fewer units in years 2012-2018)

This policy simulation uses model equation (1) with all the same data for the predictor variables except for the NewUnits variable. This policy simulation uses simulated data for the NewUnits variable (i.e. a counterfactual). That is, instead of using actual new units data for years 2012-2018 (an average of 3,871 new units per year), we use simulated data that reflects that the new units trend for years 2007 to 2011 (an average of 1,534 new units per year) continues to 2018. After rerunning the model with the simulated data, we obtain the counterfactual results for years 2012 to 2018 and compare them to the actual results for the same years.

Projecting period 2 changes in new rental units into period 3, the average annual change in rent per square foot (psf) is $0.10. This suggests that as of 2018 the average annual net difference (savings) was $0.03 psf (Table 4). The actual rent growth during time period 3 was a

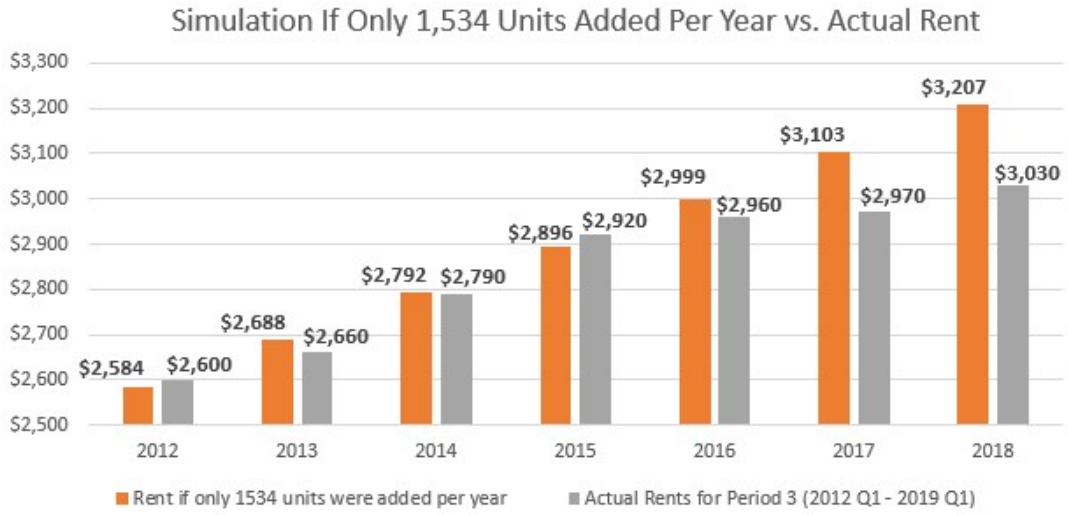
total of 22.2 percent. The model estimates that rents would have grown 29.3 percent absent the actual increase in rental units.

Table 4

Net Savings from Increasing New Units from 1,534 per Year to 3,871 per Year, 2012-2018			
	Average Units per Year	Avg. Ann. $ Amt Change in Rent psf	% Change in Rent over the period
Period Three (Simulation – Fewer units)	1,534	$0.10	29.3%
Period Three (Actual)	3,871	$0.07	22.2%
Net Savings	-	$0.03	-

If an average of 1,534 new units per year continued throughout period 3, we estimate monthly rents of approximately $3.21 psf in 2018. This is in comparison to the actual 2018 rent of $3.03 psf. Stated differently, the model estimates average monthly rent in the city for 2018 would have been $3,207 per month (5.8 percent higher) if the level of new units had not increased from the period two average of 1,534 units per year to the actual period three average of 3,871 units per year (Figure 2). Therefore, we conclude that the average additional 2,337 units (the difference between 3,871 and 1,534) each year for years 2012-2018 can be explained by an increase in supply. It appears that this finding contributed to the slowdown in average annual rent increases, which afforded renters $177 in monthly savings or $2,124 in savings for the entire year of 2018.

