A STUDY OF THE DISTRICT OF COLUMBIA'S APARTMENT RENTAL MARKET 2000 TO 2015:

THE ROLE OF MILLENNIALS

A PRESENTATION TO THE
FTA REVENUE ESTIMATION CONFERENCE
OCTOBER 10TH, 2018

Fahad Fahimullah, Yi Geng, & Daniel Muhammad

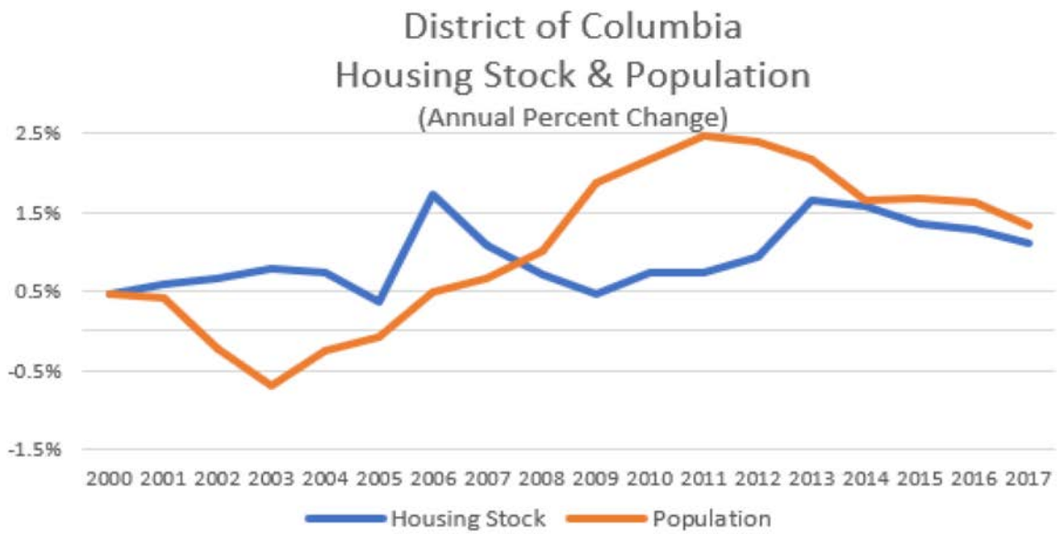
Office of Revenue Analysis District of Columbia Government

INTRODUCTION

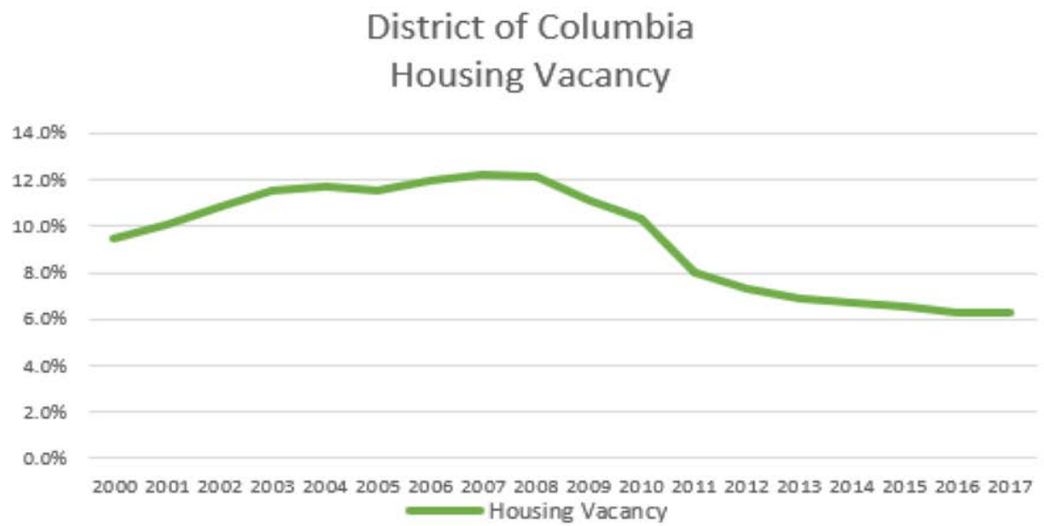
- DC has undergone remarkable commercial & residential development and demographic changes over the past 20 years
- Gentrification vs. youthification
- We test the hypothesis of youthification by looking at the profile of tenants of large apartment buildings built over the past 18 years
- Data used: CoStar data and DC individual income tax data
- Regression analysis with binary choice framework
- Findings:

  a) Evidence of continued gentrification

  b) Evidence of youthification: in the city's newest and pricier apartment buildings are attracting new, single, younger residents with income below the city average



