Do Housing Choice Voucher Recipients Import Crime?

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Abstract

Recent public attention has focused on whether and the extent to which Housing Choice Voucher Recipients (HCVRs) influence crime. Journalistic accounts of HCVR mobility imply that they do cause crime thus shedding negative light on the largest federal housing assistance program. This paper adds to the growing empirical literature in this area by examining in places among the 100 largest metropolitan areas in the country whether changes in HCVRs presence over time are followed by changes in crime rates. To do so, data is used on voucher holders from the U.S. Department of Housing and Urban Development's (HUD) Picture of Subsidized Housing, on crime from the Uniform Crime Report (UCR) Offenses Known and Cleared by Arrest compiled by the FBI, and on important demographic data from the Census. The results of the analysis do not support the hypothesis that HCVR cause crime. Where positive relationships between HCVRs and crime are found, more careful analysis using leads and lags of important variables demonstrate reverse causation at play; that is, that HCVRs tend to move to areas where crime is increasing.

Introduction

The question of whether Housing Choice Voucher Recipients (HCVRs) cause crime has gained increased attention in recent years. This is partly because relatively recent changes in the HCV program (HCVP) that relaxed where HCVs can be used led to expansion in the types of neighborhoods in which recipients search and rent housing. The HCVP is the largest federal rental assistance program, serving a little over 2 million low-income households.[1] Prior to the mid1990s, it was extremely difficult for HCVRs (or at the time Section 8 recipients) to use the certificate/voucher anywhere other than in the jurisdiction of the issuing housing authority, resulting in the concentration of recipients living in mostly racially segregated central city neighborhoods that were also economically disadvantaged (Wallace et al. 1981). However, during the 1990s, the Department of Housing and Urban Development (HUD) implemented a number of policy changes that affected the locational choices of HCV recipients, thereby influencing recipients moves across the broader metropolitan area including to the suburbs (Covington, et. al., 2011).[2]

As HCVR move to new neighborhoods, a number of claims through mostly journalistic accounts have been leveled that they import crime in doing so. The most important of these is arguably Rosin (2008) whose *Atlantic Magazine* article "American Murder Mystery" implicates the HCV program (as well as all other HUD subsidized housing programs) as a source of crime increases in Memphis, Tennessee as a result of low-income households using vouchers to move

[1] The HCVP is administered nationwide by approximately 2,500 local public housing agencies (PHAs). Voucher recipients may spend up to 40 percent of adjusted gross income at the initial lease, and the remainder is paid by the voucher usually up to fair market rent levels in the metropolitan region.

[2] These policy changes included the implementation of the Mobility Counseling Program, through which counselors encouraged movement from high-poverty to low-poverty neighborhoods, the introduction of portability that led to the streamlining of the process through which HCV could use their voucher in a jurisdiction other than the one that issued the voucher, and the shift from certificates to vouchers that arguably provided assisted households considerably more choice about where to live. The former placed a ceiling on the amount of rent a household can pay (which could act to limit locational choices), while the latter vouchers do not, as long as the household is willing to pay the difference, and pays no more than 40 percent of its income toward rent (Lubbell 2001).

into previously safe neighborhoods. More recently, the *New York Times* reported on the Los Angeles bedroom suburban cities of Lancaster and Palmdale's claim that their cities were increasingly the dumping ground of the county's poor as a result of the increased presence of HCVRs there, and were suffering as a result partly in the form of higher crime (Medina, 2011).[3] Moreover, in a *Wall Street Journal* commentary entitled "Raising Hell in Subsided Housing," Bovard (2011) charges that HUDs subsidized housing programs, including the HCV program, ruin neighborhoods by increasing crime among other factors.

