Do Charter Schools Decrease the School Quality House Price Premium?

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Abstract

In the United States, students are typically assigned to public schools based on their residence. Parents that want access to good quality zoned schools pay a higher house price to guarantee admittance. Introducing charter schools, a substitute to zoned schools, can impact housing prices. In this paper, I examine the effect of charter school legislation on housing prices using data from the metropolitan American Housing survey (AHS). Using self-reported transaction prices from 43 metropolitan areas for 1985-2005 and a fixed effects estimation strategy, I find that the introduction of charter schools is associated with a decrease in housing prices. Using quantile regressions, I present evidence that the estimated negative effect reflects a weakening of the link between zoned school quality and housing prices. In fact, I observe an increase in housing prices in the bottom part of the housing price distribution and a decrease in housing prices in the top part of the housing distribution once charter legislation is in place. The observed pattern reflects residential sorting following the introduction of charters. This paper provides evidence that households value the choice available through charter school policy.

Keywords: charter school legislation, house prices, distributional effects

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1 Introduction

School quality is not uniform across schools. Parents that want access to higher quality schools have to pay either private school tuition or a school quality premium when buying a house. A higher school quality house price premium guarantees admittance to a higher quality zoned public school. Households that cannot afford private schools or a house in a high-quality school zone are often forced to attend relatively lower-performing schools. To address this type of inequality and to improve school quality for all students, starting in 1991, states implemented legislation that allowed charter schools to operate. Charter schools provide an alternative to traditional public schools. They also have the potential to increase competition in the education market and improve school quality in traditional public schools [Hoxby, 2003].

Charter schools can impact housing prices through multiple channels. The first channel, which we will refer to later as the de-linking hypothesis, revolves around households' valuation of zoned school quality. Once charter schools are operational, households' valuation of access to zoned schools might decrease. Charter schools would impact housing prices indirectly by weakening the link between zoned school quality and residential choice. Other channels allow charter schools a more direct impact on house prices. The school quality of charters themselves can be capitalized in housing prices. We later refer to this channel as the amenity/disamenity hypothesis. The impact of charter schools on housing prices will depend on the charter school quality. Additionally, in areas with good quality charter schools where the charters provide priority to students residing within the same school zone or district as the charter, we might observe a stronger capitalization of charter presence in housing prices within that area. In fact, there is evidence that access to charter schools is positively capitalized in housing prices in metropolitan Atlanta. Prices increased by six to eight percent for priority one zone homes (where households have a higher probability of admissions) compared to priority two zone homes after the opening of a new charter school [Andreyeva and Patrick, 2017].

The last channel, which we will refer to later as the information hypothesis, relies on the availability of information for home buyers. Households interested in buying a house usually have access to information on house characteristics (number of bedrooms, number of bathrooms, etc.) and school

zones to which the house belongs. However the real estate market is not completely transparent, for example, there is no information provided on crime statistics or details about schools. [1] The information exists but it's not easily available. Given the search costs associated with finding out additional information about a neighborhood and charter schools' tendency to locate in urban areas with high concentrations of minority and low-income students [Epple et al., 2015], it is possible that homebuyers interpret the location of a charter as a signal to avoid a given neighborhood. The presence of charter schools could depress demand in that neighborhood. Households tend to prefer to self-segregate on the basis of sociodemographic measures [Baum-Snow and Lutz, 2011; Bayer et al., 2007].

By examining the effect of charters on housing prices using data from 43 metropolitan areas, we add to the literature examining the impact of school choice on residential location. Economic literature studying the effect of different forms of school choice theorized that choice weakens the link between neighborhood school quality and housing prices [Epple and Romano, 2003; Ferreyra, 2007; Nechyba, 2000]. While empirical papers on the effect of vouchers and open enrollment have confirmed those predictions [Brunner et al., 2001; Brunner et al., 2012; Machin and Salvanes, 2016; Reback, 2005], less is known about the effect of charter schools on housing prices. The results from Los Angeles County suggest that neither the increase in the number of charter schools nor the expansion in charter enrollment relative to public school enrollment is capitalized into housing prices. However, an additional charter school operating in a school district and within 2 miles of a house reduces house prices by 1.9 percent when only considering charters located within the household's school district boundaries and excluding Los Angeles Unified School District [Brehm et al., 2017].[2] On the other hand in Metropolitan Atlanta, there is evidence that access to charter schools is positively capitalized in housing prices. Prices increased by six to eight percent for priority one zone homes (where households have a higher probability of admissions) compared to priority two zone homes after the opening of a new charter school [Andreyeva and Patrick, 2017].

[1] Certain details about a neighborhood or community can violate the Fair Housing Act, which was enacted in 1968 to eliminate housing discrimination.

[2] Brehm et al. [2017] restricts the analysis to charters within the household's school boundaries because students who reside within the charters authorizing school district (which is almost always the district they are located in) have admissions priority, thus generating a link between these charters and local district boundaries.

In this paper, we take advantage of the variation in when charter laws were implemented across states between 1985 and 2005. We estimate that charter schools decrease housing prices gradually over time. Once charter legislation has been in place for at least one year, our most conservative estimate shows a 7.5 percent decrease in housing prices. There are at least two alternative explanations for these results: (i) the link between neighborhood school quality and residential choice has become weaker over time (de-linking hypothesis) or (ii) charter schools are negatively capitalized in housing prices (amenity/disamenity hypotheis or information hypothesis). The first explanation reflects that households value public school quality less since charters act as cheaper substitutes to good zoned public schools. The second explanation implies that charters decrease demand for houses in neighborhoods where they locate. Charters either adversely impact academic performance or are perceived as a negative signal that a neighborhood should be avoided. We provide evidence that the effect of charters on housing prices is likely due to the delinking between neighborhood school quality and housing prices.

The results are robust to using different functional forms (log-level, level-level, and Box-Cox) as well as to using a repeated sales sample and to restricting the data to a shorter time period. When we examine the effect of charter schools on the distribution of housing prices, we find that the effect starts positive, gradually decreases, and then becomes negative as housing prices increase. Housing prices increase by about 1.6 to 9.3 percent below the 20th percentile and decrease by about 1.2 to 8.4 percent starting at the 30th percentile. The pattern observed using quantile regressions suggests that a delinking between public school quality and housing prices occurs once charters start operating. We report a large effect of charter legislation on housing prices. [3]

[3] While our most conservative estimate and quantile regression results fall within the range of effects estimated in the literature, some of our results are very large in magnitude. This might be due to the nature of our dataset and its limitations. Charters are more likely to locate in metropolitan areas and these areas are the source of our sample. In fact, 30 metropolitan areas (of which 25 are included in our dataset) account for 63% of total charter enrollment. Seven of those metropolitan areas (and in our dataset), each have more than 3 percent of national charter enrollment with Los Angeles leading with 6.5 percent of total U.S. charter enrollment [Epple et al., 2015]. Our sample of houses are from 43 metropolitan areas, 25 of which have really high charter enrollment. This could bias our results upwards. In addition, we assume that all 43 metropolitan areas constitute one housing market. The hedonic model is based on a single housing market and there is a bias-variance trade-off in defining a housing market [Parmeter and Pope, 2009]. Our

Examining the literature to benchmark ours results, we find that the effect of different school policies on housing prices is non-negligible. Regarding the capitalization of zoned school quality in housing prices, the conclusion that emerges from many countries, different identification startegies, and at different levels of the education system is that house prices go up approximately 2.5 percent for a 5 percent change in test scores [Black and Machin, 2011]. Place-based "Promise" scholarship programs are capitalized in housing prices on the order of 4 to 6 percent. Housing price effects are larger in neighborhoods with high quality schools and in the upper half of the house price distribution [LeGower and Walsh, 2014]. Focusing on papers examining the effect of school choice policies on housing prices, we find that after inter-district open enrollment was implemented in Minnesota, a percentage point increase in outgoing students from a school district was associated with a 1.5 percent increase in housing prices within the sending district. In addition, a 1 percentage point increase in incoming students into a school district was associated with a 1.1 percent decrease in housing prices within the receiving district [Reback, 2005]. Once complete intra-district high school choice was in place in Oslo, the premium associated with living within the attendance zone of a high-quality school declined by approximately 50 percent. Before choice was introduced, a one standard deviation in student test scores was associated with approximately an 8 percent increase in housing values [Machin and Salvanes, 2016].