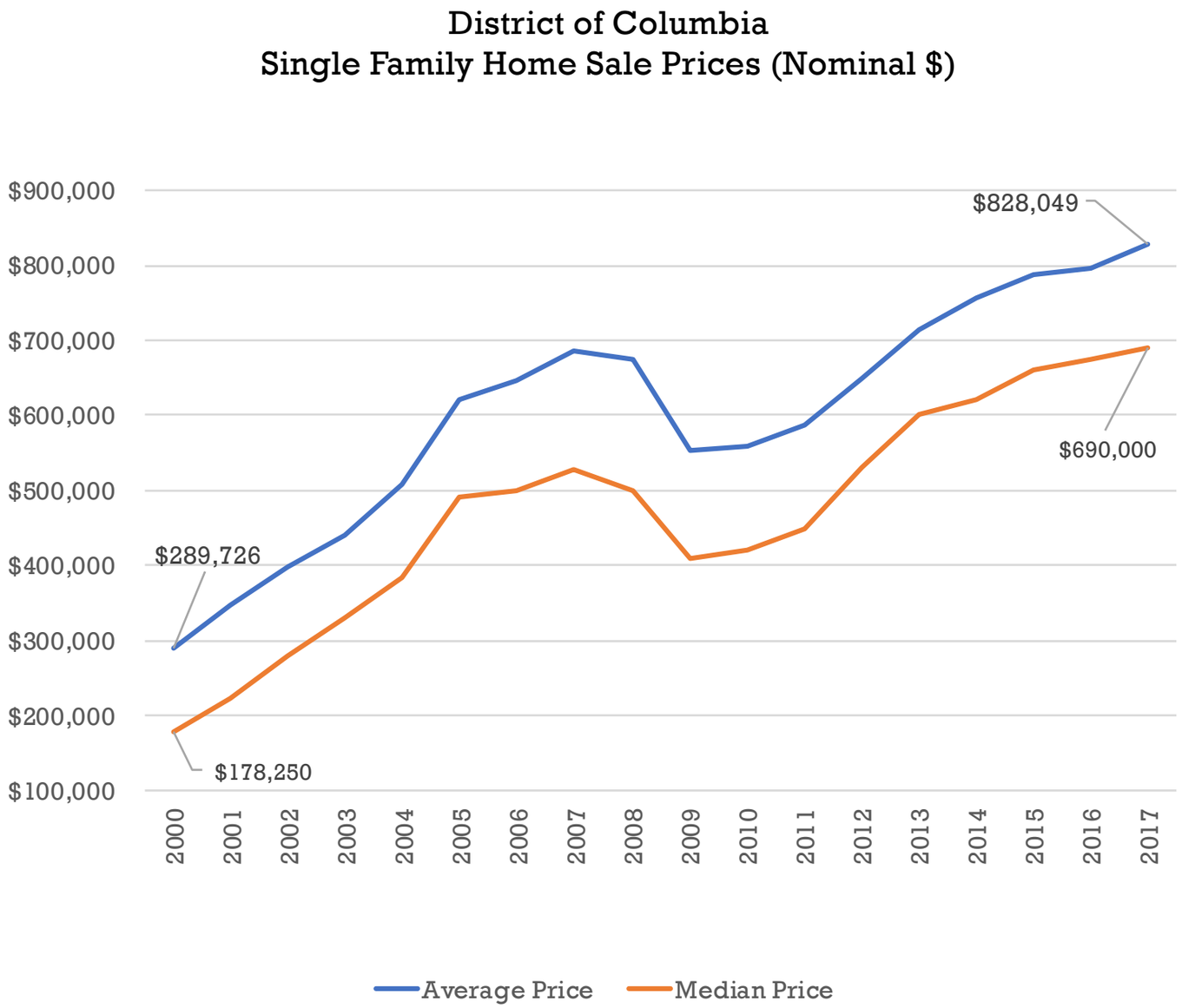
Data source: Office of Revenue Analysis



Data source: Office of Revenue Analysis

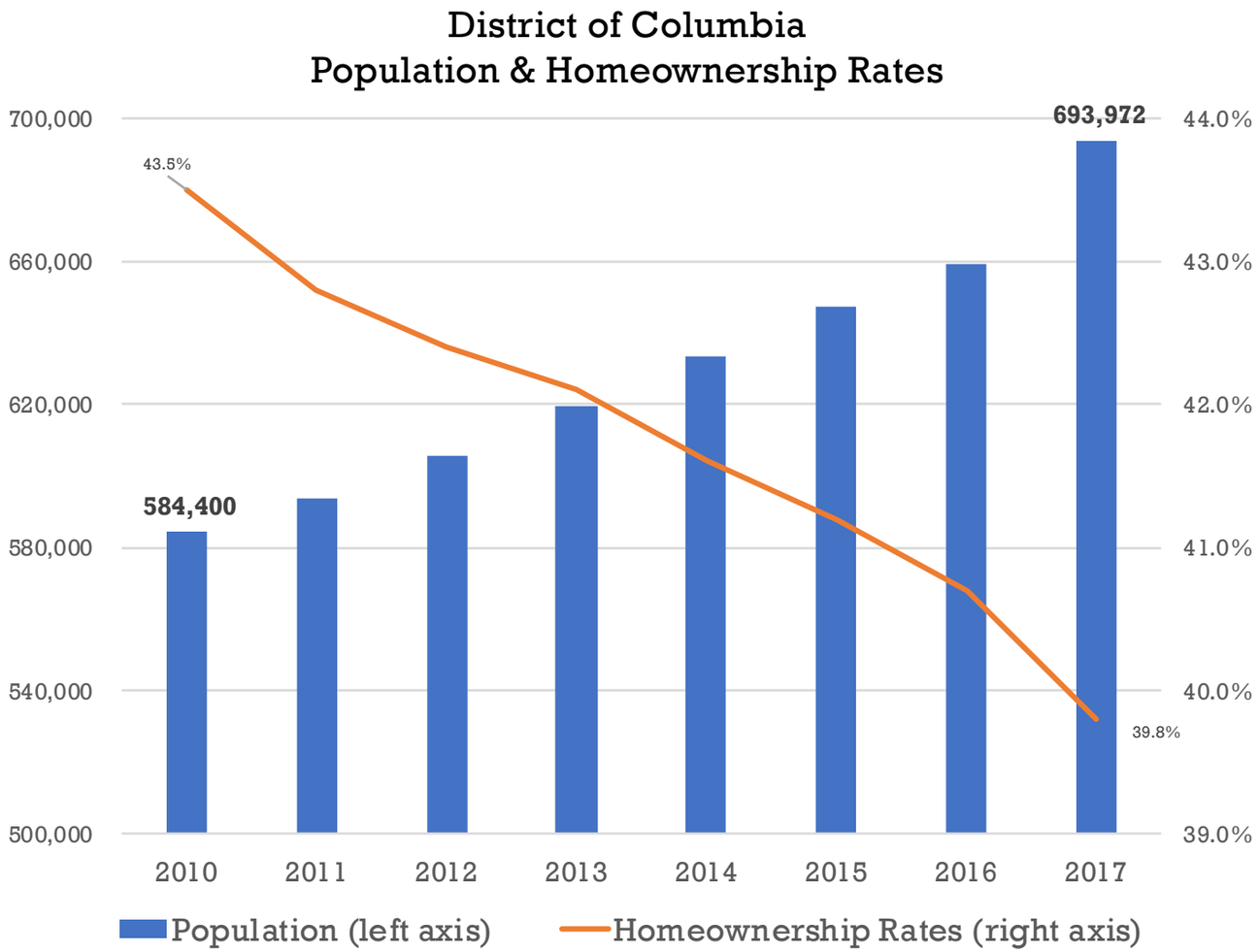
HOMEOWNERSHIP IN THE DISTRICT OF COLUMBIA

