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Renting in Urban United States: Examining determinants of rent prices across metropolitan areas

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This thesis is submitted in partial fulfillment of the requirement for the course Senior Seminar (EC 375), during the Spring Semester of 2012

While writing this thesis, I have not witnessed any wrongdoings, nor have I personally violated any conditions of the Skidmore College Honor Code.

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Abstract:

The Great Recession had detrimental effects on the housing market. As unemployment increased households became unable to pay their mortgage, which resulted in many home foreclosures. Consequently, many homeowners entered the renting market. Causing a higher demand for rental units, which were already limited due to a supply shortage that can be explained by the bias towards homeownership since the 20th century. Since the Great Recession, many studies have focused on the housing market; however, limited studies have been performed on the rental market. Thus, this research seeks to examine the determinants of rent prices and its relationship to housing affordably. The study finds that unemployment, population, and income per capita have significant effect on prices. In addition, the study finds that there continues to be a shortage of rental units.

I. Introduction:

In the United States what began as a bubble-burst in the mortgage market and spilled over to the financial market resulted in what is known today as the Great Recession, which ultimately led to a global financial crisis (Vukovic, 2010). The Great Recession led many individuals to face unemployment, decreasing incomes, home foreclosures, and heightening levels of economic insecurity (Margalit, 2013). Throughout the country many households lost much the wealth they had accumulated as a result of home ownership or had invested in down payments (Ellen & Dastrup, 2012). Millions of families lost their home during the financial crisis of 2007-2009. With the number of foreclosure, many households went from being home owners to renters. Therefore, the number of individuals competing in the renting market increased. Consequently, this study seeks to answer the question: What are the determinants of
rental prices? Since the Great Recession, there has been an ongoing debate on the topic of housing and renting affordability. Therefore, by examining and analyzing rental prices this study seeks to add to the debate of whether the United States is currently facing an affordability crisis.

The topic of housing and renting affordability has caused great debate on whether the government should implement more policies to further aid mediate this problem.

Previous studies have used trend and historical analysis to examine the rental market before and after the global financial crisis, while also examining whether there is an owner occupied housing and renting affordability problem in the United States. The history of the rental market has led to an imbalance between the supply and the demand of rental units which is still evident in today’s rental market and having significant effect. The focus of the construction of single-family homes due to suburbanization in the 20th century and the federal bias which incentivizes the purchasing of single-homes has caused a lack of renting units throughout the years. As populations increase in urban areas the limited rental stock is affecting rent prices in cities (Turk, 2004). Soon after the global financial crisis there was a disconnect between income and rent prices. Renting became more expensive for renters and affordable units were limited (Collinson, 2012; DiPasquale, 2012). Turk (2004), Collinson (2012), DiPasquale (2012), analyses allude that housing and renting affordability is not a recent nor new problem in the United States and that it was a concern during and after the global financial crisis. However, Glaeser and Gyourko (2003), argue that the housing affordability is generally defined as being determined by housing costs and incomes. Therefore, they define housing affordability as housing being expensive relative to the fundamental costs of production.

Due to the changes caused in the renting market caused by the Great Recession, the purpose of this study is to examine and analyze the determinants of rental prices in the top 73
statistical metropolitan areas, from 2010 to 2015. To do so, this study uses a hedonic pricing model. While a hedonic pricing model is typically used in a microanalysis, this study uses the concepts of the model for a microanalysis of rent prices in which population, income per capita, rental vacancy rate, unemployment rate, and construction restrictions are characteristics of the each metropolitan areas that affect prices.

Although previous studies examined the renting market they only limited their analysis to a portion of the metropolitan areas. In addition, Collision (2012)’s analysis only extends to 2009. Consequently, this paper is an updated analysis of the rental housing market in the United States, years after the Great Recession. Furthermore, unlike previous studies, this uses paper uses a regression analysis. Ultimately, by examining rent prices, this analysis can be used to examine if there is a rental and housing affordability crisis in the United States.

This study found that income per capita, and population have a positive and highly significant relationship with median gross rent. Furthermore, unemployment rate has a negatively significant effect on median gross rent. A positive relationship was found between the rental vacancy rates and median gross rent. This can be explained by an existing mobility within the rental market of people moving from less affordable rental units to more affordable rental units as well as rental stock being constant. Similarly a positive relationship was found for most of the types of permits issued and gross median rent; however, this can be similarly explained by the fact that it is unknown if the new units built are affordable.

The paper follows this organization. Section 2 provides a summary of the Great Recession. Section 3 reviews the literature. Section 4 discusses the analytical framework. Section 5 discusses robustness checks. Section 6 describes the results. Section 7, discussed the
results. Finally, section 8 concludes with a discussion on future research possibilities and policy implications.

II. **Background**

In order to understand the rental housing market and the effects it has experienced since the Great Recession it is essential to understand the effects the global financial crisis had on the housing sector in general. By the end of 2006, housing prices had experienced a drastic decline. In that same year, households had lost more than $7 trillion in home equity, this resulted in about 22 percent of homeowners with mortgages to have an outstanding mortgage balance exceeding the value of their homes (Ellen & Dastrup, 2012). Although there is still debate on what caused the Great Recession, there is a consensus that the recession began in in the mortgage sector and when the bubble burst, the effects spilled over into all other financial sectors (Vukovic, 2010).

The collapse of the housing sector and downturn in home equity experienced during the Great Recession is unlike prior recessions in the United States. Like previous recessions, the Great Recession, experiences a significant increase unemployment; however, the severe housing crisis that occurred in relation to the financial crisis has prolonged the recovery period and made it more difficult for the economy to stabilized (Ellen & Dastrup, 2012).

As unemployment increased, many households become unable to make mortgage payments, leading to many individuals defaulting on their mortgage and losing their homes (Ellen & Dastrup, 2012; Margalit, 2014). During the Great Recession, the number of foreclosures increased by fourfold; a height never seen before since the 1980s. Although the number of foreclosures has been declining since 2010, the rates remain high. This is partly due to the dwindling of the foreclosure process rather than financial stability among homeowners (Ellen & Dastrup, 2012).
While housing prices and prices in general experienced a decline during the Great Recession, rent prices held steady and continued to increase. This is in part due to the increasing number of households entering the renting market as they could no longer afford to continue making payments on their homes. The increase of people in the renting market in combination to declining incomes, increased the percentage of renters who are classified as severely rent burdened. This is defined as tenants who pay more than 50 percent of their incomes for rent. Between 2007 and 2008, the number of homeless families increased by 30 percent by almost 170,000. Consequently, it is evident that what began in one sector had troubling effects in other sectors, causing noteworthy affecting millions of people (Ellen & Dastrup, 2012). While more than 85 percent of single-family homes are owner occupied, more than 85 percent of homes with three units or more are rental housing (Glaeser, 2011). Many studies have focused on the effects of the Great Recession had on the housing market, there has been less focus on the effects the recession had on the rental housing market. Thus, this paper seeks to add to the literature and provide some focus to the rental housing market.