Until recently, scant empirical evidence evaluating the claim that HCVRs cause crime was available. Much of the existing research however has found little evidence that HCVRs cause crime (Lens, 2014; Van Zandt and Mhatre, 2013; Ellen, et. al., 2012), with a few exceptions (Hendey, et. al., 2015 for property crime; Mast and Wilson, 2013). Questions still remain about the influence of HCVR on crime because most of the empirical work relies on data for a limited or single number of cities, raising questions about external validity. Moreover, little is known about whether potential heterogeneity in the association between HCVRs and crime exists by important place level characteristics such as size, its type (i.e., whether different in suburbs or cities), and individual considerations (such as the race of the HVCR).

This paper examines whether in places among the 100 largest metropolitan areas in the country changes in HCVRs presence over time are followed by changes in crime rates. Our study adds to the literature in important ways. First, because we include places among the largest 100 metropolitan areas in our study, we thus improve on questions of external validity relative to previous work. Since arguably the effect of HCVRs on crime could vary by city or place characteristics such as size, such studies are limited in producing more general estimates of the HCV, crime connection. Second, we examine potential differential effects of HCVR on

[3] The cities attempted to curb increases in the HCVR population by hiring investigators to examine whether HCVRs and their landlords were in compliance with the policy, which in turn led to a civil rights investigation and law suit by the DOJ that eventually ended in the housing authority paying $2 million dollars as a results black residents being discriminated against by the housing authority, their employees, and local law enforcement.

crime by important characteristics that have not been explored much, such as place type (city versus suburbs), or at all such as by place size, the race of the HCVR, and by the specific crime committed since there are good reasons to believe that the HCVR, crime connection might be influenced by these factors. Third, we attempt to tease out causality by examining lags of crimes rates and leads of HCVR changes to evaluate alternative hypotheses including reverse causation of whether HCVR are following crime rates.

Can Housing Vouchers Recipients Cause Crime?

The answer to the question of whether HCVRs cause crime is theoretically ambiguous. On the one hand, there are a number of plausible factors that could link HCVRs to increased crime. Among these, economists and sociologists decades ago developed and tested hypotheses on the link between poverty (required for HCV eligibility) and crime (Becker, 1968; Merton,1938). Both approaches predict that poor individuals will be more likely to commit crimes since there are expected income benefits from crime relative to that from legal work, accounting for the risk of incarceration and other criminal penalties or of injury and possibly death. Crime in high poverty areas, where HCVR are more likely to live, is therefore expected to be higher than elsewhere.

Empirical studies have validated the connection between family income and criminal activity (Bjerk2007; Hsieh and Pugh 1993). Many studies have also found a relationship between the poverty rate in a neighborhood and the crime rate (Hannon 2002; Krivo and Peterson 1996; Stults 2010). In concert, these causal factors may create a situation whereby the expected number of crimes committed by members of the new HCV-holding household will exceed that committed by the prior residents of the dwelling that changed occupancy, generating a net increase in the neighborhood's crime rate.

Property crime may become elevated as a consequence of HCVR growth or in-migration as a result of greater opportunity to commit such crimes if they move to areas with higher

incomes than that in their previous neighborhoods (Lim and Galster 2009). Moreover, it is plausible that HCVRs live in neighborhoods where they are poorer on average than nonHCV households since vouchers allow households to afford more housing than they would otherwise. Voucher holders who move into a neighborhood have lower incomes than the households who would have otherwise moved in. Moreover, several theories suggest that crime will grow with inequality, either because wealthier households and their property present targets to low-income households or because neighborhoods containing people of diverse backgrounds and limited shared experiences are likely to be characterized by greater social disorganization, which can reduce social control and lead to increases in crime (Shaw and McKay 1942).

In addition, individuals in HCV households, particularly adolescent youth, may have engaged in or have ties to others who engaged in crime and may import these behaviors and friends to their new neighborhood. For example, teens in HCV-holding households may have preexisting connections that bring them into conflict with gang members already established in the area, thereby generating more crime (Hagedorn and Rauch 2007; Popkin et al. 2000; Venkatesh et al. 2004). Moreover, moving to a new neighborhood is disruptive (Hagedorn and Rauch 2007), and scholars have demonstrated that frequent residential moves for young people lead to increased likelihood of committing violent crimes (Haynie and South 2005; Sharkey and Sampson 2010).