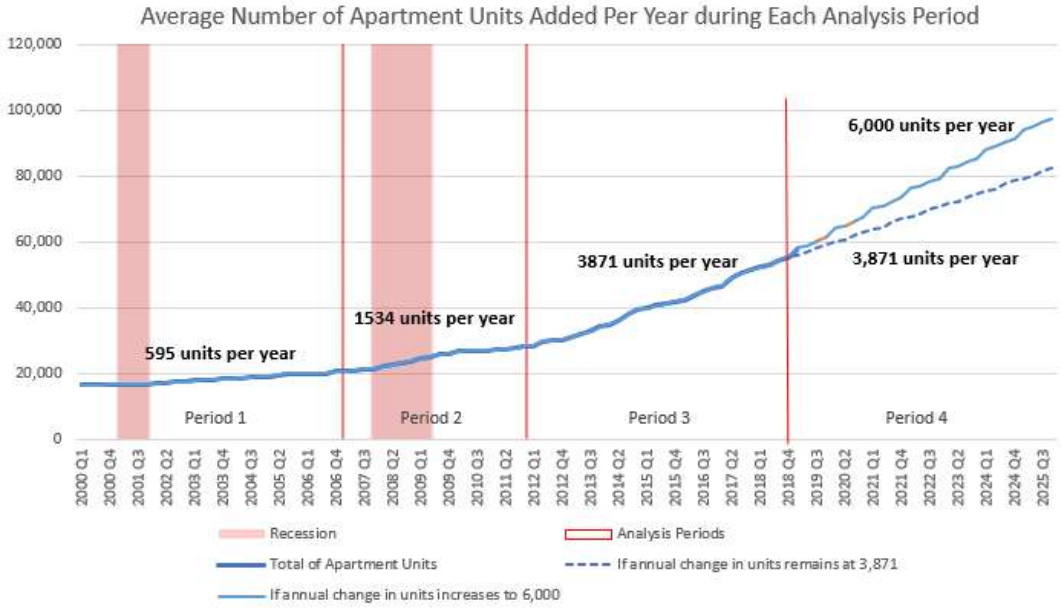
Figure 2



Policy Simulation #2 (City adds 13,000 more units than trend in years 2020-2025)

In May 2019, the city's Mayor signed an order "directing District agencies to identify new policies, tools, and initiatives to begin fulfilling her bold goal of creating 36,000 new housing units… by 2025."[5] The Mayor's Initiative is to add a total of 36,000 additional units by 2025 or an average of 6,000 units per year beginning in 2020 (Figure 3).

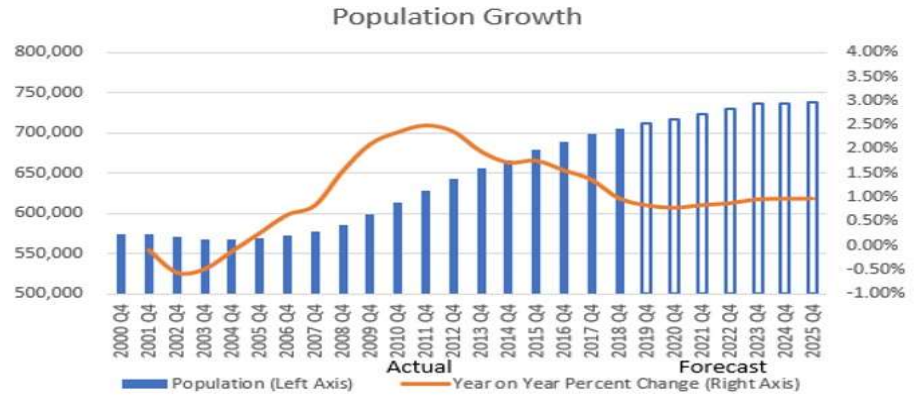
Figure 3



This model simulation uses the actual economic data for years 2000 to 2018 and forecasted (trend) values for the same variables for years 2019 to 2025. However, the population growth variable changes appreciably for years 2019 to 2025 from the prior years. Between 2011 and 2019, the city's annual population growth rate slowed from 2.6 percent in 2011 to a little less than one percent in 2019. Forecasts for the annual population growth for the 2020 to 2025 period is expected to remain stable around one percent per year (Figure 4). Whereas the city added population by an amount of 10,881 (net) per year during time period 3, the city is expected to add only of 6,860 (net) new residents per year during time period 4. Therefore, Policy Simulation #2 for years 2020 to 2025 will allow for two economic variables to change: NewUnits and population.