- Population is growing at a faster rate than the city's stock of housing
- Causes:
  - Accelerating land & construction costs per sq. ft.
  - Zoning
  - Decreasing supply of land
- Consequence
  - Decreasing vacancy rate



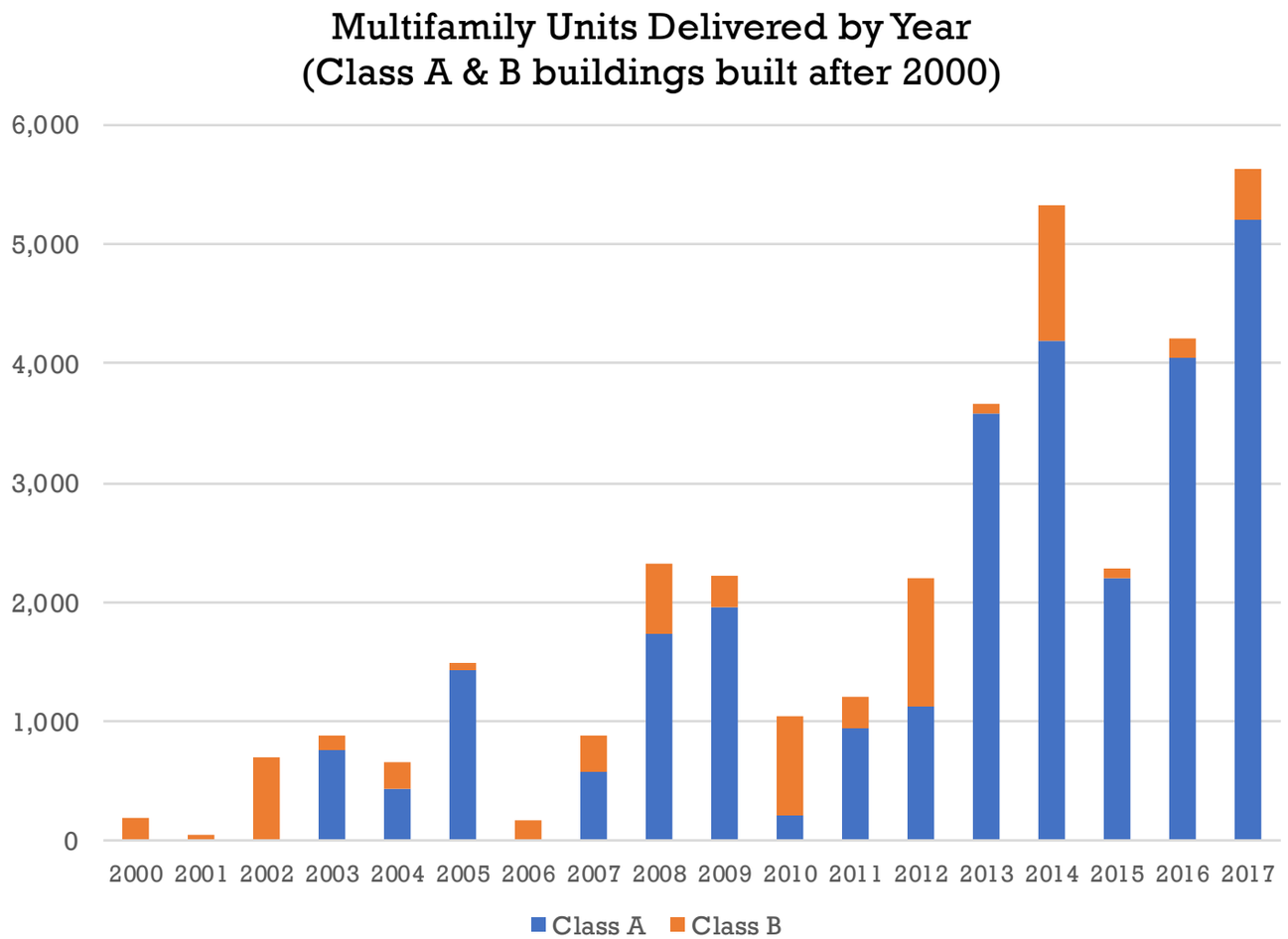
HOMEOWNERSHIP IN THE DISTRICT OF COLUMBIA

- DC's home ownership rate of 39.8% was the lowest in the nation (as of 2017)
- Cause: High cost of homes and homeownership
- Median home price increased 8.3 percent per year
- Inflation: Only 2.3%