Only seven states have not passed charter legislation so far. The number of students choosing charters over their zoned school keeps growing, and the number of charter schools keeps increasing. Charter schools increased from 1.7 percent of all public schools in 1999 to 6.9 percent in 2014. Charter enrollment increased from 0.7 percent in 1999 to 5.4 percent in 2014. Given the prevalence of this policy, it is important to assess its effects. Looking at the housing market allows us to examine the valuation of charters by households. It also makes it possible to examine the valuation of charters by different groups through documenting the variation in capitalization effects across the housing price distribution. Households' valuation of charters can provide evidence on the effectiveness of charter school policy and shed light on any unintended effects.

use of a large housing market might bias the results but it's not feasible for us to conduct the analysis with a smaller definition of a housing market since the AHS does not include publicly available detailed geographic information on houses.

2 Background on Charter Policies

The US has a decentralized schooling system where school boards are responsible for setting attendance zones. Students are assigned to a school based on their residential location, in other words the attendance zone in which they reside. A combination of geographic and historical conditions as well as a pursuit of property values created this zone-based school assignment system [Fischel, 2009]. [4] A consequence of zone-based assignment is that households that want to choose a school for their children to attend have two options. They can either pay private school tuition or "purchase" higher school quality by paying a higher price for a house, ceteris paribus.

A variety of legislation starting in the 1970's offered parents and students more control over which school they attend.[5] One of these legislation, charter school policies allow charter schools to operate. Charters are public schools with public funding. However, they differ in the level of flexibility they are allowed by school districts regarding curricula and staffing decisions. Minnesota was the first state to pass charter school law on June 4th, 1991. The first charter school did not start operating in St. Paul until September 7th, 1992. Initially, charters were championed by Albert Shanker, the president of the American Federation of Teachers, as means for teachers to create their own experimental schools under the district's supervision [Shanker, 1988]. Some policymakers rallied around the idea to apply a market-based approach to education. Increasing competition among schools would improve school quality [Lubienski and Weitzel, 2010]. Schools in a competitive market setting with multiple suppliers (schools) must provide high-quality education to attract and keep students. Other policymakers saw in charters an opportunity to provide access to good quality schooling to all students regardless of their socio-economic background.

Oversubscription and the increase in the number of wait listed students

[4] Fischel [2009] discusses how concern about property values drove the establishment of schools and school districts. The Land Act of 1785, which provided for the measurement and sale of land in the US also included a provision that a square mile of land in each township was to be set aside as an endowment for schools for residents of the township. The government's incentive to establish schools was to maximize the value of its land holdings. Schools made the land attractive to settlers and subsequent purchasers.

[5] Similar to the US, the following countries have been adopting school choice: England, Chile, South Africa, the Czech Republic, China, Australia, New Zealand, and Sweden (Plank and Sykes 2003).

imply there is strong demand for charter schools from students and parents. Most urban charter schools are routinely oversubscribed [Hoxby et al., 2009] and the length of the average waiting list increased from 233 in 2009 to 277 in 2012 [Rebarber and Zgainer, 2014].[6] In New York City (NYC), for example, the NYC Charter School Center estimated that NYC charter schools received applications from 64,600 students for 22,000 available seats in 2015.

Charter schools are public schools operating under a charter: a contract between the school and its authorizing agency. The span of the contract can be between one year and 15 years. The charter outlines specific educational outcomes (such as graduation rates and test scores benchmark) as goals for the charter school to achieve. In return, the charter school benefits from operational autonomy regarding setting the curriculum as well as staffing and budget decisions. Although charter schools are privately managed, they are still publicly funded.[7] Authorizing agencies are responsible for approving charter applications, negotiating contracts, and determining whether to renew a charter. The charter school closes at the end of the charter term if it fails at achieving its goals. [8] Additionally, for a charter school to remain open, there must be enough community demand. Authorizers are mainly school districts. Higher education institutions, state boards of education, nonprofit organizations, independent charter boards, and municipal governments can authorize charters depending on the state laws in place. Table 1 presents the different years in which the states implemented charter legislation. Observations from states shaded in gray are included in the sample used throughout the paper.

Theoretical papers [Epple and Romano, 2003; Ferreyra, 2007; Nechyba, 2000] examining the effect of school choice on residential sorting and housing prices predict that the capitalization of school quality in housing prices declines as school options available to parents increase. The introduction of school choice would decrease housing prices in areas previously linked to high quality schooling and increase housing prices in areas previously linked to low

[6] If the number of applicants to a charter exceeds the number of available seats, students are waitlisted.

[7] Authorizing agencies monitor charter schools through site visits to schools, financial audits, and academic reports (on enrollment, academic achievement, and student admission).

[8] A charter can be revoked before the charter end term if the authorizing agency identifies problems in the operation of a charter school and the charter does not remedy the identified problems.

quality schools. A household under a schooling system that allows choice can reside in an area linked to low quality schools thus paying less in housing prices. However, the household would still have access to higher quality level schools by either attending a school in a different zone or district (under inter-district and intra-district open enrollment policies), attending a private school (under voucher programs), or attending a charter school. Access to school choice would not guarantee equalization of school quality premium. Students would still be able to sort on characteristics. School priorities and constraints, for example transportation costs, can also hinder school quality from equalizing across schools.

Most empirical studies on the effect of choice on housing prices focused on voucher programs, inter-district, and intra-district legislation. Fewer studies have examined the effect of charters on housing prices. Brehm et al. [2017] finds little evidence that charter schools affect housing prices on average using data from 76 districts in California from 2008 to 2011. However, the paper shows when restricting to districts other than Los Angeles Unified and counting only charter schools located in the same school district as the household, housing prices fall by 2 percent for each additional charter within two miles. The paper finds no evidence of differential impact by school quality. Brehm et al. [2017] interpret the negative effect of charters on housing prices as reflecting the weakening of the link between the availability of local schooling as a public good and housing prices. Andreyeva and Patrick [2017] presents evidence that access to charter schools is positively capitalized in housing prices in metropolitan Atlanta using data from Fulton and Delkab counties from 1990 to 2015. Prices increased by six to eight percent in areas where households have a higher probability of admissions. This paper adds to the limited empirical literature investigating the effects of charter schools on housing prices by providing a national-level analysis incorporating policy changes in 19 states over 21 years. [9] We confirm that introducing charter schools impact housing prices. The distributional impact of charter legislation on housing prices suggests that charter legislation weakens the link between zoned school quality and residential choice.

[9] The sample includes transaction prices for 25 states but we only observe policy changes for 19 states between 1989 and 2005.

3 Data

To estimate the effect of charter school policies on housing prices, we use data from the metropolitan American Housing Survey (AHS).[10] The sample includes residential unit sales from 43 metropolitan areas within 25 states from 1985 to 2005. The data includes the price at time of transaction (self-reported), the year the transaction occurred, house characteristics, and household characteristics. Using the Housing Consumer Price Index from the Bureau of Labor Statistics, we express house prices in 2005 dollars throughout the paper.