[5] https://mayor.dc.gov/release/mayor-bowser-signs-order-drive-bold-goal-36000-housing-units-2025

Figure 4



Source: Office of Revenue Analysis

To allow for changes in two variables while still isolating the effects of each on the dependent variable, Policy Simulation #2 comprises three model estimations. Model Estimation A describes the effect of the independent variables as indicated in time period 3 and continued along trend to year 2025. Model Estimation B assumes only that the population growth rate slows down to about one percent per year beginning in 2019 and all others variables remain the same as in Model Estimation A. Model Estimation C assumes the population growth rate slows down to about one percent per year beginning in 2019, that there is full implementation of the Mayor's Housing Initiative of 2019, and that all others variables remain the same as in Model Estimation A. This three-step approach allows us to isolate not only the effect of slowing population growth but also the effect of the Mayor's Initiative on average city rents.

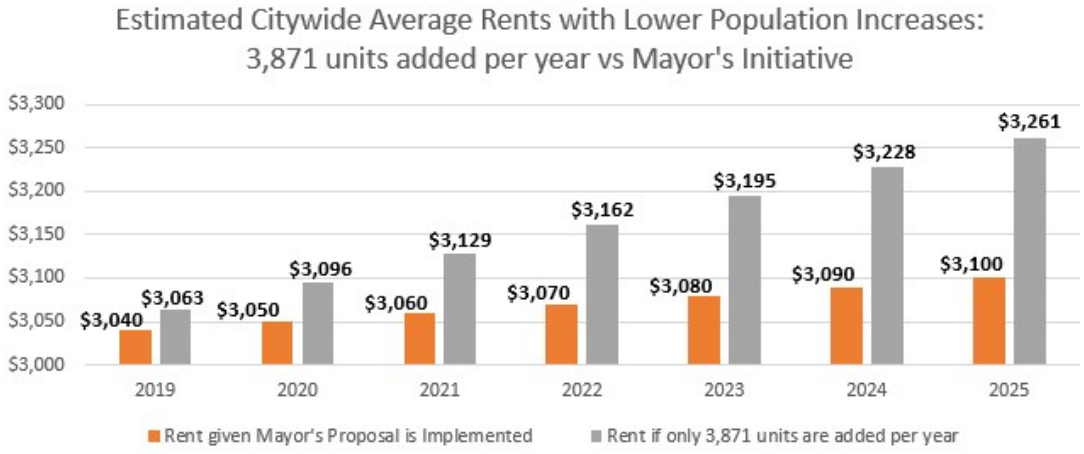
Assuming all economic trends from time period 3 continue into time period 4, Model A estimates an average annual net change in rent per square foot of $0.07 per square foot in years 2019 to 2025 (Table 5). This would amount to an average rent of $3,520 per month in 2025. But, since 2010 the city has been experiencing continuous declines in its population growth rate, Model Estimation B assumes the city will gain a net increase of only 6,860 new residents during time period 4 (37 percent less than in period 3). Under this scenario, the model estimates an average annual net change in rent per square foot of $0.03 per square foot in years 2019 to 2025, and this would amount to an average rent of $3,261 per month in 2025. Finally, allowing for a lower population increase and the Mayor's Housing Initiative, Model C estimates an average annual net change in rent per square foot of only $0.01 per square foot in years 2019 to 2025. This would amount to an average rent of $3,100 per month in 2025.

Table 5

Net Savings from Increasing New Units from 3,871 per Year to 6,000 per Year For Years 2019 to 2025 (Time Period 4)				
	Average Population Increase per Year	Average Units per Year	Average Annual Change in Rent psf	% Change in Rent over the period
Model Estimation A: Continue Period 3 trends	10,881	3,871	$0.07	16.2%
Model Estimation B: Period 3 trends except for lower population	6,860	3,871	$0.03	7.6%
Model Estimation C: Period 3 trends except for lower population & Mayor's Housing Initiative	6,860	6,000	$0.01	2.3%
Net Savings (Simulation B minus Simulation C)			$0.02	-

Policy Simulation #2 predicts that the current trend of lower annual population increases, by itself, will help slow down average annual rent increases in the coming years. However, the Mayor's Initiative of adding 13,000 more units than trend will fortuitously help slow down average annual rent increases even further. With full enactment of the Mayor's Initiative, city rents are estimated to amount to approximately $3,100 (4.9 percent less) per month in 2025 instead of $3,261. This would amount to monthly savings of $161 in 2025 alone and $1,932 for the year (Figure 5).