This may be especially true for those moving from public housing projects, as Rosin (2008) contends. There is existing evidence that crime rates are elevated in public housing developments for a variety of reasons (Goering et al. 2002; Hanratty, McLanahan, and Pettit 1998; Rubinowitz and Rosenbaum 2000), and thus it is not implausible to hypothesize that residents using vouchers to leave distressed public housing developments are more likely to commit crimes – or have friends who are more apt to commit crimes – than the individuals already living in the voucher holders' chosen destination neighborhoods. However, evidence

from the Moving to Opportunity (MTO) experiment suggests that youth who leave public housing may reduce their criminal behaviors when they leave (Kling, Ludwig, and Katz 2005).

Finally, HCVR could cause crime through increases in turnover in a community, which may also lead to elevated crime as social networks and norms break down. Sampson, Raudenbush, and Earls (1997) report a strong association between residential instability and violent crime in Chicago. Other indicators, such as white flight, are associated with higher crime (Taub, Taylor, and Dunham 1984). To the extent that in-migrating HCVRs commit more crimes in their destination neighborhood, they may encourage other, longer term residents of that place to commit more crimes themselves. This process of recruiting neighbors into criminal acts may proceed through role modeling or changing local collective norms about the acceptability of illegal behaviors. Livingston et al. (2014), for example, found an increased propensity of individuals to commit their first crime if they lived near neighbors with previous criminal records.

On the other hand, there are good reasons to believe that HCVRs do not cause crime. For one, local housing authorities are permitted to screen voucher applicants for criminal records. As a consequence, voucher holders will be less likely to engage in criminal activity than other individuals with similar incomes who do not receive housing assistance (US Department of Housing and Urban Development (HUD), 2001).

A second reason is that a sizable number of voucher holders actually remain in their same unit when they first use their vouchers (Covington, et. al., 2011; Feins and Patterson 2005). For these households and given steady sate turnover in these areas, new vouchers add economic resources to neighborhoods, which in turn could dampen crime.

Third, reverse causation of voucher holders moving to neighborhoods where crime is already increasing could be at play, as demonstrated elsewhere (Lens, 2014; Mast and Wilson, 2012; Ellen, Lens, and O'Regan, 2012). Rents in neighborhoods with high or rising crime are

likely more affordable, and as a consequence will be demanded by voucher holders trying to minimize the portion of rent they must pay given the value of the voucher (Sard and Rice 2014). In this instance, rising neighborhood crime causes increases in voucher holders, not the reverse.

Finally, it is plausible that an observed positive relationship between crime and HCV holders may be spurious if the growth of both factors in a neighborhood is caused by other (often hard-to-measure) neighborhood characteristics. For example, a neighborhood park with good recreational facilities may attract families holding HCV to live nearby, but it also may attract gangs and illegal activities unrelated to HCV families, with a potential increase in crime.

Despite the predictive ambiguity of theory regarding this question, the few papers that have investigated it have found little support for the idea that HCVR influence crime, with at least one exception. Lens (2012), using panel data on over 200 US cities and fixed effects to control for unobserved place characteristics, finds a weak or non negative relationship between violent crime rates and HCVRs. Ellen, Lens, and O'Regan (2012), examining 10 large cities, concluded that neighborhoods with increases in HCVR households did not experience increases in crime. Instead, they concluded that any positive association between voucher holders and crime was driven by voucher households' tendency to move into areas where crime was already increasing. This latter finding is consistent with other work using different methodologies or data (Popkin et al., 2012; Van Zandt and Mhatre, 2009; Keels, Duncan, Deluca, Mendenhall, & Rosenbaum, 2005).

Hendey, et. al. (2015), use 1999–2008 quarterly data from Chicago census tracts to test this allegation with a dynamic panel model designed to overcome the challenges of omitted variable and endogeneity biases. They find no support for the proposition that growth in HCV holders leads to growth in violent crime rates. However, they do find it is positively associated with growth in property crime rates but only in higher poverty neighborhoods or if HCVs exceed a threshold concentration.