HOMEOWNERSHIP IN THE DISTRICT OF COLUMBIA

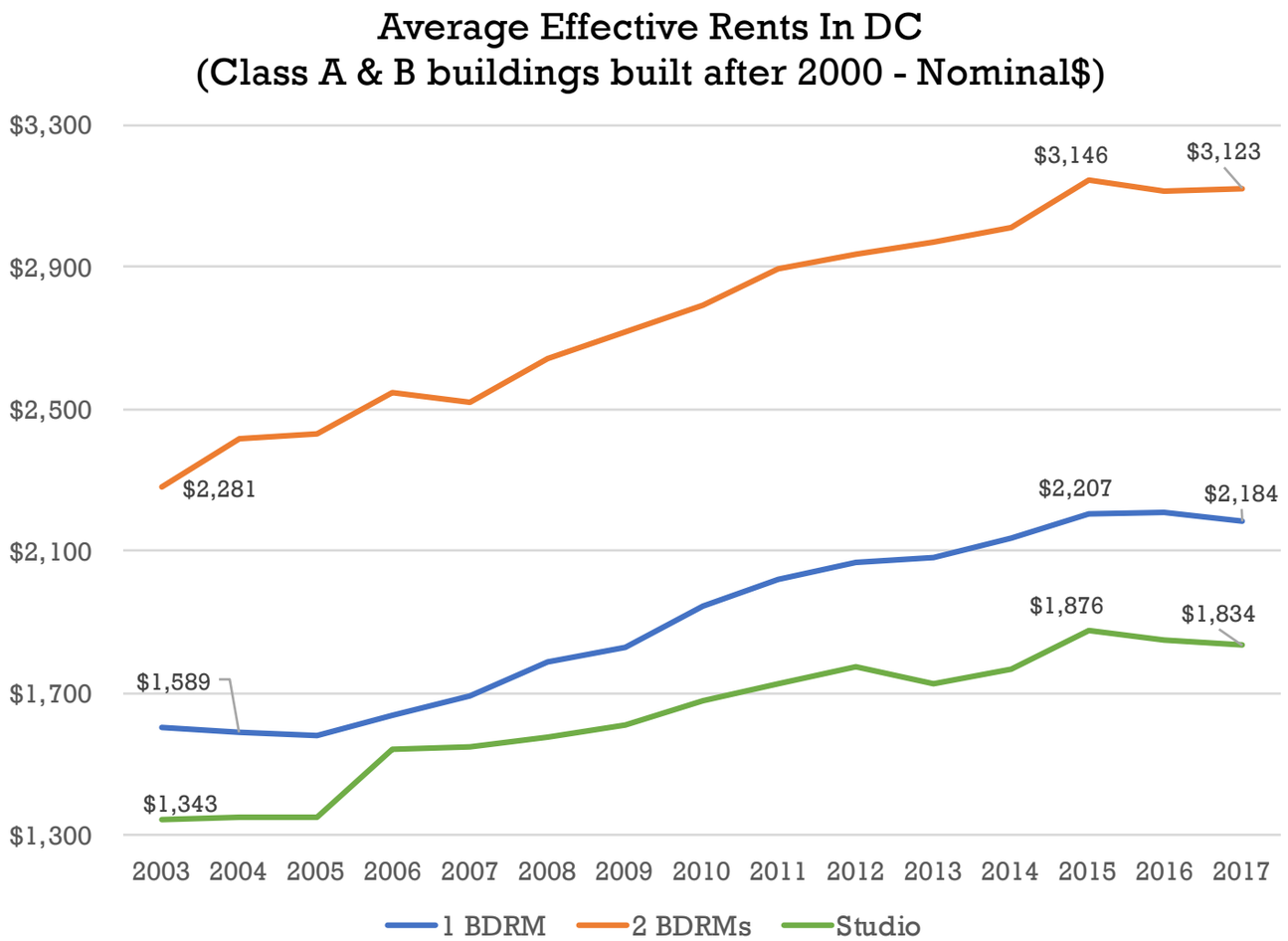
- # of Single-family home and condo sales averaged 4.9% annual rate between 2009-2017
- Population growth averaged 2.5%
  - One of the key explanatory factors in the city's robust residential development



AFFORDABILITY AND HOUSING

- Renting has been the preferred housing option
- Between the years 2013 and 2017, the city added over 4,200 multifamily units per year on average
- Premium buildings (Class A and Class B)

- CoStar Data



AFFORDABILITY AND HOUSING

- In 2017, one-bedroom rents at $2,184
- Rental rates have generally grown over time in line with the area's consumer price index
- In comparison, median home price increased 8.3 percent per year

Scenarios of Estimated Minimum Annual Household Incomes For District of Columbia Rental Units in 2015			
Rent as Share of Gross Monthly Income: 40%			
	Studio	**1 Bdrm**	**2 Bdrm**
Annual Household Gross Income	$56,280	$66,210	$94,380
Monthly Household Gross Income	$4,690	$5,518	$7,865
Estimated Monthly Rent	$1,876	$2,207	$3,146
Rent as Share of Gross Monthly Income: 50%			
	Studio	**1 Bdrm**	**2 Bdrm**
Annual Household Gross Income	$45,024	$52,968	$75,504
Monthly Household Gross Income	$3,752	$4,414	$6,292
Estimated Monthly Rent	$1,876	$2,207	$3,146

AFFORDABILITY AND HOUSING

- 30% income threshold: HUD definition of housing affordability
- 40% and 50%: moderately to severely housing cost burdened
- Cost-savings measures to reduce housing costs
- Should expect few renters with income below $45k or $56k

Summary Statistics of 2015 Tax Filer Data	
# of Tax Filers	10,814
Income Statistics	**$ Amount**
Mean Income	$75,945
Median Income	$57,428
Minimum Income	-$998,487
Maximum Income	$5,799,739
Standard Deviation	$117,874
Income Tax Filer Type	**Share**
Single Filers (Share)	83.0%
Married Filers (Share)	11.0%
Head of Household Filers (Share)	4.5%
Other Filers (Share)	1.5%
Residents	**Age**
Mean Age	34.2
Median Age	31.5
City Tenure	**Share**
Newest Residents	64%
Longer-term Residents	36%

AFFORDABILITY AND HOUSING

- Half of the 10,814 residents had an annual income of less than $57,428
- Median household incomes in DC was $70,848 in 2015 per Census
- 1 bedrooms: 57%
  2 or more bedrooms : 26% and studios: 17%
- Room-mating is a predominant feature

Data:

- CoStar: 88 Class A and Class B large and mid-sized apartment buildings built after 2000; containing 11,507 total residential units
  - Also contains information such as rents, vacancy, units number, types of units, and unit sizes.