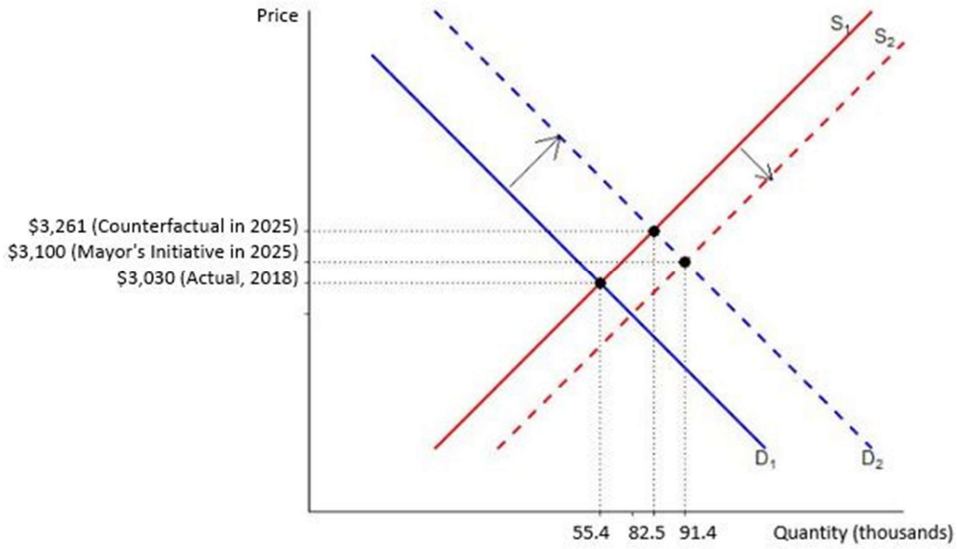
Figure 5



According to the model, the city's growing population, income and number of jobs are increasing the demand for housing in the city. But, the city is continuing to assertively facilitate more housing units (particularly rental housing units). According to economic theory, this predicament can be illustrated in terms of market demand and supply curves as shown in Figure 6. The vertical axis represents the average monthly rent for apartments in the city, and the horizontal axis represents the total number of class A and class B rental units in the city. The figure illustrates that while the city's demand factors are expected to continue to cause the demand curve in 2018 for rental housing units to increase (shift to the right) over time, the city's supply of rental housing units is also increasing (also a shift to the right) in part via a plethora of city policies involving land use, tax, zoning, land reclamation, regulation and housing. Thus, the regression model estimates that citywide average rent in 2025 would be

$3,261 (7.6 percent higher than in 2018) absent an aggressive increase in new units. But, adding 36,000 new units despite declining population growth rates is expected to cause rents to be only $3,100 (2.3 percent higher than in 2018).

Figure 6 The District of Columbia's Rental Housing Market in 2018 and 2025



The figure also shows how the city had 55,400 units in 2018 in mid- and high-rise class A and class B apartment buildings with 20 or more units. For this subset of housing units, the city's growing economy would naturally (i.e. according to trend) produce 27,100 new units as of 2025 (82,500 total units). But, the Mayor's Initiative essentially increases the city's rental units by an additional 8,900 (10.8 percent) as of 2025 (91,400 total units).

Discussion

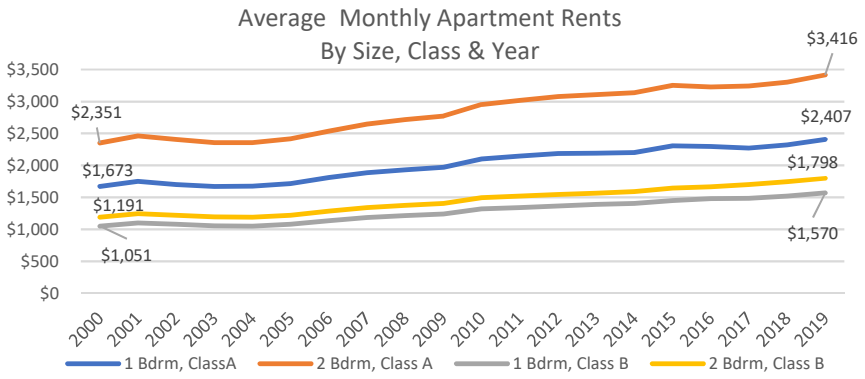
Rental Housing as An Alternative to Homeownership

Even though the levels of apartment rents in the city are relatively high[6], average apartment rents have grown relatively modestly since 2000 (Figure 7). Over the study period, class A one-bedroom and two-bedroom rents grew at an annual average rate of approximately 1.99 percent. This is in accord with the annual average growth rate in the area's consumer price index over the same time period, which was 2.2 percent.[7]

[6] In the District of Columbia, the average monthly rent for a one-bedroom in 2019 was $2,407 and $3,416 for a two-bedroom. The rents for two-bedroom Class A apartments tend to be 40 percent higher than one-bedroom Class A apartments. The rents for two-bedroom Class B and C apartments tend to be 15 percent higher than one-bedroom Class B and C apartments. The rents for one-bedroom Class A apartments tend to be about 53 percent higher than one-bedroom Class B & C apartments. And, two-bedroom Class A rents tend to be almost double two-bedroom Class B & C apartments rents.