On the other hand, Mast and Wilson (2013) using annual data from 2000 to 2009 for Charlotte-Mecklenburg County in North Carolina and quantile regression models with year and census tract fixed effects, find that voucher households are associated with increased crime, and that estimates of this effect vary with the neighborhood crime level.

Despite this growing body of evidence, there still remains questions about the casual influence of HCVR on crime because most of this work relies on data for single or limited number of cities (Hendey, et. al., 2015; Mast and Wilson, 2013; Ellen, Lens, and O'Regan, 2012); Popkin et al., 2012; Van Zandt and Mhatre, 2009; Keels, Duncan, Deluca, Mendenhall, & Rosenbaum, 2005), raising serious questions about external validity. Lens (2012), however, includes over 200 metropolitan areas in the analysis but does not account for the concentration of HCVRs in large metro areas. Thus, estimating average impacts of HCVRs on crime across metropolitan areas (and not marginal impacts of HCVRs on crime) may not be produce accurate estimates. Moreover, unanswered questions still remain about whether the potential influence of HCVRs on crime varies by important factors including the size of the metropolitan area size or by race of the HCVR.

Data and Methods

To answer the central question of whether HCVRs cause crime, we use data from a variety of sources. Data on voucher holders comes from the U.S. Department of Housing and Urban Development's (HUD) Picture of Subsidized Housing for 2000, 2007 and 2010, and we use it to measure the number of people (and households) using Housing Choice Vouchers (HCVs) by all places in metropolitan areas. In addition, we use 2000 and 2008 Census data to measure housing and demographic place characteristic variables that include the percentage of rental housing that is fair market rental (FMR), population size, and the percentage of residents that are black, Latino, foreign born or poor. Finally, crime data comes from the Uniform Crime Report (UCR) Offenses Known and Cleared by Arrest compiled by the FBI for 2000 and 2008.

HUD's Picture of Subsidized Housing data is used to describe the characteristics of HUD assisted housing recipients including the type of housing program (HCVR or other), and population characteristics of the assisted households (such as race of recipient) at the census tract level. The main HCV variable is measured as the percentage of the total population that is HCV recipients (HCVRs) in 2000 and 2007.[4] Unlike Van Zandt (2013), Mast and Wilson (2013) and Ellen et. al. (2012), we model crime rates rather than counts because we have accurate census population estimates for 2000 and 2008, although our analysis of HCVR and crime counts (not shown) produced no dissimilar qualitative results.

We measure crime rates using 2000 and 2008 data from the (UCR). The UCR data provide counts of crimes reported to the police for each police agency (referred to as a reporting unit in the UCR data) by month. To calculate crime rates, we aggregated 12 months of crime data to create annual estimates for 2000 and 2008. In all tabulations, crime rates are measured as criminal incidents per 100,000 residents.

We use the UCR data to estimate rates of serious felony crimes. Felony criminal incidents involving victims are officially categorized into the following seven mutually exclusive categories: murder, rape/sexual assault, robbery, aggravated assault, burglary, larceny/theft, and motor vehicle theft. For much of the analysis, we aggregate incident types to present findings for two general categories of crime. Conventional aggregations generally group the first four felonies under the banner of violent crime. The latter three felony offenses are commonly referred to as property crimes, since the objective of each is to unlawfully acquire the property of

[4]This entails counting the number of individuals in a household where the head possess a housing choice voucher and dividing this by the total population in the place (from Census data). Alternatively, we measure the HCVR rate as the percentage of all households in a place (gathered from Census data) where the head possessed a HCV. This alternative measure produced results that were not qualitatively dissimilar.

another without physically encountering the victim. In addition, we improve upon previous research by providing results for each of the individual crimes listed above where appropriate.[5]