III. Literature Review

The History of the Rental Market

To adequately examine today’s rental prices, it is important to understand the history of the rental market. Turk (2004) describes in detail the history of the rental market starting with the 20th century in the United States. The suburbanization of America in the second half of the twentieth century has had significant effect on the rental market in such ways that it is evident today in many cities throughout the United States. The desire for the American Dream of the house with the white picket fence, resulted in a shift towards homeownership that began during this part of the century and continued into the Great Recession. This lead to an increase in
demand for single-family homes, which resulted in an increase supply or construction of these types of home. This resulted in a de-emphasis on rental units, causing adverse impact on the renting market in United States urban areas. From 1946 to 1956, single-family homes were constructed almost eight times more often than multifamily units, which were often used for renting purposes. In addition, the real estate industry did not find it profitable to produce low-cost housing. This de-emphasis in the rental market resulted in a decrease in the construction of multifamily homes. Consequently, the rental housing market consisted and continues to be comprise of existing units rather than newly constructed ones; in fact, the vast majority of existing units were built more than 30 years ago (Turk, 2004).

Therefore, Turk (2004) argues that there is an persisting imbalance between the supply and demand, which drives rental housing affordability. However, later efforts to remedy this imbalance through policies such as the 1949 US Housing Act only further hindered the rental market as it was interpreted by many developers as a continuation of the expansion for homeownership units. This was also evident in the upgrade or improvement of already existing rental units, which lead to the formation of condominiums or other homeownership units for higher-income occupant and did not resolve the affordability problem for lower income tenants. From the mid-1960s through the mid-1980s, affordable housing was generally produced through either government subsidy such as favorable mortgage rate subsidies or through the formation of loans and grants or through the help of wealthy investors which were syndicated, this generated significant paper losses that served as tax write offs for these investors (Turk, 2004).

Furthermore, Turks (2004) not only argues that the supply of rental unit drives the affordability crisis, but also makes the argument that income distribution is important in understanding the debate on housing affordability crisis. It uses a trends analysis to illustrate the
relationship of income on rent affordability. In 2002, for three-quarters of all states examined, the monthly rent for a two-bedroom apartment was more than twice the income earned at the state’s minimum wage for that year. Income levels push rents directly; therefore, skew in income distribution becomes both cause and effect within the housing market.

Similarly, Glaeser (2011), also examines how historically the government has favored homeownership while taking focus away from the rental market. This bias towards ownership can be illustrated by the various ways in which the federal government subsidizes homeownership like the home mortgage interest deduction and government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac. In the 1990s, state-sponsored enterprises partook in the mortgage census, which objective was to make more low- and moderate-income households into homeowners (Turk, 2004). Glaeser (2011) argues, that federal intervention in promoting home ownership have been supported by three justifications. The first justification is that homeownership can lead to individual prosperity. Second, alleged market failures in the mortgage market require market-making action from the government. Lastly, homeownership helps form a foundation for good citizenship.

Consequently, Glaeser (2011), makes the argument that the Great Recession has challenged these justifications. The amount of foreclosure which resulted from the recession illustrates how subsidized borrowing does not lead to ownership. In fact, many households lost much the wealth they had accumulated as a result of home ownership or had invested in down payments (Ellen & Dastrup, 2012). It is also argued that even if federal intervention is needed, the way in which the GDEs have provided subsidy is not necessary. These subsidies often times are for single-family homes which not the typically form of housing in urban areas like in metropolitan areas (Glaeser, 2011).
However, compared to Turk (2004), Glaeser (2011) doesn’t examine how the federal bias towards single-family homes affect the rental market; instead, it studies how the federal bias towards single-family homes and homeownership is used to explain the environmental and social effects that are result from suburbanization and people fleeting from urban centers. Therefore, Glaeser (2011) argues that in order to mediate these effects, policies should focus on the construction of multifamily homes and not single-family homes. However, a problem could arise from shifting the focus from homeownership to the rental market as there is already an existing limited stock of rental units in the market. Thus, Glaeser (2011), illustrates the importance of allowing and incentivizing the construction of multifamily homes. Although, Glaeser (2011) study does not focus on the rental prices and rental housing affordability problem, like Turk (2004) it does help support and establish that throughout history, the United States has maintained a bias towards homeownership through the construction and purchasing of single-family homes. This has ultimately caused effects long lasting effects in the rental market that are still evident today.

Furthermore, Collinson (2011) uses trend analysis to study and examine the affordability of rental housing for low-and moderate-income renters from 1990 to 2009, at a national and at a metropolitan area level. It also examines early evidence on the effects the global financial crisis and foreclosure crisis had on rental housing affordability. This study uses the Census Bureau Current Population Survey for national data and uses a time series of median renter incomes by metropolitan area derived from the 1990 and 2000 Census 5-percent Public Use Microdata Sample (PUMS), American Community Survey (ACS) PUMS 2005, and 2009 microdata from the Minnesota Population Center’s Integrated Public Use Microdata Series (IPUMS) (Collison, 2011).
The analysis indicates, that real renter incomes declined in almost every housing market in the first half of the 2000s and ended the decade below 2000 levels in all of the 25 markets the study examines. This may be mostly due to the historic recession that took place between 2007 to 2009. Nonetheless, even with downward pressure on prices throughout the country during the Great Recession. From the 26 housing markets examined in this study, 19 experiences real rent levels in 2009 that were above 2000 levels. The study also found that for renters at 50 percent of Area Median Income (AMI), rental housing affordability varies significantly across metropolitan areas. In 2009, the number of extremely low-income renter households paying more than 50 percent of their income for housing increased to more than 6.7 million households. In addition, only 41 affordable and available units existed for every 100 extremely low-income renters (Collinson, 2011).

By doing a national examination of the rental housing market, Collinson (2011) is looking at a wide distribution of not only rent prices but also income levels. The analysis is done by dividing the United States into four regions and although the analysis conducted was based on trends, empirically thinking this could lead to high standard deviations. This would be as a result of the difference in price between small rural areas and large metropolitan areas. Consequently, this also paper also looks at the top ten metropolitan cities in the United States. Due to the definition of metropolitan area as socially and economically integrated groupings of one or more counties, which provide appropriately detailed geographic analysis in addition to a mapping units for a national overview, metropolitan cities are not constant. Although in short time span metropolitan cities may not experience significant change, by only using the top ten it not only limits the analysis to population, but other factors not accounted for in the categorization and formation of metropolitan areas.
Furthermore, while Collinson (2011) analysis focuses on just renters’ income, Turk (2004) argues that the assessment of the costs underlying rents, suggests that rents are not strictly or typically set on the basis of costs of provision. Instead, income levels directly drive rents in which the skew in income distribution becomes both cause and effect within the rental and housing market. Therefore, although market value of properties is central more as a result of the state of the real estate market but not intrinsic costs. Consequently, the income levels of all households, not only renters, but also of owner-occupied housing, both existing and newly constructed, may have primacy in determining the rent levels set.