[7] CPI

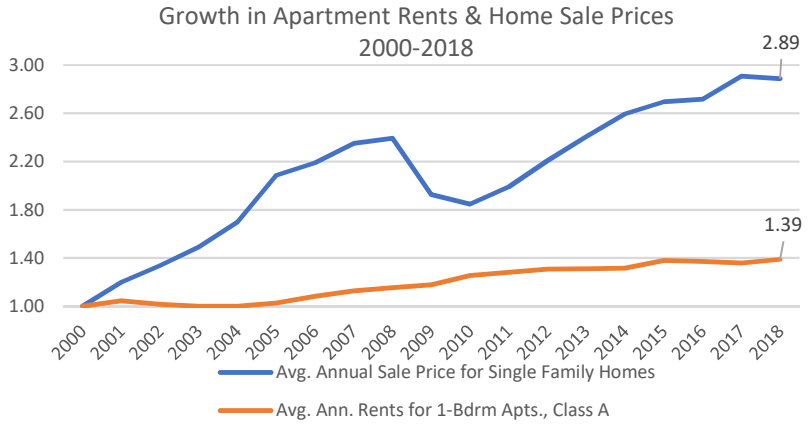
Figure 7



Source: CoStar

In contrast, the average sale price for a single-family home in the city was $286,100 in 2000 but $825,898 in 2018. This is almost a tripling in the sale price (188.7 percent) over the time period and an annual average increase of 6.1 percent (Figure 8).[8]

Figure 8



Source: CoStar and MRIS/GCAAR

The District had 103,000 apartment units of all types in 2000, and the supply of units grew to 144,000 in 2018, a 40 percent increase.[9] On the other hand, property tax records indicate that there were 91,000 single family structures[10] in the city in 2000 but only 101,000 in 2018, an 11 percent net increase.[11] In a city with a growing population of primarily 25 to 44 year-olds, it

[8] In 2000, the median sale price for a single-family home in the city was $178,250. But in 2018, the median sale price for a single-family home was $725,000. This is a 306.7 percent increase over the time period and an annual average increase of 8.1 percent. Source: GCAAR

[9] CoStar

[10] This excludes condominiums and co-operatives.

[11] Property tax records also indicate that there were 71,490 homesteads properties in the city in 2000 and 93,826 in 2018. Homestead properties are owner-occupied residential properties that are the principal residence of the owner. Owners applied with the Office of Tax and revenue for an annual deduction from their home's assessment value, which allows for a lower real property tax bill. The deduction also allows for annual increases in the taxable assessment value of the home to be limited to 10 percent beginning in 2006.

appears that the relative lack of growth in the overall supply in single family structures is just one of the considerable contributors to the general unaffordability of single-family home ownership. Conversely, rental housing appears to have been kept more affordable to some extent due to the substantial increase in the supply of rental units.

Other Contributing Factors

There are numerous factors contributing to the addition of an average of 2,100 new apartment units per year from 2000 to 2018. These include a growing population, accommodating financial and capital markets and the growing national and local economies. Moreover, the city incentivizes residential development (particularly investment-grade large multifamily projects) through its tax code. The city's 2019 residential property tax rate of $0.85 (per $100 of assessed value) was 55 percent less than the commercial property tax rate of $1.89 (per $100 of assessed value). And, the city has the lowest real property tax rate for residential property in the metropolitan region. The city's residential property tax rate is 22.3 percent lower than Montgomery County's property tax rate of $1.0934 and 17.2 percent lower than Arlington County's rate of $1.026.[12]