Note that the voucher data are reported at the census tract level and the crime data at higher levels of geography including places, Minor Civil Divisions, and unincorporated portions of counties. To conduct the analysis, we aggregate census tracts to these larger geographies. For the most part, reporting units/police agencies correspond to places. Places refer to incorporated jurisdictions - such as cities, towns, and villages - as well as census-designated places - unincorporated areas delineated by the U.S. Census Bureau for statistical purposes. For example, the Oakland Police Department is a single reporting unit. In instances where there are multiple police agencies within a place, we aggregate crime data from all reporting units to create a place-level total.[6]

Reporting units may also correspond to a Minor Civil Division (MCD). The Census Bureau uses MCDs to designate the primary governmental and/or administrative divisions of a county, such as a civil township, precinct, or magisterial district. MCDs exist in 28 states and the District of Columbia. For the remaining states, the Census Bureau designates MCD equivalents, called Census County Divisions (CCDs), for statistical purposes.[7] Police agencies covering areas not located within a place but located within an identifiable MCD/CCD are aggregated to the MCD level. Finally, police agencies covering unincorporated areas of counties that lie outside of these two geography types are combined into a balance-of-county aggregate.[8] After matching reporting units to the relevant geography, we identified roughly 5,500 separate geographic units within the 100 largest metropolitan areas that appear in the UCR data.

[5] Simple assault is a misdemeanor and not a felony crime, but is a kind of crime that could result from increases in the HCVR population. Including this in the violent crime rate does not affect the results. Moreover, we show the results for specific crime rates including simple assault in Table 6.
[6] For example, many universities have their own police departments. Hence, a city that has within its boundaries a single university with its own department will have two reporting units: one for the city's police department and one for the university police department.
[7] 28 states, mostly on the east coast, use the MCD system, while CCSD's are found mostly on the west coast.
[8] For all three geography types, we use the 2005 Law Enforcement Agency Identifier Crosswalk to match each police agency in the UCR data to Census Bureau data.

Finally, we match our community-level crime data to data from the decennial census and the American Community Survey (ACS). Specifically, we employ data from the 2000 Census of Population and Housing Summary File 3, and the 2005- 2009 ACS five-year estimates.[9] We use these data to estimate the proportion of community residents that are black, Latino, foreign-born, or poor in each year. For identifiable census places and MCDs, we match corresponding estimates from the decennial census or ACS directly to the UCR data. Roughly 75 percent of the population of the metropolitan areas included in this study resides within a definable place or MCD. For the unincorporated balance-of-county observations, we assign the county-level average values.[10] If the voucher subsidy accurately reflects local housing costs, voucher holders should theoretically be found in nearly all neighborhoods (typically measured as census tracts) with rental housing available at or below fair-market rents (FMRs).

As noted, we include the largest 100 metropolitan areas in the sample; as a result, approximately 5,500 places/units are observed in the data. This facet of the research improves upon previous studies: more metro areas are included than in previous studies and thus a more precise general estimate of the potential impact of HCVR on crime can be estimated. Moreover, the larger sample size of metropolitan areas and places allows us to examine the potential heterogeneity of the influence of HCVRs on crime by, among others, city/suburban status, and population size, given the important observation that crime in general is higher in more populous places (Akerman, 1999; Ousy, 2000).

Table 1 presents basic descriptive statistics of crime rates and HCVR presence in 2000 and 2008. Characteristics of the poor are also shown as a comparison group to HCVRs. Panel A provides un-weighed statistics, while Panel B weights these by the place population. Panel A

[9] Post-Census 2000, five-year estimates from the ACS represent the only demographic data source with sample sizes sufficient to produce estimates for geographies with populations under 20,000.

[10] In the model estimates presented below, we explored the sensitivity of our results to this particular imputation for balance-of-county observations. First, we reran all models omitting these observations. Second, we reran all models including a dummy variable indicating counties with such an imputation. All of the results are robust to these specification changes.

shows the empirical regularity that property crime is much higher than violent crime in both periods, as well as the expectation that the percentage of people who are poor is greater than those who have HCVs. Over the 2000 to 2008 period, the data show a slight (4 percent) increase in the violent crime rate, while the property crime rate declined over this period by a similar percentage. On the other hand, the fraction of people in these areas with HCVs increased by nearly 2 percentage points, slightly higher than that experience by the poor.