To construct the data set, we pool the 1985-2011 AHS waves to obtain a sample of housing units.[11] We limit the analysis to units purchased before 2006 to avoid any bias from the housing market crash that started in the second quarter of 2006 and the recession that started in December 2007. The housing bubble peaked early 2006 and then housing prices started to decline that same year. Housing prices, before 2006, were on an upward trend with almost no interruptions. Figure 1 shows the yearly average National Case-Schiller home price index from 1975 to 2015. The Case-Schiller index measures change in the prices of single-family, detached residences using repeat sales method. The index compares the sales prices of the same properties over time. Looking at figure 1, we observe that the only dip in housing prices was in the early 1990's when the index went from 76.94 in 1990 to 75.93 in 1991, but it quickly resumed increasing by the next year. That is a minor decrease compared to the decrease that occurred starting 2006. [12] When estimating the effect of charters on housing prices, we include year fixed ef-

[10]The American Housing Survey (AHS) is a housing unit survey produced by the Census Bureau for the U.S. Department of Housing and Urban Development. Data are from the metropolitan sample surveys that were fielded every year from 1985 to 1996 and the surveys in 1998, 2002, 2004, 2007, 2009 and 2011. The metropolitan areas surveyed change from wave to wave. The Metropolitan Survey cycles through a set of metropolitan areas, surveying each one about once every six years. Although we restrict our sample to houses bought before 2006, 11.3 percent of our sample is from the 2007, 2009, and 2011 AHS waves. The AHS uses dependent interviewing; some answers do not change (e.g. price of house at date of transaction if a resale did not take place). We only keep information on housing units from the interview closest to the transaction date if no resale occurred.

[11]Table A.1 in appendix A lists the different steps to produce the data set used in this chapter.

[12]Once the index decreased from 183.49 in 2006 to 179.96 in 2007, the index kept decreasing until 2011 when the index reached 139.24.

fects and state-specific (linear and quadratic) time trends to account for the upward trend in housing prices over the time period examined.

Next, we limit the maximum period length between transaction date and interview date to 10 years to avoid recall bias.[13] We also remove the lowest one percent of housing prices in our sample or prices below 21,000 dollars.[14] These prices are likely misreported or representing non-arms-length transactions, in other words transfer between relatives. While we do not have access to detailed geographic identifiers, we know in what county is a house located. We combine the dataset on housing prices with information on time-invariant county characteristics. Information on county land area, percent water area, and amenity scale are from the county characteristics study by the Inter-University Consortium for Political and Social Research. [15] The sample used in the analysis is 43,449 houses of which 84.63 percent are houses that only appear once while the rest are houses for which we observe more than one transaction. We supplement the data with information on charter school legislation through the National Center for Education Statistics and the National Alliance for Public Charter Schools. Table 2 presents the sample's descriptive statistics. The average house costs 208,708 dollars (in 2005 dollars) with three bedrooms, two baths and a unit size of 2,100 square feet. Most houses have a garage (87 percent), central air conditioner (63 percent), and a fireplace (60 percent).

Figure 2 illustrates the share of student enrollment in charters across states for the 2004-2005 school year. States in purple (15 states) have no students enrolled in charters. Green states (15 states) have up to 1 percent of students in charters. Yellow states (4 states) have up to 2 percent of students in charters. Red states (7 states) and Hawaii have up to 3 percent of students in charters. Blue states (7 states) and Alaska have more than 3 percent of

[13]Column (2) and column (3) in table A.2 in appendix A checks the sensitivity of the results to this decision. The results are robust to using a 5 year window and a 15 year window between transaction date and interview date.

[14]Column (4) and column (5) in table A.2 in appendix A checks the sensitivity of the results to this decision. The results are robust to including the lowest 1 percent of housing prices and to excluding the lowest and highest 1 percent of housing prices.

[15]The natural amenities scale is a measure of the physical characteristics of a county that enhance the location as a place to live. The measure combines six measures of climate, topography, and water area that reflect environmental qualities most people prefer. The measures are warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area. We drop observation for two Colorado counties for which no amenity scale is available.

students in charters. Observations from states with an x in the middle are included in this paper's sample.

4 Empirical Strategy

Using a standard hedonic model, we can relate housing prices to housing and location characteristics (Rosen, 1974). The hedonic model is a method to decompose the equilibrium price of a product to get implicit prices of the attributes of that product. It is used to estimate prices or willingness to pay that can not be directly measured (e.g., valuation of clean air, a nice view, or a good school). The hedonic method relies on revealed preferences.[16] The basic hedonic price model we estimate to investigate the effect of charter school legislation on housing prices can be expressed as follows:

$$log(P_{hst}) = \alpha + \beta_1 Charter_{st} + \beta_2 H_h + Year_t + State_s + \epsilon_{hst}$$

Where P_{hst} is the property price for house h in state s at time t. The charter variable is an indicator variable equal to one if charter legislation has been in place for at least one year. We don't expect charter legislation to have an immediate impact on housing prices. It takes authorizing agencies 6 to 12 months to authorize a charter school once they receive an application.[17] In the next section, we look at the dynamic effect of charter school legislation on housing prices which confirms that the impact of charter legislation was not immediate and that a lagged charter variable will better capture the effect of the policy. [18] H_h includes property characteristics. House characteristics (H_h) included in the regressions are lot size, unit size, house age,

[16] An alternative way to get an estimate of the willingness to pay for any latent characteristics would be to rely on stated preferences.

[17] Once a charter school law is in place, individuals or organizations that are interested in starting a charter school must file an application with an authorized charter-granting agency. Authorizers either post formal requests for applications or simply reply to applications as they are submitted. The applicant must build a team, develop a mission, identify a target community, and create a work plan that includes the start-up budget needed to operate a charter prior to applying. Not all applications are approved. Applications are rejected for not meeting the criteria set by the authorizing agency or due to cap provisions in place. Once the authorizing agency approves the application, a charter school can begin to operate.

[18] Table A.3 in appendix A checks the sensitivity of the results to the definition of charter variable used in the paper. The table includes a variable equal to one once charter policy

house age squared, number of baths, number of bedrooms, number of half baths, having a fireplace, having a garage, having a basement, having central air conditioner, and having a heating unit that uses gas as fuel. H_h also includes county level characteristics (C_c): county land area, percent water area in county, and county amenity scale. We weight the data by the inverse probability of selection provided by the AHS to insure that our estimates are consistent [Solon et al., 2015]. [19] When surveys sample different segments of a population at different probabilities, weighting allows us to reconfigure the sample as if it was a random draw of the total population which would yield accurate estimates for the parameters of interest.

The data include variation across states and variation within state across time. The sample includes housing transactions from 25 states over a 21-year period. The identification strategy relies on the exogenous variation from within-state changes in the policy over time. To apply a fixed effects estimation strategy, in addition to controls for house and county characteristics, we include state fixed effects, year fixed effects, and a state-specific linear or quadratic time trend. State fixed effects control for time invariant differences across states in housing prices. By including state fixed effects, we control for the average difference across states in any observable or unobservable characteristic. The remaining variation is the within state across time variation that is needed to identify the effect of charter school policy on housing prices. Housing prices are on an upward trend, therefore, we include time fixed effects to control for time-varying unobservables that affect housing prices identically across states (e.g., common economic fluctuations). The model also includes state-specific time trends (linear and quadratic). The state specific time trends allow us to control for differential population growth across states or demographic trends that are smooth over time. Finally, ϵ_{hst} is a random error term. The standard errors from the regressions are clustered at the state level to control for within-state cluster correlation [Bertrand et al., 2002].

The identification strategy assumes that unobservable factors that might simultaneously affect housing prices and charter implementation are time-invariant. A variety of other factors can affect housing prices, for example, crime rates or employment opportunities. But, as long as these factors are not systematically related to the year the laws passed, they will be absorbed by

is enacted and a variable equal to one once charter policy has been in place for at least 2 years.