- Individual income tax data for renters who lived in one of the 88 apartment buildings in 2015

- To better evaluate the data, we bifurcate the building and tax filer data into two cohorts or groups
  - The control group is comprised of residents in 48 multifamily buildings that delivered between January 2000 and December 2012 – older buildings
  - The treatment group is comprised of residents in 40 multifamily buildings that delivered between January 2013 and December 2015

THE MODEL

- Binary choice model: $(y = 1)$ if an individual resides in a newer premium building or an older premium buildings $(y = 0)$ in 2015

- Regression: $E(y_i|x) = F(x_i'\beta)$

- Marginal Effects:

$$\frac{\partial F(x_i'\beta)}{\partial x} = \beta * F'(x_i'\beta) = \beta * f(x_i'\beta)$$

Results of T-Tests			
Variables (in 2015)	**Newer Buildings**	**Older Buildings**	**Difference**
Average Square Feet per Unit	748.6 (18.7379)	836.8 (21.3084)	-88.26*** (28.9452)
Average Effective Rent per Sq. Foot	$3.28 (0.1248)	$2.79 (0.0987)	$0.49*** (0.1571)
Vacancy Rates	6.00 (0.5325)	4.86 (0.4726)	1.1377 (0.7101)
Mean Tenants Income	$70,297.0 (1,193.8)	$80,181.2 (1,768.1)	-$9,884.1*** (2,288.7)
Average Age of Tenants	33.41 (0.1173)	34.76 (0.1341)	-1.3458*** (0.1852)
# of Apartment Buildings	40	48	

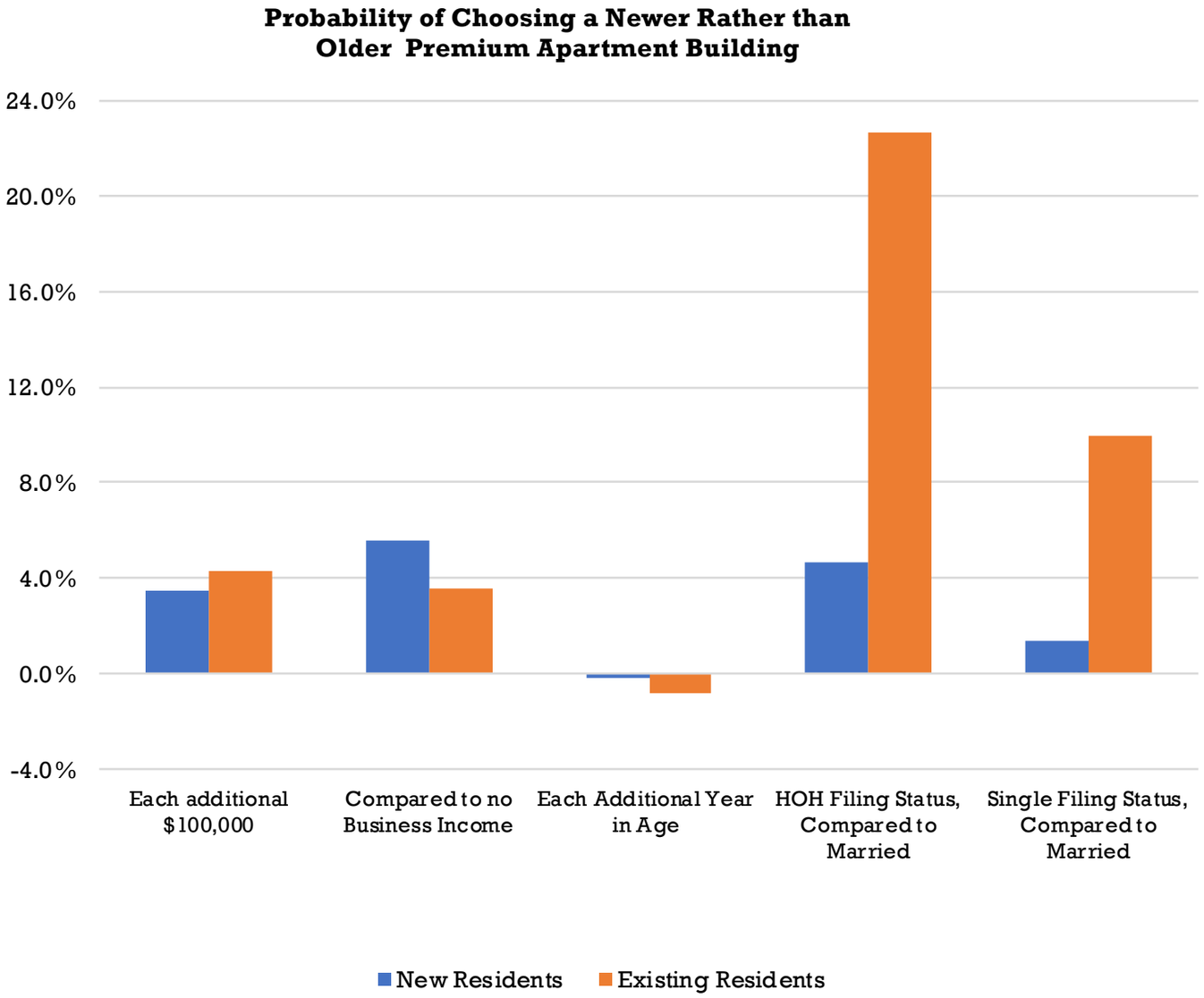
T-TEST RESULTS

- Units in newer buildings are on average 88.3 square feet (10.5%) smaller
- They cost 17.5 percent more per square foot
- Tenants in newer buildings have $9,884 (12.3%) less income
- They are 1.3 years younger than renters in older buildings