A Major Local Determinant

Beyond the financial and economic factors, the District of Columbia government continues to play a major role in facilitating increased residential housing capacity via its assertive use of land, zoning, tax, regulatory and housing policies. The city government has not only allowed more[13] and higher density residential development[14] throughout the city, but it has also helped to make large swaths of land acreage (in some cases formerly federal and other tax exempt land) available for development.[15] For example, the city's newest neighborhoods of the Capital Riverfront, Southwest Waterfront, NOMA, and Union Market were made possible via explicit government interventions such as special tax incentives or local public subsidies in some cases and efficacious land use, zoning, regulatory and housing policies in other cases. And based on current residential development trends in the city, it is possible that even a few additional new

[12] The District of Columbia is the only jurisdiction in the metropolitan region that has different tax rates for different types of property. The city has residential tax rate of $0.85 (per $100 of assessed value) and a commercial tax rate of $1.89 (per $100 of assessed value). In the District of Columbia, all multifamily buildings are considered residential property. Arlington County has the lowest tax rate in northern Virginia, and Montgomery County has the lowest property tax rate in suburban Maryland. All counties in the state of Maryland and Virginia apply one tax rate to all properties. Source: Tax Facts, 2019.

[13] For example, more than 4,000 residential units have been produced out of former office buildings since 2002. But, the more striking trend that has taken hold in the city in recent years has been the conversion of church properties (formerly tax-exempt properties) into residential developments. In some cases, a residential development totally replaced the church, and in other cases the former church structure was replaced with both a new church structure and a large residential development onto the site. Some examples are the 13th Street Sanctuary (3431 13th St, NW), Stanton Tower (609 Maryland Ave., NE), The Vintage (3146 16th St., NW), The Churchill (514 4th St, SE), Scripture Cathedral (810 O St., NW), Riverside Baptist Church (699 Maine Ave., SW) and St. Augustine Episcopal Church (555 Water St., SW).

[14] For example, popups are a form of residential expansion and increased density because they add stories on top of the older buildings which allow for changes in the number of units per structure (e.g., converting a single-family house into multiple apartments, or vice versa). Schuetz, J. (2019). Teardowns, Popups and Renovations: How Does Housing Supply Change? Journal of Regional Science, 2019; 1-22.

[15] In 2000, the District devoted one percent of its land area to multifamily development. But, in 2018, multifamily development existed on 8 percent of its land area. Tax Facts, 1999 and 2019.

communities may materialize or mature in the coming years such as the Parks at Walter Reed, Buzzard Point, Capitol Crossing, Reunion Square, and the Skyland Town Center.

Helping to Make Rental Housing More Affordable

The District of Columbia is currently facing an affordable housing crisis, whereby an increasing number of city households are finding it impossible to afford rental housing in the city, much less homeownership. Affordable housing is primarily a function of housing costs relative to household income in a given time period. In the short-term, facilitating affordable housing for relatively low-income households requires a unique set of immediate policy responses.

However, this study maintains that through its assertive use of land use, zoning, regulatory, housing and tax policies the city is having a greater effect helping to prevent rental housing (in contrast to home ownership) from becoming entirely unaffordable for low- and moderate-income households. It appears that this long-term policy of aggressively increasing the city's supply of rental units has, in part, precluded sharp price increases in the medium and short terms.

Conclusions

There are a number of contributing factors why the District of Columbia added an average of over 2,100 new apartment units per year since 2000. But, one of the primary local determinants has been the city government's overall policy to facilitate, induce and even incentivize (in some cases) rapid residential redevelopment throughout the entire city. This overall policy is multifaceted in that it comprises, but is not limited to, zoning, regulatory, land use (including the reclamation of former federal and tax-exempt land), housing and tax policies. This has resulted in over 20 years of allowing both the conversion of voluminous parcels throughout the city to their current highest and best use (residential in many cases) and greater housing density in numerous areas of the city.

In the face of a growing average annual number of new rental units demanded by renters since 2000, there has been a commensurate average annual number of new rental units added to the city's housing market. This appears to be one of the reasons why average annual citywide rent increases has remained on par with the area's inflation rate. This paper suggests this phenomenon has contributed to relatively lower levels of average citywide rents in recent years compared to the counterfactual of a much slower annual increase in the housing supply.

We estimate that the considerable increase in rental units caused the average city renter to save $2,124 in housing rental costs in 2018. And if this policy continues as planned by city leaders, we estimate that the average renter in the city could save an additional $1,932 in housing costs in 2025 relative to the counterfactual of a much slower annual increase in the housing supply. It is conceivable that in recent years the city government's overall policy toward residential redevelopment has contributed to slightly less prohibitive rents for at least a few residents resulting in the retention of residents who otherwise would have migrated out of the city.