[19] The universe of interest for the AHS metropolitan sample is the residential housing units in the given metropolitan areas that exist at the time the survey is conducted.

the state and year control variables.[20] Only seven states have not yet adopted any charter school laws. Therefore, we do not think states are self-selecting into treatment. The more plausible case is that all states will eventually adopt charter school legislation.

5 Effect of Charter Legislation on Housing Prices

We present a baseline set of results for house price transactions during the 1989-2005 period in table 3. In column (1), we regress the log of housing price on the charter variable as defined in the previous section. The regression also includes year and state fixed effects as well as house and county characteristics. [21] The regression in column (1) is not weighted by the inverse probability of selection provided by the AHS. In column (2), we present the results from a weighted regression of log of housing prices on charter and the rest of the covariates. When weighted and unweighted estimates contradict each other, this may be a red flag that the specification is not a good enough approximation to the true form of the conditional mean [Solon et al., 2015]. Reassuringly, table 3 shows that unweighted and weighted regressions present consistently negative and significant effects of charter school laws on housing prices. The unweighted regression has less precise estimates which supports our decision to use the weighted regression to estimate the effects of charter school laws on housing prices in the rest of the analysis.

In column (3), we include a state specific linear time trend, while column (4) includes a state-specific quadratic time trend. The state-specific trends account for economic, social, and demographic unobservables that vary with time but differently by state. Our preferred specification is column (4), the most saturated specification, which suggests that charter school policies decreased housing prices by approximately 17 percent, on average, once charter school policy has been in place for over a year.

[20] In the next section, we test the robustness of the results to including unemployment rate, a variable that varies by state across time.

[21] House characteristics included in the regressions are lot size, unit size, house age, house age squared, number of baths, number of bedrooms, number of half baths, having a fireplace, having a garage, having a basement, having central air conditioner, and having a heating unit that uses gas as fuel. County characteristics included in the regressions are land area, percent water area, and amenity scale.

The full set of estimated coefficients from the regression presented in table 3, column (4) are included in table A.2, column (1) in appendix A. Coefficients for house and county characteristics are in the expected direction and comparable magnitude to those found in the literature. [22] Table 3, column (5) and column (6) present the effect of charters on housing prices using the repeated sales sample. Column (5) repeats the regression with the preferred specification using the repeated sales sample while column (6) adds controls for house fixed effects. The repeated sales sample includes houses that sold more than once between 1989 and 2005. Using this sample, we can control for house fixed effects which account for all unobservable house specific characteristics such as view or neighborhood. Using the repeated sales sample and including house fixed effects, we observe an approximately 8 percent decrease in housing prices after the charter policy has been in place for at least one year. [23]

In the last two columns, we aggregate housing prices to the state level, which is the level of the policy change. Column (7) presents results from a regression of state level house prices, so that each state is given equal weight. Finally, column (8) shows the results from a weighted regression of state level house prices where the weights are derived by summing the AHS house weights in each state by year. The coefficient in column (7) is consistent with the results in the other columns. Housing prices decrease by approximately 12 percent a year after charter policy is adopted. In column (8), the results suggest that charter policies decrease housing prices by approximately 8 per-

[22] Sirmans et al. [2006] provides a meta regression analysis of the nine housing characteristics that are present most often in hedonic pricing models. We compare the coefficients from this analysis to theirs. One additional bedroom increases housing prices by approximately 4 percent in this paper. The average coefficient in the literature is 3.8 percent. The coefficient on bathroom in our regressions is positive and large (0.207) compared to the average effects in the literature (0.089) but that is common using AHS data as Sirmans et al. [2006] notes. A 1,000 square feet increase in the size of a house increases housing prices by approximately13.4 percent compared to 34 percent, the average effect in the literature. 1,000 square feet increase in lot size increases housing prices by approximately 0.04 percent compared to 3 percent on average in the literature. Having a garage increases housing price by approximately 16 percent compared to 11 percent in the literature. Having a fireplace increases housing prices by approximately 20 percent compared to 9 percent on average in the literature. Air conditioning has no effect in this analysis but has an average effect of 8 percent in the literature.

[23] The coefficients from the repeated sales sample are similar to the findings from the regressions using the full sample but not statistically significant. The sample size for the repeated sales sample is much smaller than for the full sample used throughout the paper.

cent. For the rest of the analysis, we use the specification presented in table 3, colum (4) that includes year and state fixed effects as well as a state-specific quadratic time trend.

In figure 3, we examine the dynamic effect of charter legislation on housing prices. We present the results from a non-parametric specification of the effect of charters on housing prices. We use the same specification as before, but instead of one indicator for the policy being in place, we use a series of indicator variables representing time relative to implementation of the laws. The regression includes two leads and three lags following Autor [2003]. The leads check for any anticipatory effects prior to the implementation of the policy. The lags estimate the dynamic effects of charter policy. Figure 3 shows that the leads are not statistically significant and are close to zero. Therefore, there is no evidence for anticipatory effects. The lags illustrate that the effect of charter school laws on housing prices is not immediate. This result is not surprising. Entities interested in operating a charter will need time to put together an application and it takes authorizing agencies 6 to 12 months on average to approve an application.[24] The effect of charter schools on housing prices is gradual, negative, and increases in magnitude with time.

6 Hedonic functional form and stability of preferences over time

Using the hedonic method, we must deal carefully with omitted variable bias and the choice of a functional form. We use a log-level specification to present the main results in this paper. Simpler functional forms perform better in the presence of omitted variables [Kuminoff et al., 2010; Parmeter and Pope, 2009]. We test the robustness of the results to other functional forms and present the findings in table 4. In column (1), we present the results from the preferred specification, the log-level specification with controls for state fixed effects, year fixed effects, and a state specific quadratic time trend as well as house and county characteristics. Column (2) and column (3) present

[24]Tennessee Department of Education(TDOE), for example, lists an application review timeline that starts with an applicant sending the local board or TDOE a letter of intent on February 1st, 2017 . The earliest authorizers rule on an application is June 30th, 2017 and the latest is November 11th, 2017. Louisiana Department of Education list June 1st, 2017 as a deadline for local school board to make decisions on applications submitted by February, 24th, 2017.

the results from a linear regression and a Box-Cox regression respectively. The mean housing price is 208,708 dollars. The log regression suggests the effect of charter legislation was a decrease in housing prices of about 36,000 dollars. The level regression shows a negative effect of about 52,000 dollars and the Box-Cox regression shows a negative effect of 28,000 dollars. [25]

Column (4) presents the results from only the treated sample. When we restrict the sample to only treated states, the effect remains negative, significant and consistent with the previous results. The hedonic model assumes stable preferences across house characteristics over time. So far, we examined the effect across a 21-year time period. It is possible that preferences over house characteristics changed over that time period. In column (5), we restrict the time period examined to 1985-1997. We observe that the effect of the policies on housing prices is consistent when restricting to a 13-year period.[26] In column (6), we include unemployment rate in the regression, a variable that varies at the state level with time, the results remain robust to including this covariate which gives us confidence that no economic shock occurred at the same time as the policy implementation which would bias the results. The hedonic model also assumes a single housing market. In this paper, we assume a national metropolitan housing market. The estimated effect of charter schools on housing prices reflects the preferences of a metropolitan population rather than the subpopulation that lives in one city or local market.

7 Distributional Effects

In this section we present different hypotheses for the distributional impact of charter legislation on housing prices that we might observe and then we examine the results from quantile regressions to determine which hypothesis holds ex-post. The first hypothesis, the de-linking hypothesis, states that

[25]The Box-Cox regression has the highest R-squared followed by the log regression. When using Box-Cox to obtain the optimal value of the transformation parameter to normalize the data, the parameter we get is 0.1501216. When the parameter is equal to 0, the data is transformed using the log. Since the transformation parameter is very close to zero and the log is easier to interpret, we proceed with the log results throughout the paper.