Probit Regression Results on Apartment Choice: Average Partial Effects (APE) of Explanatory Variables on Probability of Choosing Newer Apartment Buildings					
Dep: Apartment Choice (1 if newer and 0 if older)	Model 1: Full Sample	Model 2: Income $20k-$250k	Model 3: Income $20k-$250k with Ward Dummies	Model 4: Income $20k-$250k with Ward Dummies New Residents	Model 5: Income $20k-$250k with Ward Dummies Existing Residents
DC AGI ($000's)	-0.009%* (0.00005)	0.007% (0.0001)	0.045%*** (0.0001)	0.031%* (0.0002)	0.039%** (0.0002)
Business Income Binary	6.029%*** (0.0141)	5.361%*** (0.0162)	4.395%*** (0.0159)	5.037%** (0.0209)	3.120% (0.0244)
Capital Gains Binary	-3.767%*** (0.0118)	-4.523%*** (0.0129)	-2.331%* (0.0127)	-2.855%* (0.0161)	-1.545% (0.0206)
New Resident	1.529% (0.0103)	1.513% (0.0112)	2.747%** (0.0111)	--	--
Age	-0.382%*** (0.0006)	-0.452%*** (0.0007)	-0.538%*** (0.0007)	-0.207%** (0.0010)	-0.867%*** (0.0010)
FS HOH	12.721%*** (0.0234)	13.089%*** (0.0274)	7.873%*** (0.0283)	2.880% (0.0426)	12.166%*** (0.0384)
FS Married	-3.138%** (0.0156)	-3.652% (0.0176)	-4.957%*** (0.0173)	-1.307% (0.0226)	-10.275%*** (0.0271)
Ward 1	--	--	-4.275%*** (0.0144)	-5.245%*** (0.0182)	-2.276% (0.0234)
Ward 2	--	--	-17.699%*** (0.0151)	-19.794%*** (0.0185)	-12.599%*** (0.0258)
Ward 3	--	--	-5.295%* (0.0278)	-8.474%** (0.0350)	-0.844% (0.0453)
Ward 4	--	--	12.751%*** (0.0230)	16.623%*** (0.0306)	7.678%** (0.0354)
Ward 5	--	--	23.305%*** (0.0208)	21.590%*** (0.0263)	25.712%*** (0.0336)
Ward 7 & 8	--	--	14.086%*** (0.0329)	21.756%*** (0.0512)	9.792%** (0.0445)
# of observations	10,680	8,761	8,761	5,402	3,359
McFadden R-squared	0.0095	0.0083	0.0409	0.0431	0.0482

REGRESSION RESULTS

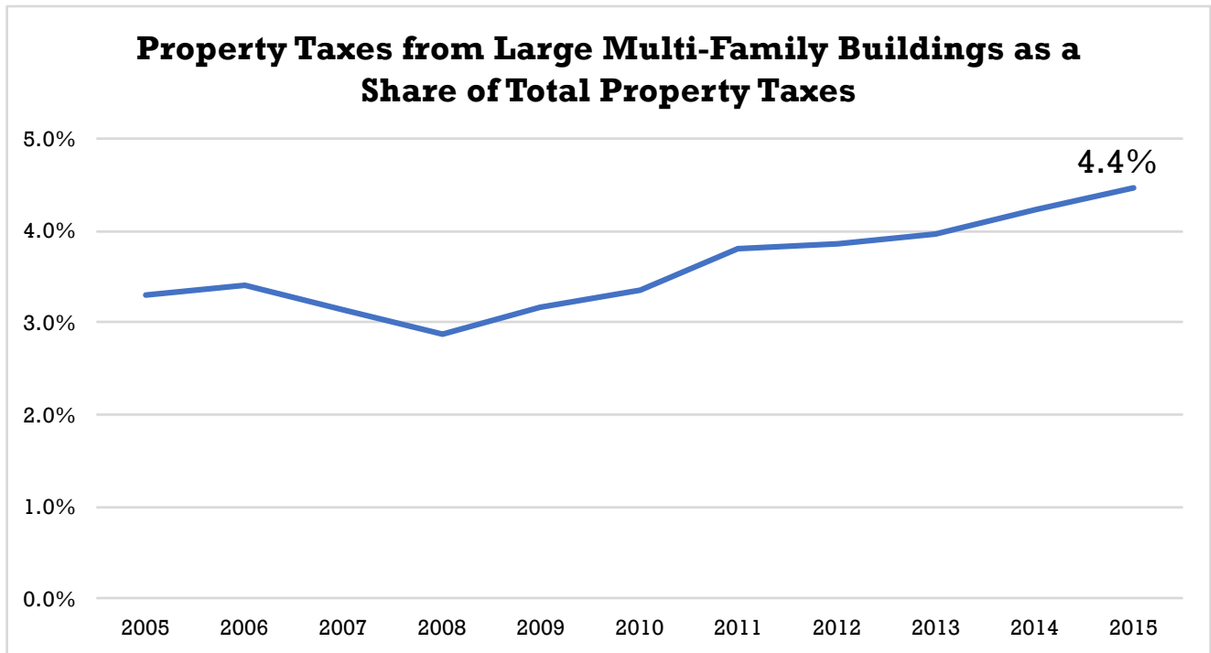
- Model 1 is for all data, as described in the summary statistics table
- Model 2: To prevent the possibility of extreme income amounts distorting the model's results, we subset the data to residents with incomes between $20,000 and $250,000
- Model 3 adds ward dummies.
- When we control for wards, the income variable becomes statistically significant and positive, as expected
- Model 1 & 2 were confounding geographical differences of residents across wards – which is a model misspecification
- Residents are more likely to reside in new buildings when they are in Wards 4, 5, 7 and 8, especially in ward 5, where gentrification is happening at fast pace