The Effects of the Great Recession on the Rental Market

Unlike the previous papers which examine the history and trends of the rental market DiPasquale (2011), specifically examines the impacts of the Great Recession, the foreclosure crisis, and the freeze in the credit market on the rental housing market and the resulting implications for federal policy. The argument is that as the United States experienced the housing crisis, many households that experience foreclosure transitioned from homeowners to renters. With fewer homeowners, some portion of the foreclosed homeowner stock thus entered the rental market. Consequently, putting downward pressure on rental prices property value.

A national trend analysis illustrates that in 2009, properties with seven or more units, reached foreclosure rates of 7.8 percent in low-income neighborhoods, 4.3 percent in moderate-income neighborhoods, and 2.1 in high-income neighborhoods, compared to 2.3, 0.5, and 0.0 percent, respectively, in 2005. The rental housing stock is quite diverse. This means that the rental stock is composed on various types of housing, for example, single-family homes and multifamily homes. Multifamily homes are composed of two-unit, three-unit, four-units, or five
or more units buildings. In 2005, 25 percent of the rental units were single-family detached homes, 25 percent were in two to four-unit buildings, and 11.4 percent of rental units were in structures with 50 or more units. In addition, the rental housing stock is distributed across the country, with 43 percent of rental units in central cities, 40 percent in suburban communities, and 17 percent in rural areas. In 2009, the rental vacancy rate peaked at 10.6 percent. In 2010, the rental vacancy rate was 10.2 percent (DiPasquale, 2011).

In the existing multifamily rental stock, an increase in the number of vacancies and foreclosures in addition to a decline in property values, rents, and renter household incomes may cause a decrease in the quality of this portion of the rental stock. During the Great Recession, losses were common for apartment real estate investment trusts (REITs) and many lowered earnings expectations for 2010. Additionally, the market for Low-Income Housing Tax Credits (LIHTC) had practically vanished in 2008 and 2009. However, the LIHTC program appeared to be rebounding in 2010, when notably more LIHTC equity was raised than in 2008 and 2009. Consequently, investors, such as insurance companies and some banks, returned to the market. This rebound, specifically for new construction, is rather unexpected given the high vacancy rates in the rental market and the number of foreclosed owner-occupied units that could ultimately convert to rental housing stock. Furthermore, the incentives by the LIHTC program can encourage more construction than which can further cause a downward pressure on the rental market (DiPasquale, 2011).

Although the Great Recession, resulted in a downturn turn in new construction, the demand for multifamily mortgages continued to be refinance and the purchase of existing buildings continued. From 2008 through 2010, Fannie Mae and Freddie Mac largely kept the multifamily mortgage market open (DiPasquale, 2011). While this paper does illustrate the
demand-supply imbalance addressed in Turk (2004), it also assumes that new government policies and programs are stimulating new construction that may cause a rebalance or possibly further imbalance in the opposite direction. However, it does not take into account that although the size of the rental housing stock at any period may increase due to the construction of new or the conversion of rental units, during the same time there is also a decrease in rental units as a result of removals, demolition, and depreciation; therefore, annual change of the rental stock is fairly minute. Consequently, in the short run, the stock of rental units continues to remain fixed (Rosen & Smith, 1983).

Cetin and Kole (2012), examined the causes of the drastic decline of the number of one-family houses (C25) sold in the United States after the Great Recession. This analysis used C25 as the dependent variable and mortgage rate, unemployment rate, population, and housing price index as independent variables. The results indicate that when interest rate increased by 1%, the number of C25 sold decreased by 20 thousand. In addition, when unemployment rate increases by 1%, the number of C25 sold decreased by 81 thousand. The study concluded that current mortgage rate is significant at 1% level; mortgage rate at lag one time period is significant at 5% level; both real personal incomes at lag one time period and unemployment rate at lag two-time period are significant at 10% level.

Due to the historical bias and focus towards single-family ownership and construction, the C25 or single-family homes is recognized as a great indicator for the economy (Cetin & Kole, 2012; Glaeser, 2011). The idea is that when the economy is doing well and stable, there is a constant or increase of C25 purchased; however, when there is a downturn in the economy, the number of C25 purchased decrease. This helps illustrates the relationship between the homeownership and renting.
It is important to understand the importance between single-family homes and the renting market. As a result of the Great Recession, many people defaulted on their mortgage and lost their homes. The high number of foreclosures increased (Ellen & Dastrup, 2012). DiPasquale (2011), analyses the effect of home foreclosure on the stock rental units, which effect home and rental prices. Since many people lost their homes, this meant that they entered the renting market. Consequently, the finding in Cetin and Kole (2012) are not unexpected due to the high rate of unemployment during and after the Great Recession. The logic is that during and soon after the Great Recession the number of single-family homes purchased would decrease as people would be unable to afford or risk losing their more of their wealth due to homeownership (Ellen & Dastrup, 2012). In addition, Cetin and Kole (2012), focuses on the purchase of newly constructed single-family homes. This means that with the condition of the economy, the purchase of new homes is expected to be low, especially with how condition of the mortgage sector. To further illustrate the relationship between homeownership and the rental market, in order to make mortgage payment and through other incentives some of the homes that were foreclosed or in fear of foreclosure transferred into the rental stock (DiPasquale, 2011). Therefore, it is expected that households and families would become cautious and withhold from becoming homeowners for fear that they would fall into similar misfortune.

Supply-Demand of Rental Units

As illustrate by Turk (2004), a driver of rent housing affordability is the imbalance of supply and demand. Rosen and Smith (1983), further confirms that rental price changes are significantly affected by limited supply and/or excess demand in the renal market. This study uses a sample of seventeen U.S. cities in a pooled time-series cross-sectional analysis to empirically investigate this relationship. It uses a simple demand and supply theory, stating that
at any one time there is a stock of rental housing units providing housing services and a demand for these services.

The results indicate that the price adjustment in rental housing is sensitive to excess demand and supply conditions in the housing market. Variations in the actual vacancy rate are significant in determining the percentage change in rents at the 96 percent level in thirteen out of seventeen cities, 90 percent level in fifteen of the seventeen cities, and in all seventeen cities using the pooled cross-section time-series regression analysis. It also determined that there is a wide variation in the natural vacancy rate between cities reflect differences in natural vacancy rates and not the degrees of market tightness (Rosen and Smith,1983).

For the demand side analysis, this paper does factor in the time and cost spent by consumers searching for rental units. However, it does not take into account affordability as a determinant for consumers in the searching for rental units. For this analysis specifically, affordability can be factored in as the amount of money and time spent searching for homes, but it could also limit the pool of rental units from which the consumer can choose. Nonetheless, it is understood that this paper seeks to prove the relationship between rental price changes due to the excess supply or demand in the renal market and does not focus on the housing affordability.

Studies like Glaeser and Gyourko (2003), argue that the Unites States is not uniformly facing an affordability crisis. The paper defines housing affordability as housing being expensive relative to the fundamental costs of production. The study finds that home prices are fairly similar to the physical costs of construction. This paper seeks to explain high home prices through two hypotheses. Using a classical economic approach, the first argues that houses are expensive because land is expensive. The second argues that the high home prices are a result of artificial limits or restrictions on construction, in this case on land, not due to scarcity, but as a
result of man-made regulations.