[26]We do not have enough variation in the timing of the policy implementation to run a regression using the sample from 1998 to 2005. Three out of the Six states that adopt charter policy in that time frame adopt in 1998.

charters would positively impact the left tail of the housing price distribution and negatively impact the right tail of the housing price distribution. If charter schools are behaving as the literature on school choice predicts [Epple and Romano, 2003; Ferreyra, 2007; Nechyba, 2000], school choice would decrease housing prices in areas previously linked to high quality schools and increase housing prices in areas previously linked to low quality schools. Households under school choice can pay less for a house without being restricted to attend the zoned lower quality school. We would expect a positive effect of charter policy on housing prices in the bottom part of the distribution and a negative effect of charter policy in the upper part of the distribution.

The second hypothesis, the amenity/disamenity hypothesis, postulates that charters would only impact the left tail of the housing price distribution. If charter schools are impacting housing prices through the capitalization of charter school quality in those prices then charter policy would have a positive impact in areas where charters are positively impacting academic performance and a negative impact in areas where charters are adversely affecting academic performance. Given the heterogeneity that exists in charter schools' performance, it is not straightforward to predict the sign of the impact on housing prices but we expect the impact to be restricted to the bottom part of the housing price distribution due to charter schools' location decisions.

The final hypothesis, the information hypothesis, postulates that charters would only negatively impact the left tail of the housing price distribution. Charter schools are more likely to locate in areas with low-performing school zones and low-income students [Bifulco and Buerger, 2015; Epple et al., 2015]. Houses in low-performing schools zones are less expensive and in the lower part of the housing price distribution [Black and Machin, 2011]. Consequently, if the introduction of charter schools into a neighborhood is perceived as a clearer signal for households to avoid that neighborhood, we would only expect a negative effect of charter policy in the lower part of the housing price distribution. The decrease in prices would reflect a decrease in demand for cheaper houses after charter legislation is in place.

Figure 4 illustrates the effect of charter policy across the housing price distribution using quantile regressions. A standard linear regression minimizes the squared standard errors and summarizes the relationship between a set of regressors and the outcome variable based on the conditional mean function. Quantile regression minimizes the absolute standard errors and presents the relationship between the regressors and outcome at different points of the

conditional distribution of housing prices. We estimate quantile regressions using the generalized quantile regression method proposed by Powell [2016] that allows for the presence of covariates without including the covariates in the structural quantile function. The treatment variable, charter legislation, is included in the structure quantile function but the control variables are only used to aid identification. If the control variables are included in the structural quantile function, the interpretation of the parameter of interest is altered and it can no longer be interpreted as the impact of a change in the treatment variable on the distribution of the outcome variable.[27]

The effect of charter legislation on housing prices is gradually decreasing across the housing price distribution, as presented in figure 4. The effect is positive below the 20th percentile and negative above the 30th percentile. The pattern shown in figure 4 provides evidence that charter school policy decreases housing prices in the top part of the distribution due to the school quality house price premium decreasing. [28] This observed pattern confirms the literature's predictions [Epple and Romano, 2003; Ferreyra, 2007; Nechyba, 2000].

We examine the housing price distribution before and after charter legislation graphically to provide supporting evidence to the quantile regressions results. We confirm that charter legislation does not just cause a location shift to the left but instead it changes the shape of the housing price distribution. Figure 5 presents evidence that the housing price distribution narrows after charter legislation. [29] There is a slight shift to the right for the bottom part of the housing price distribution and a bigger shift left for the top part of the housing price distribution.

Finally, we examine the heterogeneity in the effect of charter policy on

[27]Traditional conditional quantile models [Chernozhukov and Hansen, 2006; Koenker and Bassett Jr, 1978] assume that the relationship between the treatment variable and the outcome varies based only on unobserved factors and, consequently, the interpretation of the parameters changes as some of these factors become observed (covariates are added to the quantile function). The Powell [2016] Generalized Quantile Regression model assumes that the treatment effects vary based on a nonseparable term which is a function of both observed and unobserved factors.

[28]Figure 4 illustrate how the effect of charter legislation varies across quantiles using log regressions. Figure A.1 illustrate how the effect of charter legislation varies across quantiles using level regressions.

[29]We run a regression of housing price on house characteristics, state fixed effects, year fixed effects and a quadratic state specific time trend and then plot the residual. We use observations from states for which we have observations before and after charter legislation.

housing prices by house and household characteristics. Column (1) in table 5 reports the result form the preferred specification. Column (2) interact charter with number of bedrooms. Number of bedrooms is positively capitalized in housing prices. A house with a higher number of bedrooms is associated with a bigger negative effect of charter policy on housing prices. Column (3) interact charter with unit size. Unit size is positively capitalized in housing prices. A bigger house in term of unit size is associated with a bigger negative effect of charter policy on housing prices, although the coefficient on the interaction term is not statistically significant. Column (4) interact charter policy with amenity scale. Amenity scale is a measure of quality linked to the location of a house. It is a measure of the physical characteristics of a county that enhance the location as a place to live. The measure combines six measures of climate, topography, and water area that reflect environmental qualities most people prefer. [30] Amenity scale is positively capitalized in housing prices. A house located in a better county is associated with a bigger negative effect of charter policy on housing prices. In the AHS, we can also identify if a house is located in a suburb or inside a primary or secondary metropolitan city. Charters are more likely to locate inside a city than in a suburb. Column (5) reports that locating in the suburb is positively capitalized in housing prices. [31] A house located in a suburb is associated with a bigger negative effect of charter policy on housing prices, although the coefficient on the interaction term is not statistically significant. These results mirror the findings from examining the distributional impacts of charter legislation on housing prices. Houses in counties with a higher amenity scale or more bedrooms, more expensive houses, observe a decrease in price following the implementation of charter school legislation.

[30] The measures are warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area.

[31] In the rest of the columns, we examine the effect of charter policy on housing prices by household characteristics. Column (6) to (8) interact charter with married, non-white household, and older household. Older household is defined as buyer 60 or older at time of purchase. The interaction term between charter and these covariates are not statistically significant.

8 Conclusion

Studies examining charter schools have so far mainly focused on academic performance [Abdulkadiroğlu et al., 2011; Abdulkadiroglu et al., 2015; Hoxby et al., 2009]. We add to the limited literature examining households' valuations of charters by examining the effect of charter school legislation on housing prices. We investigate if charter school policy managed to weaken the link between public school and housing prices as it hoped to do or if it had unintended consequence by creating a willingness to pay among households to avoid charters.

This paper estimates the effect of charter schools on housing prices. Using information on house transactions from the metropolitan American Housing Survey, we report that charter schools decrease housing prices by 7 percent (most conservative estimate). We explore two possible explanations for why housing prices decrease following the introduction of charters: either the link between neighborhood school quality and residential choice becomes weaker over time (de-linking hypothesis) or the capitalization of charters in housing prices reflects that households perceive charters as a disamenity or a negative signal (amenity/disamenity hypothesis or information hypothesis). Using quantile regressions, we provide evidence that the decrease in housing prices reflects a decrease in the school quality housing price premium. In fact, housing prices increase in the bottom part of the housing price distribution and decrease in the top part of the housing price distribution.

Charter school policy is part of an educational reform movement that aims to provide access to good quality schooling for students regardless of their socioeconomic background, increase competition among schools, and give parents a choice over which school their children attend [Lubienski and Weitzel, 2010]. In the 2013-2014 school year, 2.5 million students attended charters compared to 0.8 million in the 2003-2004 school year.[32] As this trend continues, examining the impact charter school policy has on academic performance, the public-school system, residential sorting, and school segregation is essential.