REGRESSION RESULTS- MODEL 4 & 5

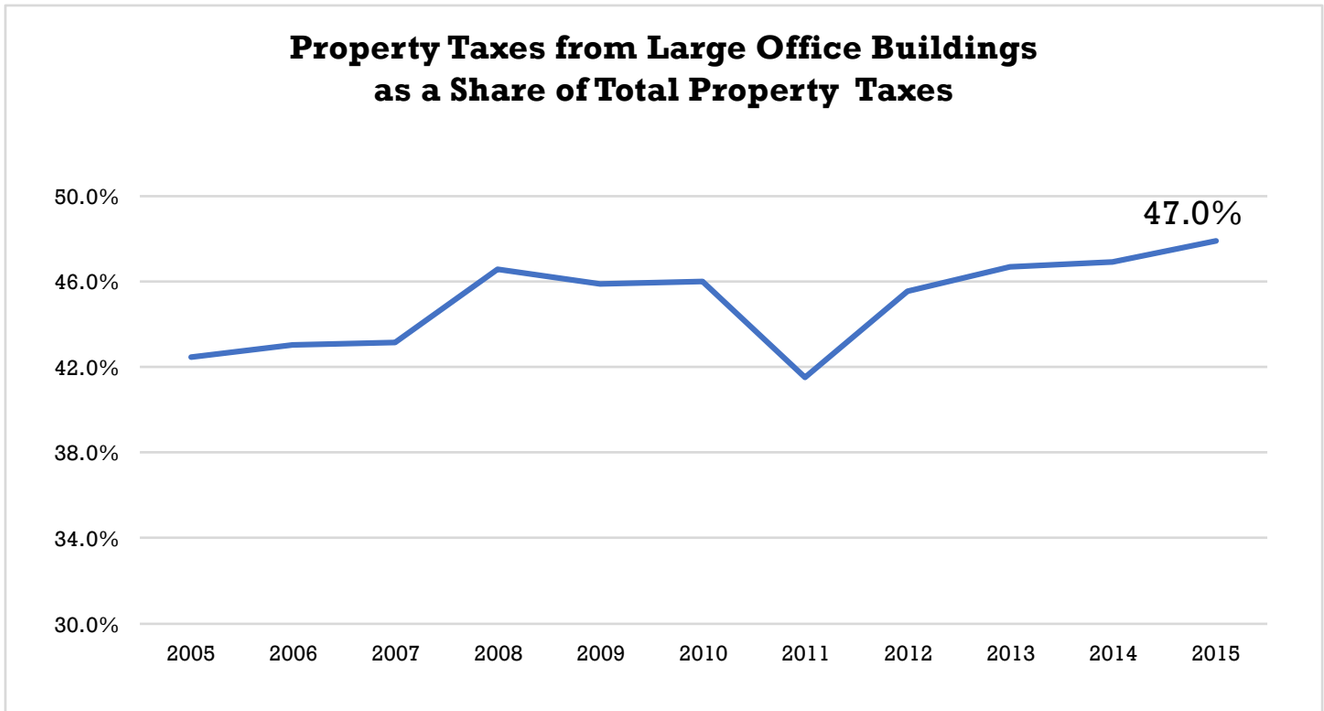
- Model 4 analyzes building choices of only new residents
- Model 5 analyzes such choices for only existing DC residents
- Results are quite different for these two groups
- Age and filing status have a much larger impact for existing residents in their building choice
- For existing residents, a HOH is 12.2% more likely (compared to single status) to live in a new building, while this percentage is statistically insignificant for new residents
- This may be reasonable given that the waitlist for ADUs is long and that some applicants wait for more than a year to attain a city-government facilitated ADU.

TAX BURDENS FOR APARTMENT BUILDINGS



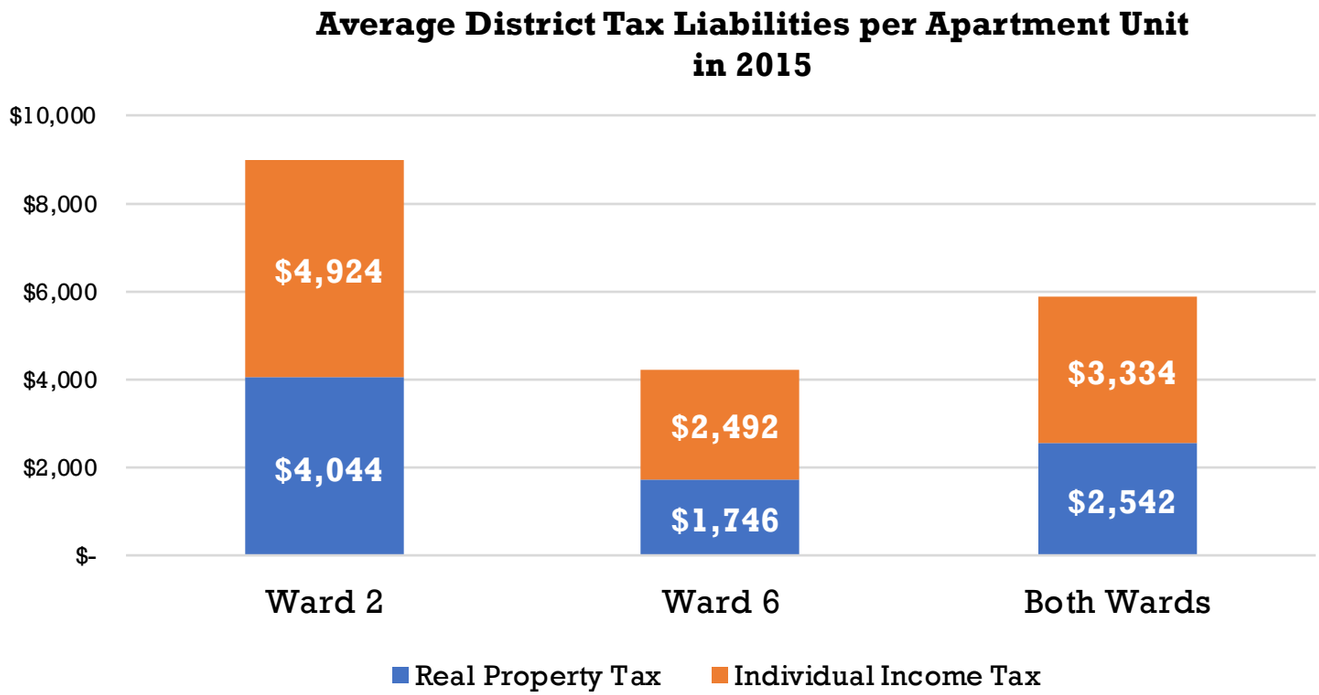
- Large multi-family buildings (over 2,500 new ones between 2005-2015)
- Only responsible for 4.4% of all property taxes in 2015
- This equates to $96.2 million