The study uses a hedonic model to compare prices of homes on different land lot sizes and also subtracts the construction costs from the home value and divides it by the number of acres as the two methodologies to measure these relationships. The study uses three approaches, the first, neoclassical approach suggests that land should not be valued the same in either methodology. The second approach, is looking at it according to high-costs areas and finally the third approach correlates measures of regulation with the value of housing prices (Glaeser & Gyourko, 2003).

Using the hedonic model, the study finds that in areas with high home prices, the cost of a house on 10,000 square feet is usually similar in value to a house on 15,000 square feet. Additionally, these high prices often are not associated with extremely high densities. Furthermore, zoning, and other land-use controls, are more responsible for high prices. There is a large gap between the price of land implied by the gap between home prices and construction costs and the price of land implied by the price differences between homes on 10,000 square feet and homes on 15,000 square feet. However, these findings are not definitive (Glaeser & Gyourko, 2003).

The third approached used in this paper, which correlates measures of regulation with the value of housing process is problematic because high values of land may lead to the formation of new regulation. In addition, although home prices are fairly close to the physical costs of construction, in areas like New York and California housing prices are below the physical costs of construction (Glaeser & Gyourko, 2003). The findings in this paper can be used to make explain the supply side of the argument focused on the relationship between rental price changes and supply-demand in the renal market as addressed in Turk (2004) and Rosen and Smith (1983).
The lack of supply and the construction of rental housing units in large cities can more likely explained by the number and strictness of regulations on land rather than availability or cost of land. However, Glaeser and Gyourko (2003) does not account for the fact that government policies since the recession have stimulated new construction of rental units as depicted in DiPasquale (2011).

Similar to Glaeser and Gyourko (2003), Caudill, Ault, and Saba (1988) uses a hedonic model; however, it is used to estimate the costs of rent control to suppliers. The traditional method bases hedonic estimates entirely on transactions in the unregulated sector of the market. This study uses a new approach which uses transaction in the regulated and unregulated as an alternative method in estimating hedonic prices. If most of the transactions in the available data occur in the uncontrolled sector, the efficiency loss from the exclusion of controlled transactions is small. However, many empirical studies of rent control have used data set that include a small number of observations on uncontrolled units.

Both studies use the hedonic model to evaluate different aspects pertaining to the housing market. However, while Glaeser and Gyourko (2003) examines the relationship of regulations on home prices, Caudill, Ault, and Saba (1988), use regulation or lack thereof to examine the cost of controls to suppliers. Similarly, this paper seeks to use this model to examine the determinants of rent prices. Due to these studies, it is evident that regulation and restrictions should be accounted for when examining renting prices.

**Rental Housing Affordability**

Housing affordability can be described as the ability for tenant to spend no more than 30 percent of their household income towards housing costs (Joice, 2014). While severely rent burden is defined as households paying more than 50 percent of their household income on
housing costs (Ellen & Dastrup, 2012). While Turk (2004) and Collison (2011) allude to the important role of income on rental affordability, Rosen and Smith (1983) does not account for nor examine affordability in any form. However, Glaeser and Gyourko (2003), argue that a housing affordability crisis would mean that housing is expensive relative to the fundamental costs of production and not as a result of people simply being poor or their inability to pay for rent. Therefore, Glaeser and Gyourko (2003), focuses only on housing prices and not on the distribution of income.

Nonetheless, Dong (2017) seeks to answer question of whether rising inequality has a worsening effect on rental affordability in metropolitan areas. The study uses two cross-sectional models to detect the effect of inequality on rental affordability in 2000 and 2008-2012. It also uses a longitudinal analysis to assess if the rising inequality (Gini coefficient) has worsened rental affordability. Unlike Glaeser and Gyourko (2003), Dong (2017) defines housing affordability as being determined by housing costs and incomes.

The cross-sectional models revealed a significant and consistent connection between income inequality and the rate of severely rent burdened low-income households. All things equal, an increase in the Gini coefficient by 0.1 in a county resulted in 2.2 in 2000 and 4.4 in 2008-2012 percentage points increase for severely rent-burdened low-income households. The longitudinal analyses confirm that changes of income inequality have a significant effect on changes of rental affordability. On average, counties that experienced a 0.1 greater increase in the Gini coefficient from 2000 to 2008-2012 saw faster growth of the rate of severely rent-burdened low-income households by 2.9 percentage points.

Furthermore, Dong (2017) uses the number of foreign immigrants as a variable to account for demographic shifts; however, Mussa, Nwaogu, and Pozo (2017) and Vigdor (2017)
which look at the effect of immigration on the housing market find that although immigration
does cause an upward pressure on home prices, it also causes a spillover effect of native-flight
which causes prices to balance once again. Nonetheless, similarly to Collison (2011), which
found that many recent college graduates went from renting to moving back with parents after
the recession, this study illustrates the importance of demographic shifts on the effect on stock
and prices and rental units.

As illustrated by the literature there is a persistent imbalance between supply and demand
driving rent prices (Turk, 2004; Glaeser, 2011). In addition, while some of the literature argues
that income does not factor in housing affordability, others state that the examination of income
distribution is essential in studying the rental housing affordability crisis. Furthermore, there is
inconsistency between whose and what type of income should be used when analyzing and
examining rent prices.

Most of the literature argues that there is a housing affordability crisis and seeks to
illustrate this problem of affordability through trends analysis from before, during, and after the
Great Recession. However, Glaeser and Gyourko (2003), argue that this affordability crisis is
not present in the United States. While their argument that restrictions and regulation affect
housing prices shows some results, it is also important to note that their analysis on affordability
was preformed prior to the Great Recession. Therefore, during that period the United States may
not have been suffering from a housing affordability problem. However, more recent studies like
Collinson (2011), DiPasquale, (2011), and even Dong (2017), illustrate that there is inequality
and problems when it comes to affordable housing in the rental market. Therefore, this paper
seeks to examine the determinants of rent price using a hedonic model similarly to the literature
by using factors such as income, population, and other supply and demand variables as characteristics driving these rent prices.

IV. Analytical Framework

Data and Variables

The dataset includes the top or major metropolitan areas and examines data from 2010 to 2015. Similar to the literature this paper uses a sample which includes the greatest population sizes in the country, but unlike Collinson (2011) and DiPasquale, (2011), it does not focus on the top 10 or 25, which is too small of a sample size and may not give an accurate representation of metropolitan areas across the country. Instead this paper used the top 73 metropolitan statistical areas. This is a large enough sample size that represents the distribution of the United States; however, using all the statistical metropolitan areas in the country, which is almost 2,000, would lead to a large distribution and variance in population and income.

This paper seeks in a way to be an update to Collinson (2011) analysis of the rental housing affordability, which focuses on 1990 to 2009. Consequently, this paper analyzes and examines the rental market starting 2010. In addition, the analysis stops at the year, 2015 because this is the year with the most recent, available, and updated data.