[32] `http://nces.ed.gov/programs/coe/indicator_cgb.asp`

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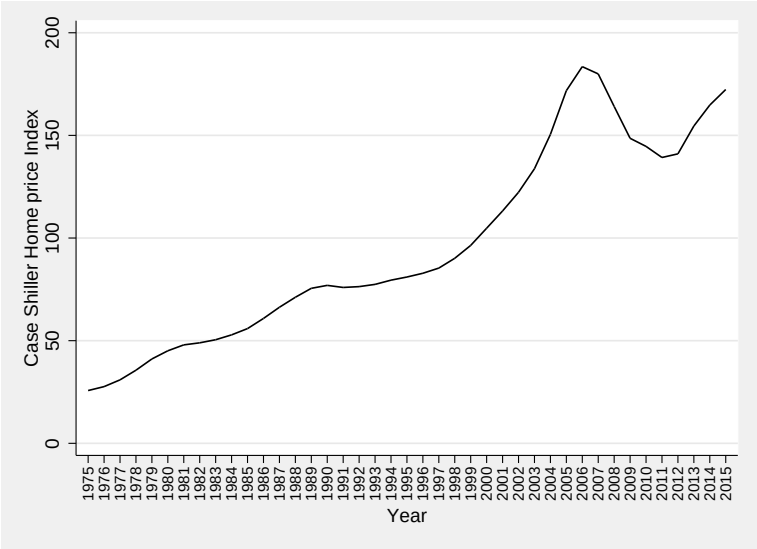
[Ccd] *U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey".*

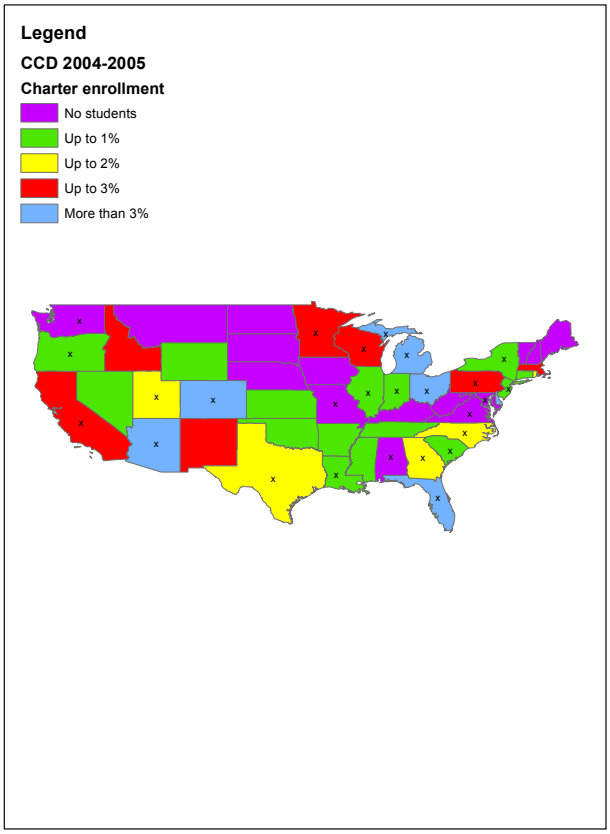
[Ahs] *U.S. Department of Housing and Urban Development and U.S. Census Bureau, American Housing Survey.*

Figure 1 The CaseShiller Home price index 1975-2015



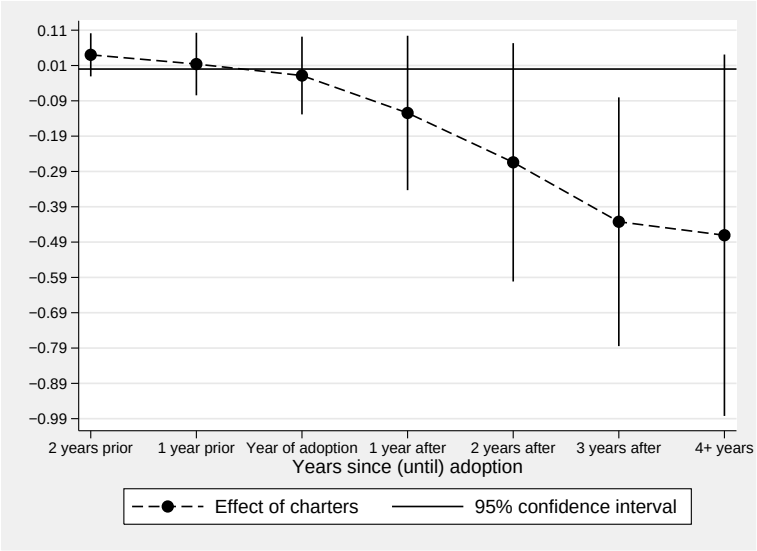
Notes: The graph shows the U.S. National Case-Schiller home price index from 1975 to 2015. The index measures changes in the prices of single-family, detached residences using repeat sales method. Therefore, the index compares the sales prices of the same properties over time. Source: S&P Dow Jones Indices LLC, S&P/Case-Shiller U.S. National Home Price Index [CSUSHPINSA], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CSUSHPINSA, July 18, 2016.

Figure 2 Charter enrollment by state 2004-2005



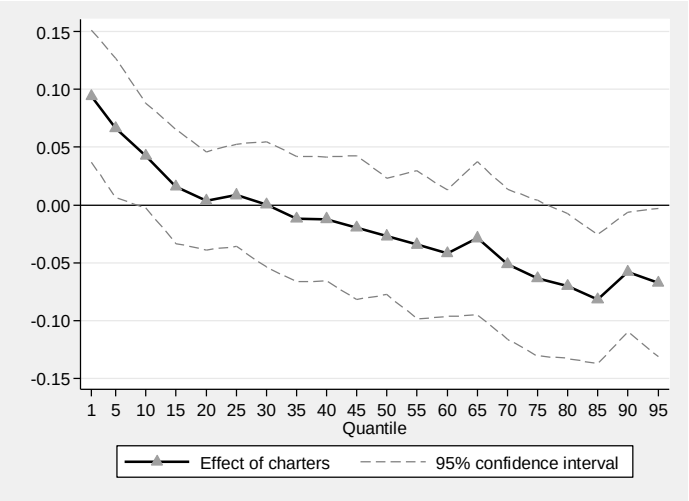
Notes: The figure illustrates the share of student enrollment in charters across states for the 2004-2005 school year. Observations from states with an x in the middle are included in this paper's sample. Source: SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey.

Figure 3 Dynamic effect of charter school policy on housing prices



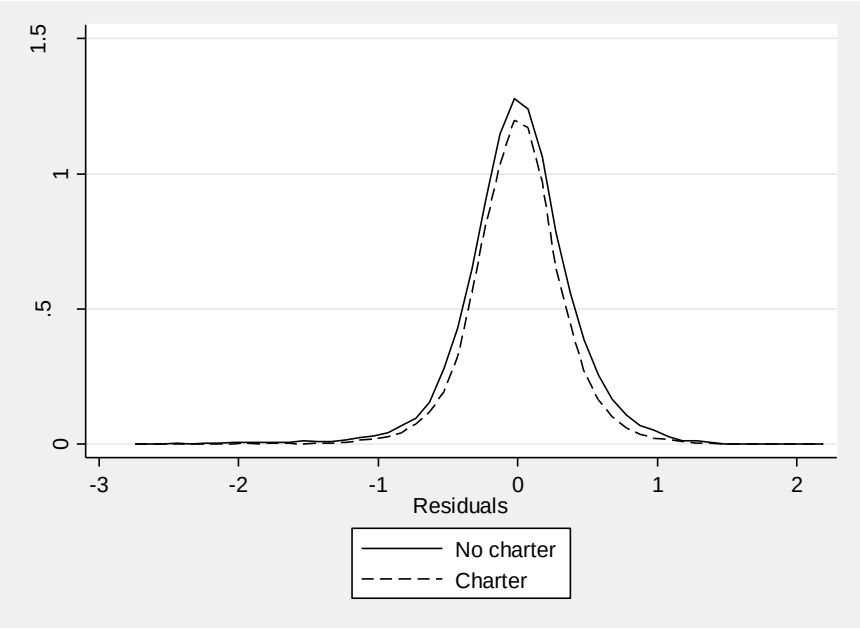
Notes: The graph shows the dynamic effect of charter school laws on housing prices. The circles represent coefficients from a weighted regression of log of housing prices on dummy variables that represent how long the laws have been in place. The omitted category is non-adopters and adopters 3 or more years before adoption. The leads are not statistically significant and close to zero which shows no evidence for anticipatory effects. The lags show that the negative effect of charter school policy on housing prices is gradual and increases in magnitude with time. The regression includes year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The vertical bands represent $\pm$ 1.96 times the standard error of each point estimate. The standard errors are clustered at the state level. States included in this graph are those shaded in gray in Table 1.