TAX BURDENS FOR OFFICE BUILDINGS

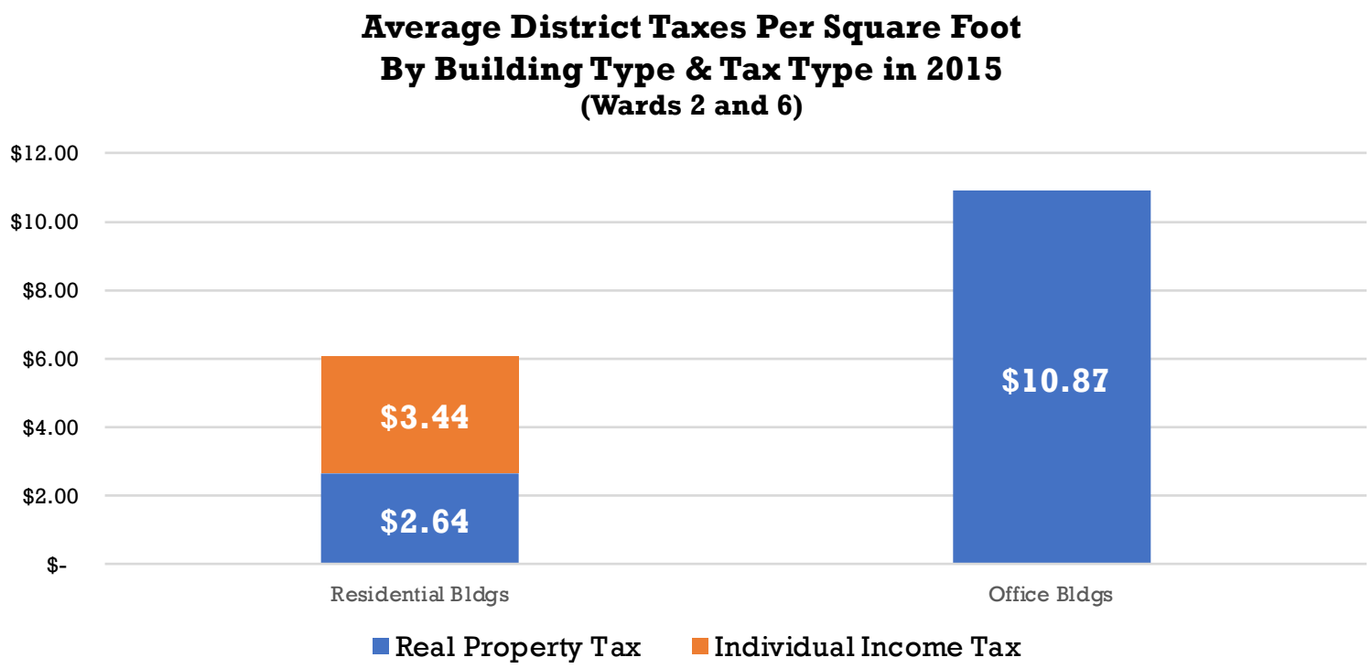


- As a comparison, the city's large office buildings (547 in 2005 and 614 in 2015) are responsible for much more property tax
- They paid $1.032 billion of $2.194 in 2015
- Equates to 47%

TAX BURDENS FOR APARTMENT BUILDINGS



- A sample of large apartment buildings that were built after 2000 in Wards 2 and 6 (i.e. the commercial core of the city),
- Each of these relatively new apartment units, on average, contributed
  - $2,542 in real property taxes
  - $3,334 in income taxes to the city's tax collections in 2015 (Figure 2).
- With the exception of Ward 3, Wards 2 and 6 had the highest average incomes in the city.



MULTIFAMILY BUILDINGS VS. OFFICE BUILDINGS

- We use a sample of buildings built after 2000 in Wards 2 and 6 (where 91% of city's office buildings are by sq. ft)
- Offices pay almost 4x more in property tax by square foot
- When income taxes are included for apartment buildings, total tax paid is ~56% of what office buildings pay
- multi-family buildings *not* expected to account for more than 10 percent of all city property taxes in foreseeable future
- In spite of population growth and residential property development, the role large office buildings play for the city's property tax collections will remain prominent

SUMMARY OF FINDINGS

1. The newest apartment units are getting more expensive likely because the rent per unit is remaining relatively constant while the average square footage is getting smaller
2. Residents with incomes of $250,000 or more tend not to live in the newest apartments, likely because of their preference and ability to afford larger housing units.
3. For residents earning between $20k and $250k, there is a positive correlation between income levels and the probability to live in the newest apartments (0.05% for each additional $1000)
4. Residents in the city's newer buildings were 1.3 years younger than renters in older buildings and had $9,900 (12.3 percent) less AGI
5. Residents in newer units are more likely to have business income in their AGI
6. 64% of the tenants in both the newest and older units are new residents and single
7. Surprisingly, newer buildings have more head of household (HOH) filers, possibly due to the city's affordable housing efforts

CONCLUSIONS

- Recent surge of premium apartment buildings is likely evidence of continued gentrification.
- Contrary to conventional wisdom, residents in city's newest and pricier apartment buildings tended to be new residents to the city, single, younger and had income below the city average (youthification)
- Residents in newest buildings are more likely to have business income: gig economy
- Newer buildings have more HOHs, likely due to city's affordable housing efforts
- Continued youthification and gentrification of the city's evolving housing market are likely to have considerable implications on the residential and economic patterns of the city in the years to come.