Data for rent prices is difficult to find and sources are scarce. For example, Fair Market Rent (FMR) prices are used to determine payment standard amounts for the Housing Choice Voucher program, to form initial renewal rents for some expiring project-based Section 8 contracts, to determine initial rents for housing assistance payment (HAP) contracts in the Moderate Rehabilitation Single Room Occupancy program (Mod Rehab), and to create rent ceilings for rental units in both the HOME Investment Partnerships program. The U.S. Department of Housing and Urban Development (HUD) annually estimates FMRs for the Office
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of Management and Budget (OMB) who defines metropolitan areas and micropolitan areas (Fair Market Rents, 2018). However, compared to the Zillow Group rent prices and other rent prices found in different databases, FMR are lower than real rent prices; therefore, they are not an accurate representation of rent prices in metropolitan statistical areas analyzed in this paper. However, this does illustrate that there is a gap between real rent prices and these government programs.

In addition, Zillow Group is an independent online real estate company. It gathers monthly rental data; however, this data is only for that of their listings. Furthermore, since this a privately-owned company, the data is based on their interpretation and definition of a metropolitan area, which does not accurately match any other dataset for metropolitan areas (Zillow Group, 2018).

Consequently, the paper uses data based on the median gross rent for each metropolitan area from the American Community Survey (ACS), which is part of the United States Census Bureau. The ACS is a continuous survey which provides yearly information about the nation and the people of the United States. The ACS provides information about jobs, and occupations, educational attainment, veterans, homeownership status, and similar data. The ACS recently began to gather median gross rental data based on bedrooms for the year 2015 onward; therefore, this could be used for future research (About ACS, 2018).

The dataset for population and rental vacancy rates was obtained from the U.S. Census Bureau. The U.S. Census Bureau is a part of the U.S. Department of Commerce and overseen by the Economic and Statistics Administration (ESA), it gathers data on the county's people and economy. The dataset population is an estimate based on the latest census of 2010. The Census Bureau uses the United States Office Management and Budget (OMB) definition of metropolitan
and metropolitan statistical data areas for their housing and rental vacancy data (What We Do, 2018).

The dataset for real income per capita, is from the Bureau of Economic Analysis (BEA). The BEA is an agency of the Department of Commerce. Along with the Census Bureau, the BEA is part of the Department's Economics and Statistics Administration. The BEA produces economic accounts statistics that enable government and business decision-makers, researchers, and the American public to follow and understand the performance of the Nation's economy. To do this, the BEA collects source data, conducts research and analysis, develops and implements estimation methodologies, and disseminates statistics to the public (BEA, 2018).

The dataset for unemployment rate was obtained from the Bureau of Labor Statistics (BLS). The BLS is independent statistical agency, which is a part of the U.S. Department of Labor, who is the main federal agency responsible for measuring labor market activity, working conditions, and price changes in the economy. It collects, analyzes, and disseminates economic information for a wide range of individuals and groups such, but not limited to business leaders, consumers, economists, financial advisors, jobseekers, public policy, the media, students and educators, as well as researchers (What We Do BLS, 2018).

In order to account for strictness or regulation on construction, this paper uses the amount of building permits that were given out each year from 2010 to 2015. The dataset for construction permits was acquired from the State of the Cities Data System (SOCDS). This dataset is a part of the U.S Department of Housing and Urban Development (HUD). The building permit database, contains data on permit for residential construction issued by about 21,000 jurisdictions collected in the Census Bureau's Building Permits Survey (SOCDS, 2018).
The dependent variable for this regression function is $GREN_T_{it}$, median gross rent where $t^{th}$ time is from 2010 to 2015 of the $i^{th}$ metropolitan area. Gross median rent provides information on the monthly housing cost expenses for renters, this variable is measured in U.S. dollars. It is the contract rent plus the estimated average monthly cost of utilities (electricity, gas, and water and sewer) and fuels (oil, coal, kerosene, wood, etc.). As evident by Collinson (2011) and Turk (2004), previous studies have done trend analysis on rent prices and the rental market. A limitation to this variable is that it does not differentiate between the types of rental units, meaning the rent price is the median rent for one-bedroom, two-bedrooms, condominiums, etc., which may not result in the most accurate representation of rent prices in the region. However, compared to other sources this is the best available data for rent prices. Furthermore, since this study uses a hedonic price model and seeks to examine the rental market it seemed that this would be the most appropriate form of price.

The independent variable, $POP_{it}$, is population for $t^{th}$ time, 2010 to 2015 of the $i^{th}$ metropolitan area. Population is one of the various variables in this study used to account the imbalance of supply and demand concluded in Turk (2004). The more people in an area, the more demand for limited rental stock, which would result in an increase of rent. Similarly, Cetin and Kole (2012) also use population in their analysis of the decrease of single-family home purchases. However; it is important to keep in mind changes in population happen overtime and even then, these changes may not be drastic.

The independent variable, $RIN_C_{it}$, is real income per capita in $t^{th}$ time from 2010 to 2015 of the $i^{th}$ metropolitan area. While Collinson’s (2011) analysis focuses on just renters’ income, Turk (2004) argues that that assessment of the costs underlying rents, suggests that rents are not strictly or typically set on the basis of costs of provision. Instead, income levels directly
drive rents in which the skew in income distribution becomes both cause and effect within the housing market. Therefore, although market value of properties is central more as a result of the state of the real estate market but not intrinsic costs. Consequently, the income levels of all households, not only renters, but also of owner-occupied housing, both existing and newly constructed, may have primacy in determining the rent levels set. Dong (2017), also examines inequality and its effect on rental affordability; however, uses the Gini coefficient. Collinson (2011) and Dong (2017), both use renters' income; however, due to the vast income distribution in metropolitan statistical areas and the limited supply of rental stock in these areas, it is essential to use all income in the analysis and not just renters' income. In addition, by using real income per capita, compared to income per capita, inflation is taken into account and therefore, an inflation variable such as consumer price index (CPI) does not need to be included in this regression model.

The independent variable \( UNEMP_{it} \), is unemployment rate in \( t^{th} \) time from 2010 to 2015 of the \( i^{th} \) metropolitan area. This variable is in conjunction to the unemployment variable used in Cetin and Kole (2012). In addition, as illustrated by Vukovic, (2010), Ellen and Dastrup (2012), and Margalit (2013), describe the effects the Great Recession had on unemployment, which impacted the housing market drastically. The independent variable \( VRATE_{it} \), is rental vacancy rate in which \( t^{th} \) time from 2010 to 2015 of the \( i^{th} \) metropolitan area. This is the proportion of the rental inventory which is vacant and available for rent. As illustrated by Rosen and Smith (2011), Collinson (2011), DiPasquale (2011), and Turks (2004), the availability of rental units is important in understanding the relationship between supply and demand in terms of rental stock, which according to the literature stated above, have an effect on prices.
The final independent variables are \( TOTALPER_{it} \) for the sum of all types of permits in \( t^{th} \) time from 2010 to 2015 of the \( i^{th} \) metropolitan area. This variable is then divided into the types of permits based on the number of units being built. These include: \( ONEPER_{it} \) for single-family homes, \( TWOPER_{it} \) for a two-units, \( THREEPER_{it} \) for three or four-units, and \( FIVEPER_{it} \) for five or more units for \( t^{th} \) time is from 2010 to 2015 of the \( i^{th} \) metropolitan area. Glaeser and Gyourko (2003), found a relationship between regulation or strictness on construction of units as being more important than the relationship between land availability and construction. Therefore, in order to account for regulation strictness, this study looks at the number of permits given out each year in each metropolitan area. The idea is that a high number of permits would signify that regulation is low; while, a small number of permits indicates regulation to be high. The variable \( ONEPER_{it} \), which is the number of permits for single-family homes is used because availability of single-family homes would have an effect on people deciding to rent or buy. In addition, while in some metropolitan areas single-family homes may not be common to rent, in other metropolitan areas it is common; therefore, it is important to account for units that are representative of all the metropolitan areas in this study.