Figure 4 Effect of charter school policy on the housing price distribution



Notes: The graph shows the effect of charter school laws on the distribution of housing prices. The triangles represent coefficients from quantile regressions of log of housing prices on a dummy variable that represent charter law in place for over one year. The regression includes year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The vertical bands represent $\pm$ 1.96 times the standard error of each point estimate. The vertical line is for reference at zero. The figure is produced from the sample of houses in states that adopted charter legislation between 1985 and 2005.

Figure 5 Housing price distribution



Notes: The graph shows the distribution of log of housing prices before and after charter legislation has been in place for a year. The figure is produced from the sample of houses in states that adopted charter legislation between 1985 and 2005. We run a regression of housing price on house characteristics, state fixed effects, year fixed effects and a quadratic state specific time trend and then plot the residual.

Table 1 Charter school legislation

State	Year charter policy passed
Alabama	2015
Alaska	1995
Arizona	1994
Arkansas	1995
California	1992
Colorado	1993
Connecticut	1996
Delaware	1995
Florida	1996
Georgia	1994
Hawaii	1994
Idaho	1996
Illinois	1996
Indiana	2001
Iowa	2002
Kansas	1994
Kentucky	No
Louisiana	1995
Maine	2011
Maryland	2003
Massachusetts	1993
Michigan	1993
Minnesota	1991
Mississippi	2010
Missouri	1998
Montana	No
Nebraska	No
Nevada	1997
New Hampshire	1996
New Jersey	1995
New Mexico	1993
New York	1998
North Carolina	1996
North Dakota	No
Ohio	1997
Oklahoma	1999
Oregon	1999
Pennsylvania	1997
Rhode Island	1995
South Carolina	1996
South Dakota	No
Tennessee	2002
Texas	1995
Utah	1998
Vermont	No
Virginia	1998
Washington	2012
West Virginia	No
Wisconsin	1993
Wyoming	1995

Notes: Information on policy years is from the National Center for Education Statistics (NCES). Observations from the states shaded in gray are included in this paper's sample.

Table 2 Summary statistics

	Mean	Standard Deviation	Minimum	Maximum
Panel A: Policy				
Charter	0.0475	0.2126	0	1
Panel B: House characteristics				
House price (2005 dollars)	208,708	143,458	21,349	2,649,647
Year house bought	1989	3	1985	2005
House age	22	20	0	86
Unit size (square feet)	2,100	890	100	26,598
Lot size (square feet)	20,301	41,108	200	981,377
Number of bedrooms	3.2381	0.8211	1	10
Number of baths	1.8108	0.7243	1	10
Number of half baths	0.4467	0.5675	0	10
Fireplace	0.6004	0.4898	0	1
Basement	0.4804	0.4996	0	1
Garage	0.8682	0.3382	0	1
Heating unit uses gas	0.6965	0.4598	0	1
Central air conditioner	0.6288	0.4831	0	1
Panel C: County characteristics				
Land area (square miles)	1,872	3,543	15	20,053
Percent water area	14	19	0.1	75
Amenity scale	2	4	-3	11

Notes: Data are from 43,449 house transaction in the AHS merged with data on county characteristics. Results in the table are weighted with the inverse probability of selection provided by the AHS.

Table 3 Regression results

	Baseline unweighted (1)	**Baseline weighted** (2)	**Linear time trend** (3)	**Quadratic time trend** (4)	**Repeat sales sample** (5)	**House fixed effects** (6)	**State-level unweighted** (7)	**State-level weighted** (8)
Charter	-0.101^{+}	-0.114*	-0.177^{+}	-0.174^{+}	-0.117	-0.076	-0.119^{+}	-0.075^{+}
	(0.053)	(0.046)	(0.092)	(0.086)	(0.093)	(0.077)	(0.068)	(0.044)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes		Yes	Yes
House and county characteristics	Yes	Yes	Yes	Yes	Yes			
State specific time trend			Yes					
State specific quadratic time trend				Yes	Yes	Yes		
House fixed effects						Yes		
Mean price (2005 dollars)	208,708	208,708	208,708	208,708	206,390	206,390	192,191	213,954
Adjusted R squared	0.620	0.560	0.566	0.571	0.599	0.900	0.737	0.887
Number of observations	43,449	43,449	43,449	43,449	6,678	6,678	458	458

Notes: In all columns, the dependent variable is the log of housing price. The sample used is of houses sold between 1985 and 2005. The regressions in col. (1)-col. (6) and col. (8) are weighted using the inverse probability of selection provided by the AHS. Col. (7) shows the results from a regression of the weighted mean of the log of housing prices on a charter binary variable as well as year and state fixed effects. Standard errors in parentheses are clustered at the state level.
$+p < 0.10, *p < 0.05, **p < 0.01$.

Table 4 Sensitivity checks

	Log (House prices) (1)	**House prices** (2)	**Box-Cox house prices** (3)	**Log (House prices)** (4)	**Log (House prices)** (5)	**Log (House prices)** (6)
Charter	-0.174^{+}	-51,705.245*	-1.128^{+}	-0.180^{+}	-0.119*	-0.145*
	(0.086)	(24,152.786)	(0.550)	(0.089)	(0.075)	(0.068)
Unemployment rate						-0.035**
						(0.012)
Sample	Full sample	Full sample	Full sample	Only treated states	Full sample 1985-1997	Full sample
Mean price (2005 dollars)	208,708	208,708	208,708	213,238	208,432	208,708
Adjusted R squared	0.571	0.535	0.583	0.573	0.574	0.572
Number of observations	43,449	43,449	43,449	37,533	29,969	43,449

Notes: The Full sample is of houses sold between 1985 and 2005. All the regressions in the table include year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The regressions are weighted using the inverse probability of selection provided by the AHS. Standard errors in parentheses are clustered at the state level.
$+p < 0.10, *p < 0.05, **p < 0.01$.