As stated earlier, this paper focuses on metropolitan statistical areas. Metropolitan areas are socially and economically integrated groupings of one or more counties, which provide appropriately detailed geographic analysis in addition to some mapping units for a national overview. Therefore, metropolitan areas do take into account population in a region, but it does account for other factors. Populations are not constant; therefore, the metropolitan areas are always changing. This means that the ranking of metropolitan areas is not constant and can change from year to year. In addition, this can also mean that the name of metropolitan areas can also change from every few years.
The 2000 and 2010 standards provide that each CBSA must contain at least one urban area of 10,000 or more population. Each metropolitan statistical area must have at least one urbanized area of 50,000 or more inhabitants. However, changes in the delineations of these statistical areas since the 1950 census have consisted chiefly of the recognition of new areas as they reached the minimum required city or urbanized area population, and the addition of counties cities and towns to existing areas as new decennial census data showed them to qualify. In some instances, formerly separate areas have been merged, components of an area have been transferred from one area to another, or components have been dropped from an area. Most of the changes take place on the basis of decennial census data (Geographic Terms and Concepts, 2012).

Some of the datasets define a statistical metropolitan area based on the 2000 metropolitan/nonmetropolitan definitions, while other datasets use the 2015 definition. The 2015 metropolitan area data reflect 2010 definitions, the 2005 to 2014 data reflect 2000 definitions (Geographic Terms and Concepts, 2012). Therefore, a limitation to this paper is that some of the metropolitan areas have changed from one definition to another meaning, they either no longer qualify as a metropolitan area from one dataset to another or are no longer named the same due to additions, merging, or disqualification due to change in populations.

**Regression and Hedonic Price Model**

Unlike previous studies this paper seeks to examine the determinants of rent price using a hedonic pricing model. The hedonic pricing model assumes that price is determined by internal characteristics of the good being sold and external factors affect it. The hedonic pricing model is often times used to estimate quantitative values for ecosystem or environmental services that directly affect market price. While the hedonic price model is commonly used for a
microanalysis approach, this paper seeks to use the concepts of the hedonic price model to analyze rental prices using a microanalysis approach. Consequently, this paper uses real income per capita, population, rental vacancy rate, unemployment rate, and regulation strictness as the characteristics driving and affecting prices in the rental market.

The main regression function of this paper is:

\[
\ln GREN_T_{it} = \alpha_i + \beta_0 \ln POP_{it} + \beta_2 RINC_{it} + \beta_3 UNEM_{it} + \beta_4 VRATE_{it} + \beta_5 \ln ONEPER_{it} \\
+ \beta_6 \ln TWOPER_{it} + \beta_7 \ln THREEPER_{it} + \beta_8 \ln FIVEPER_{it} + \varepsilon_{it}
\]

The idea for this function came from Cetin and Kole (2012), where they used an OLS regression function to examine the decrease of single-family homes sold. Cetin and Kole (2012) use the number of single-family homes sold as the dependent variables and independent variables included population, unemployment, and income, which are illustrated in this regression function as \(POP_{it}\) for population, \(UNEM_{it}\) for unemployment rate, and \(RINC_{it}\) for real income per capita. Since this paper is examining data from 2010 to 2015 for 73 metropolitan statistical areas, real income per capita was used to account for inflation for the time interval. In addition, income per capita rather than median income is used because income per capita is better when comparing one geographic area to another.

While the idea for this function originated from Cetin and Kole (2012), this paper takes a different approach in that it uses prices, specifically, median gross rent prices, as the dependent variable since it is trying to examine the determinants on prices rather than numbers of something sold or rented. The dependent variable \(GREN_T_{it}\), is similar to rent prices observed in Collinson (2011), Turk (2004), and DiPasquale (2011). However, due to availability of data and a larger number of statically metropolitan areas being used in this paper, median gross rent is
used rather than median rental prices. Furthermore, $V_{RATE_{it}}$ represents vacancy rate and is similar to rental stock and vacancy rate found in Rosen and Smith (2011), Collinson (2011), DiPasquale (2011), and Turks (2004). Finally, $ONEPER_{it}$, $TWOPER_{it}$, $THREEPER_{it}$, and $FIVEPER_{it}$, are used to represent strictness or restrictions on construction as found in Glaeser and Gyourko (2003). All of these variables are representative of the relationship between supply and demand and how supply and demand affect rental prices. The literature constantly illustrates that there is an persistent imbalance between the supply and demand relationship in the rental market, due to historical and current focus on the construction of single-family homes.

The expectation is that $GRENT_{it}$ and $POP_{it}$, will have a positive relationship, since there is an expectation that as population increases demand will increase; therefore, leading to an increase in rent prices. According to Rosen and Smith (1983) even when new rental stock is added into the market, there are also rental stocks being removed from the market; therefore, the rental stock remains fixed. Consequently, if rental stock remains fixed as argued by Rosen and Smith (1983), if population increases the demand on a limited supply of rental units will cause prices to increase.

Ellen and Dastrup (2012), explains that although prices in general were decreasing throughout the country during the Great Recession, rent prices continued to increase steadily. However, a similar relationship is expected between $GRENT_{it}$ and $RINC_{it}$. An increase in real income per capita would mean people are able and willing to pay more for rent causing rent prices to also increase.

Vukovic, (2010), Ellen and Dastrup (2012), and Margalit (2013), describe the effects the Great Recession had on unemployment and its effect on the housing market. Many households went from owning their own to defaulting on their mortgage payments as a result of the Great
Recession. The high unemployment was a big factor as to why households could not make payments. However, since the Great Recession unemployment rates have decreased. Therefore, a negative relationship is expected between $GREAT_{it}$ and $UNEM_{it}$ because as unemployment decreased it is expected that more people are able to afford to pay rent causing a allowing rent prices to increase.

Rosen and Smith (1983) and DiPasquale (2011) have opposing views on the effects of vacancy rate and rental stock. While, DiPasquale (2011) argues that a portion of the foreclosure housing transferred into the rental market and there has been an increase in the construction of multifamily homes, Rosen and Smith (1983) argues that rental stock remains constant since addition to and elimination of rental stock are constantly happening at the same time. Therefore, it is unknown whether the relationship between $GREAT_{it}$ and $VRACTE_{it}$, will be negative or positive. If not accounting for Rosen and Smith (1983) argument that rental stock is fixed, the expectation is that as vacancy rate increases, it means that there are more available units for rent. According to supply and demand theory, an increase in supply will lead to a decrease in prices; therefore, rent prices would drop. However, if Rosen and Smith (1983) is correct then a positive relationship is expected.

To explain the relationship between $GREAT_{it}$ and each of the permit variables, $ONEPER_{it}$, $TWOPE_{it}$, $THREEPER_{it}$, and $FIVEPER_{it}$, it is beneficial to look at the relationship between $GREAT_{it}$ and the sum of all the permits as seen by $TOTALPER_{it}$. Similar to the relationship between $GREAT_{it}$ and $VRACTE_{it}$, the relationship between $GREAT_{it}$ and $TOTALPER_{it}$, is undetermined. Once again this has to do with the opposing arguments between Rosen and Smith (1983) and DiPasquale (2011). If rental stock is not fixed, the argument is that with low regulation the amount of permits would be many; therefore, there would be an increase
in supply which would decrease rent prices. The opposite would be if regulation is high and only a few permits issued each year. However, if rental stock is not fixed then, a positive regulation is expected.

A total of five models are used in this study. As illustrated by Table 1, model 1, uses $TOTALPER_{it}$; however, model 2 through model 5, are used to illustrates how each individual type of permit affects rental prices by adding each new type of permit variable to the next model.

V. **Robustness Checks**

The dataset presented and used in this study is a data panel. Consequently, the Hausman test was used to determined whether a fixed effect model or a random effect model was appropriate.

\[
H_0: FE = RE \\
H_0: FE \neq RE
\]

The null hypothesis is that the preferred model is random effects. The alternate hypothesis is that the model is fixed effects. Essentially, the test looks to see if there is a correlation between the unique errors and the regressors in the model. The null hypothesis is that there is no correlation between the two. As illustrated in Table 2, the Hausman test results indicate a p-value of 0.00, meaning the null hypothesis is rejected and conclude that a fixed affect model is appropriate for this study.

Furthermore, a multicollinearity test was also preformed. The classical assumption states that there is no relationship among x-variables. Table 3, illustrates the result of the test. None of
the variance inflation factors (VIF) for any of the independent variables and the mean VIF were greater than 5, signifying there being no multicollinearity.

VI. Results

The relationships between $GREN'T_{it}$ and each of the independent variable $POP_{it}$, $RINC_{it}$, and $UNEM_{it}$, did match the expected relationships, as illustrated by table one, Models 1 through 5. Table 1, illustrates that the independent variable $VRATE_{it}$, has a positive coefficient, representing a positive relationship with $GREN'T_{it}$. Furthermore, as seen in Table 2, Model 1 illustrates $TOTALPER_{it}$ having a positive coefficient signifying a positive relationship with $GREN'T_{it}$. Model 2 through Model 5, show $ONEPER_{it}$ has a positive coefficient, illustrating a positive relationship with $GREN'T_{it}$. On the contrary, the independent variable $TWOPER_{it}$ has a negative coefficient which shows a negative relationship with $GREN'T_{it}$ in Models 3 through 5. The independent variable $THREEPER_{it}$, has a positive coefficient in Model 4 and 5, describing a positive relationship with $GREN'T_{it}$. Finally, Model 5, the independent variable $FIVEPER_{it}$ also has a positive coefficient, illustrating a positive relationship with $GREN'T_{it}$ (Table 1).

In all five models, $POP_{it}$, $RINC_{it}$, and $UNEM_{it}$, were significant at a level of 1% (Table 1). In model 1, 2, and 4, the independent variable $VRATE_{it}$, was significant at a 10% level; however, in Model 5, significance is found at a 5% level, while in model 3, no significance at any level. Significance is only found in model 3 at a 10 % for the independent variable $SINPER_{it}$ and no significance is evident in the final model. Models 4 and 5 both show that there is a is 10% significance for $TWOPER_{it}$. Significance is also found in these two models for the independent variable $THREEPER_{it}$ at a 1% level. Finally, no significance is found for the independent variable $FIVEPER_{it}$ in the final model. Finally, although the model only explains
an overall 22% variation of the dependent variable $GREN_{it}$. It does explain 81% variation for $GREN_{it}$, within each metropolitan area (Table 1).

VII. Discussion of Results

Population, real income per capita, and unemployment, have a high significant effect on median gross rent, as expected and in accordance to the literature (Collinson, 2011; Turk 2004; Cetin and Kole, 2012). As population increases, gross median rent also increases due to the law of supply and demand, thus is supports Rosen and Smith (1983) argument that demographic shifts affect rent prices. In addition, during the Great Recession many people lost their homes and became renters; therefore, adding to the demographic shift happening in these areas. Similarly, as income per capita increases people are can and/or willing to pay more for rent which; therefore, increases rent. The law of supply and demand also helps explain the relationship between unemployment and median gross rent prices.

The high unemployment rate reached during the Great Recession had detrimental affect in the housing market. Therefore, it is no surprise that there was a spillover effect into the rental market. This can be explained by the number of individuals who could not afford to pay their mortgage and therefore lost their homes (Ellen & Dastrup, 2012). Consequently, as unemployment rates decreases, people are able to rent, which means that demand will increase leading to an increase in prices. Not only are people able to pay rent, but some people may decide to become homeowners once again (DiPasquale, 2011).

The positive relationship between gross median rent and vacancy rate supports Rosen and Smith (1983) argument that rental stock is fixed. Furthermore, DiPasquale (2011) argues that people are constantly moving from one type of rental unit to another; this could be an another explanation for this positive relationship. This means that there is no distinction as to which
typed of units become available as the vacancy rate increases. On type of movement, can be that people are moving from expensive renting units to more affordable units. This means that there although vacancy rate increases, the amount of affordable renting unit may be low or decreasing, while the rental stock that increasingly becomes available are expensive units.

In Model 1, the sum of all permits also had a positive relationship with the gross median rent. Similarly to the positive relationship between gross median rent and vacancy rates, it is unclear as to what typed of units are being constructed, whether the new additional rental stock is targeted to people with high income or if is targeting low-income renters and increasing the number of affordable units. Furthermore, it supports Rosen and Smith (1983), argument that rental stock is fixed. Unlike the positive relationship between the sum of all types of permits and median gross rent, two-unit permits was the only permit that had a negative relationship with median gross rent. This can mean that for two-permit building the rental stock is not fixed.

However, it is interesting see that while permits for single-family homes and five or more units where not significant and have no effect on median gross rent; two, three, and four unit permits do have significant effect on median gross rent prices. This can be explained by just analyzing the raw data. Single-family home and five or more units are the permits that are commonly issued in metropolitan areas. This means that year to year the number of permits in these two categories do not change drastically. On the contrary, two, three, and four unit permits are low even zero in some metropolitan areas. Therefore, any change in the number of these permits year to year would have a higher impact on gross rent prices compared to single-family and 5 unit or more permits.