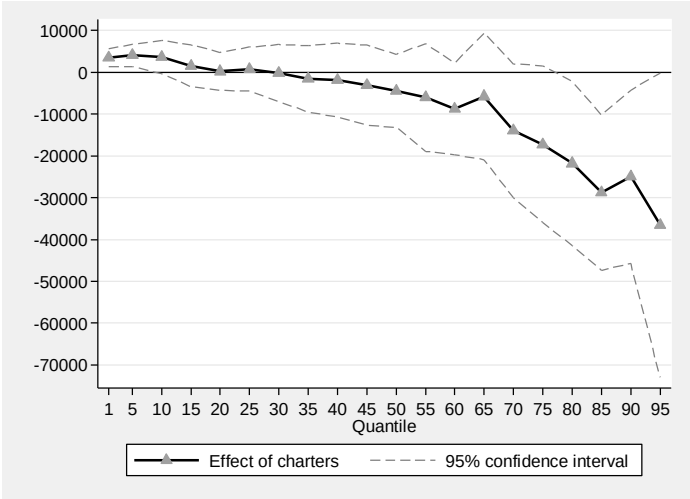
Table 5 Heterogeneity results

	(1)	**Bedrooms** (2)	**Unit size** (3)	**Amenity scale** (4)	**Suburb** (5)	**Married** (6)	**Non-white** (7)	**Older household** (8)
Charter	-0.174^{+}	-0.091	-0.144	-0.100	-0.140	-0.160^{+}	-0.170^{+}	-0.177^{+}
	(0.086)	(0.095)	(0.129)	(0.085)	(0.094)	(0.092)	(0.088)	(0.087)
Charter × Bedrooms		-0.025^{+}						
		(0.013)						
Charter× Unit size (10k)			-0.014					
			(0.028)					
Charter× Amenity scale				-0.022^{+}				
				(0.011)				
Charter× Suburb					-0.042			
					(0.043)			
Charter × Married						-0.019		
						(0.019)		
Charter × Non-white							-0.028	
							(0.027)	
Charter× Older household								0.070
								(0.048)
Suburb					0.074*			
					(0.032)			
Married						0.063***		
						(0.011)		
Non-white							-0.097***	
							(0.025)	
Older household								-0.101*
								(0.037)
Unit size (10k)	0.134***	0.134***	0.135***	0.134***	0.135***	0.133***	0.133***	0.135***
	(0.025)	(0.025)	(0.026)	(0.025)	(0.025)	(0.025)	(0.024)	(0.025)
Bedrooms	0.040**	0.041**	0.040**	0.040**	0.040**	0.037*	0.044**	0.036*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
Amenity scale	0.040^{+}	0.040^{+}	0.040^{+}	0.042^{+}	0.040^{+}	0.040^{+}	0.040^{+}	0.040^{+}
	(0.021)	(0.021)	(0.021)	(0.022)	(0.020)	(0.021)	(0.021)	(0.021)
Adjusted R squared	0.571	0.571	0.571	0.572	0.573	0.573	0.574	0.572

Notes: The results are using the full sample of 43,449 houses sold between 1985 and 2005 with an average house price of 208,708 dollars. All the regressions in the table include year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The regressions are weighted using the inverse probability of selection provided by the AHS. Standard errors in parentheses are clustered at the state level.
$+p < 0.10, *p < 0.05, **p < 0.01$.

A Appendix

Figure A.1 Effect of charter school policy on the housing price distribution



Notes: The graph shows the effect of charter school laws on the distribution of housing prices. The triangles represent coefficients from quantile regressions of housing prices on a dummy variable that represent charter law in place for over one year. The regression includes year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The vertical bands represent ± 1.96 times the standard error of each point estimate. The vertical line is for reference at zero. States included in this graph are those shaded in gray in Table 1.

Table A1 Data set construction

Pool owned units in AHS 1985 to 2011	397,185
Remove if inherited, not bought or date of transaction not reported	377,428
Remove duplicates\keep interview closest to transaction date	295,997
Remove county and state not disclosed or located in D.C.	173,266
Keep House, apartment, or flat	166,302
Keep Price reported	146,298
Keep square footage and lot size reported and not top-coded	98,847
Remove date of transaction before 1985 or after 2005	50,943
Remove if Interview date -Transaction date $>$ 10	44,418
Remove the lowest 1% of the price distribution	43,974
Keep number of bedrooms reported and at least 1 bedroom and 1 bathroom	43,927
Keep if amenity scale available	43,449

Notes: The table presents the different steps needed to produce the sample used throughout the paper.

Table A2 Sensitivity to sample selection criteria

	Within 10Y (1)	**Within 5Y** (2)	**Within 15Y** (3)	**Includes lowest 1%** (4)	**Excludes lowest and highest 1%** (5)
Charter	-0.174^{+}	-0.166^{+}	-0.175^{+}	-0.168^{+}	-0.166^{+}
	(0.086)	(0.081)	(0.085)	(0.094)	(0.083)
House age	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
House age quadratic	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lot (10k sqft)	0.000*	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Unit size (10k sqft)	0.134**	0.135**	0.133**	0.134**	0.132**
	(0.025)	(0.026)	(0.025)	(0.026)	(0.025)
Bedrooms	0.040**	0.036*	0.041**	0.050**	0.042**
	(0.013)	(0.014)	(0.013)	(0.015)	(0.012)
Baths	0.207**	0.208**	0.207**	0.199**	0.200**
	(0.017)	(0.017)	(0.016)	(0.016)	(0.017)
Half baths	0.143**	0.140**	0.143**	0.152**	0.139**
	(0.013)	(0.013)	(0.013)	(0.012)	(0.011)
Fireplace	0.200**	0.196**	0.200**	0.211**	0.205**
	(0.019)	(0.018)	(0.019)	(0.020)	(0.020)
Basement	0.042	0.041	0.043	0.063*	0.044
	(0.027)	(0.026)	(0.027)	(0.029)	(0.027)
Garage	0.157**	0.161**	0.157**	0.213**	0.156**
	(0.012)	(0.013)	(0.012)	(0.025)	(0.012)
Heating unit: gas	0.004	-0.005	0.004	0.012	0.006
	(0.044)	(0.047)	(0.044)	(0.043)	(0.045)
Central air	0.086	0.088	0.087	0.098	0.087
	(0.060)	(0.056)	(0.060)	(0.066)	(0.059)
Amenity scale	0.040^{+}	0.032	0.040^{+}	0.039^{+}	0.038^{+}
	(0.021)	(0.027)	(0.021)	(0.023)	(0.021)
Land area (10k)	-0.245**	-0.283**	-0.244**	-0.272**	-0.240**
	(0.037)	(0.037)	(0.037)	(0.036)	(0.036)
Log (Percent water area)	-0.007	-0.009	-0.006	-0.005	-0.007
	(0.020)	(0.023)	(0.020)	(0.021)	(0.020)
Mean price (2005 dollars)	208,708	212,295	208,523	206,573	205,,293
Adjusted R-squared	0.571	0.575	0.570	0.444	0.566
N	43,449	31,428	47,920	43,888	43,009

Notes: The results are using the sample of houses sold between 1985 and 2005. All the regressions in the table include year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The regressions are weighted using the inverse probability of selection provided by the AHS. Standard errors in parentheses are clustered at the state level. Column (1) includes results from the sample of houses that reported sale price within 10 years of sale date.Column (2) includes results from the sample of houses that reported sale price within 5 years of sale date. Column (3) includes results from the sample of houses that reported sale price within 15 years of sale date. Column (4) included results from the sample of houses that includes the lowest 1 percent of houses. Column (5) includes results from the sample of houses that excludes the lowest and highest 1 percent of house prices. $+p < 0.10, *p < 0.05, ** p < 0.01$.

Table A3 Sensitivity to charter definition

	(1)	(2)	(3)
Charter policy in place for at least one year	-0.174^{+}		
	(0.086)		
Year charter policy enacted		-0.074^{+}	
		(0.042)	
Charter policy in place for at least 2 years			-0.231*
			(0.093)
Adjusted R-squared	0.571	0.570	0.571

Notes: The results are using the full sample of 43,499 houses sold between 1985 and 2005 with an average house price of 208,708 dollars. All the regressions in the table include year fixed effects, state fixed effects, state specific quadratic time trend, and house and county characteristics. The regressions are weighted using the inverse probability of selection provided by the AHS. Standard errors in parentheses are clustered at the state level. $+p < 0.10, *p < 0.05, **p < 0.01$.