By examining the determinants of rent prices, it allows a better understanding of the rental market in the debate of whether there is a problem of affordability in the United States. As
illustrated by Figure 1 and 2, gross median rent and income per capita have both increased since 2010. However, Figure 3 demonstrates that the percent of income spent of gross media rent has decreased since 2010. As to the definition of affordability, housing is affordable if a tenant is spending less than 30 percent of their household income on housing cost (Joice, 2014). Although the percentage of income spent of gross median rent has decreased it remains above 30 percent. Therefore, it can be said that there has and continues to be an affordability problem in the United States; however, as the economy stabilizes and unemployment rates decrease, this affordability problem will continue to decrease and soon fall under 30 percent.

**VIII. Conclusion**

Between 2007 and 2009, the number of low income renters who met the criteria to qualify for government housing assistance programs increased by 1.2 million households; however, housing assistance resources did not match this increase. This lead, households receiving federal housing assistance dropped from 27.4 to 25 percent. In addition, during this same time period, homelessness increased by 30 percent (Ellen & Dastrup, 2012).

The historical federal bias and focus on the construction and homeownership of single-family homes has had a direct effect on the rental market (Glaeser, 2011). Although, vacancy rate in the rental market has increased since the Great Recession, in part because many of the homes that were foreclosed became rental stock and in part due to a small increase in the construction of multifamily buildings (DiPasquale, 2011). However, as illustrated by the findings rental stock for multifamily building remain fixed. Consequently, there is still an affordability problem although it has been decreasing. The problem is there is a lack of affordable units. Furthermore, when looking at vacancy rate one cannot distinguish between the typed of units that become available. Also, much of the existing rental stock is decades old,
meaning that eventually these rental units are taken out of the market. If these rental units are taken out of the rental stock at a faster and higher rate than, then the new stock being constructed, this can explain why the rental stock is constant as illustrated in the findings.

Consequently, this illustrates that the imbalance of supply and demand the rental market since rental stock remains constant but demand for rental units increases. Consequently, it is recommended that the federal policies be created to help increase the construction of new multifamily homes through incentives and by reducing restrictions. As the focus shifts towards the rental market and away from homeownership, it is expected that the amount of rental units entering the rental stock is greater than the amount of units that become unavailable in the rental stock to a point that it always supply and demand to reach equilibrium and therefore, make housing more affordable.

**Further Research**

A large limitation to this study is that median gross rent does not distinguish between the type of rental unit; therefore, in a large metropolitan area like New York-Northern New Jersey, where rents vary greatly, the median is not the best representation of rent. However, due to limited data this was the only available dataset. Nonetheless starting in 2015, the ACS began to gather data for median gross rent based on bedrooms. Therefore, if this research is replicated for years after 2015, using this new dataset it would be interesting to see if findings are different, specifically for rental vacancy rate. A second limitation of this study is that all previous rental price studies have performed trend analysis; therefore, this is paper is the first to use regression analysis to examine the determinates of rental prices, while using a hedonic pricing model which is usually used for a micro approach. A third limitation to this study is similar to the problem
with making a distinction between the type of rental unit due to the number of bedrooms. With vacancy rates it is difficult to differentiate among the types of units which are available for rent.
### Table 1: Hedonic Price Model

<table>
<thead>
<tr>
<th>Dep variable</th>
<th>Model (1)</th>
<th>Model (2)</th>
<th>Model (3)</th>
<th>Model (4)</th>
<th>Model (5)</th>
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<td>0.001</td>
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<td>(0.00)</td>
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</tr>
<tr>
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<td>80.2%</td>
<td>80.1%</td>
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All standard errors are in parentheses
* indicates significance at 10% level of significance
** indicates significance at 5% level of significance
*** indicates significance at 1% level of significance
Table 2: Hausman Test

<table>
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<th>Dep variable $GREN_T_{it}$</th>
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<th>Random Effect Model</th>
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<tr>
<td>$POP_{it}$</td>
<td>0.78*** (.11)</td>
<td>0.11*** (.02)</td>
</tr>
<tr>
<td>$RINC_{it}$</td>
<td>0.30*** (0.5)</td>
<td>0.37*** (.05)</td>
</tr>
<tr>
<td>$UNEM_{it}$</td>
<td>-0.01*** (.002)</td>
<td>-0.01*** (.001)</td>
</tr>
<tr>
<td>$V RATE_{it}$</td>
<td>0.002** (0.0008)</td>
<td>0.0006 (.0009)</td>
</tr>
<tr>
<td>$ONEPER_{it}$</td>
<td>0.009 (.007)</td>
<td>0.02*** (.007)</td>
</tr>
<tr>
<td>$T W OPER_{it}$</td>
<td>-0.004* (.001)</td>
<td>-0.0008 (.002)</td>
</tr>
<tr>
<td>$T H R E E P E R_{it}$</td>
<td>0.005*** (.001)</td>
<td>0.004* (.002)</td>
</tr>
<tr>
<td>$F I V E P E R_{it}$</td>
<td>0.004 (.003)</td>
<td>0.006** (.003)</td>
</tr>
<tr>
<td>$C o n s$</td>
<td>-7.7*** (1.5)</td>
<td>1.1* (.61)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>22%</td>
<td>24.8%</td>
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</tbody>
</table>

P-Value : 0.00

All standard errors are in parentheses
* indicates significance at 10% level of significance
** indicates significance at 5% level of significance
*** indicates significance at 1% level of significance

Table 3: Multicollinearity

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
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<td>$PO P_{it}$</td>
<td>4.95</td>
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<tr>
<td>$R I N C_{it}$</td>
<td>4.62</td>
</tr>
<tr>
<td>$UNEM_{it}$</td>
<td>3.76</td>
</tr>
<tr>
<td>$V RATE_{it}$</td>
<td>3.18</td>
</tr>
<tr>
<td>$ONEPER_{it}$</td>
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<tr>
<td>$T W OPER_{it}$</td>
<td>1.47</td>
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<tr>
<td>$TH R E E P E R_{it}$</td>
<td>1.24</td>
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<tr>
<td>$\beta_8 F I V E P E R_{it}$</td>
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<tr>
<td>Mean VIF</td>
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Table 4: Descriptive Statistics

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<th>Observations</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Minimum</th>
<th>Maximum</th>
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<td>85712</td>
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<td>2.3</td>
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<td>7698.01</td>
<td>9713.69</td>
<td>453</td>
<td>86424</td>
</tr>
</tbody>
</table>
List of Figures

Figure 1: Income Per Capita

Figure 2: Median Gross Rent
Figure 3: Percentage of Income Spent on Median Gross Rent

![Graph showing the percentage of income spent on median gross rent from 2010 to 2015. The graph indicates a general trend of decrease in the percentage spent on rent, with slight fluctuations over the years.](image-url)
References


Cetin, A. C., & Li Kole, J. (2013). The factors which caused the decline in the amount of the newly one family houses sold in US. *Journal of Economic and Social Studies, 3*(1), 185-198.