Of course, the unweighted statistics display the average for all approximately 5,500 places in our data and thus treat equally places with population sizes as little as 500 to as large as over 5 million. As a result, these changes in crime and HCV status could be misleading since more populous areas are more likely to have larger crime rates and HCV presence. Panel B weights the data by population size. Doing so reveals that both the violent and crime rates declined over this period across the 100 largest metropolitan areas, by nearly 4 percent for violent crime and nearly 9 percent for property crime. The data are consistent with other studies that show declines in both crime indexes in the U.S. over this period (Kneebone and Raphael, 2011).

On the other hand, weighting the data in this manner nets a larger increase in HCV presence to 2 and a half percentage points, and a slightly lower estimate of the growth in the percentage poor over this period. The increase in voucher use over this period is consistent with previous results and driven partly by annual incremental funding increases for additional vouchers and voucher increases to designated populations (such as veterans) by congressional mandate (GAO, 2012). Still, in the in the largest 100 metropolitan areas as a whole, the data indicate crime rates declined while voucher holder presence increased.

Finally, Panel C displays these changes by the central city/suburban status of the place. Both violent and property crime rates are higher in cities than suburbs in both periods, but crime rates declined more in cities over this period, consistent with previous research (Kneebone and

Raphael, 2011). Note also that the relative shares of the population that are HCVR or poor are higher in cities than suburbs, but that the growth rate in HCVR shares over this period was more significant than that of the poor in both cities and suburbs. Still, the data indicate the general pattern that crime rates declined in both cities and suburbs (except for violent suburban crime which remained virtually flat) while voucher holder presence increased over this period, evidence portending a negative or non-relationship between HCVR and crime.

Table 2 further probes changes in crime rates and HCV presence over the 2000 to 2008 period by the size of place. To do so, we estimate quintiles of place size for the approximately 5,500 places and re-calculate (population weighted) statistics across these categories.[11] The data in Table 2 confirm that places with largest populations drive the results. Crime rates fell between 2000 and 2008 in the quintile with the largest population, while the biggest increase in HCV presence occurs there too. Alternatively, in the lower quintile population categories, both crime rates and HCV presence increase over this period, suggesting a positive relationship between HCVR and crime and warranting an investigation of the potential heterogeneity of this relationship across population size of place.

Identifying a causal relationship between housing choice voucher use and crime presents a serious challenge. Many place characteristics that are associated with the presence of voucher households (such as its poverty rate) may also directly influence crime rates. For example, growth in poor populations could influence both the presence of voucher holders and crime, so that the influence of voucher use on crime could be spurious through poverty. Alternatively, high crime rates could lead to less attractive neighborhoods (that leads to lower rents), which in turn could lead to an increase in the presence of voucher holders (through lower rents or

[11] Of course, the quintile calculations still result in very skewed population size distributions. For example, the first quintile contains places with population sizes ranging from 50 to about 2,301 people, while the fifth quintile ranges from population sizes from about 31,000 to over 8 million people. The use of alternative categorization, such as deciles, however, does not change the results. Moreover, splitting the places sizes into categories using reasonable eyeball approach, the qualitative results are not changed; larger places drive the weighted average crime trends and HCV presence in the same direction.

increased landlord willingness to rent to voucher holders), which would be consistent with reverse causation. We address these concerns by employing a variety of modeling strategies including first-difference regressions, adding metropolitan fixed effects, controlling for observable time-varying covariates that also influence crime rates, and using lags of crime rates and leads of voucher use to tease out causality.

We first identify the influence of HCVRs on crime using first difference regression analysis. The advantage of this approach is that the potential influence of fixed place characteristics on crime are controlled. Further, we include metropolitan area fixed effects to control for metropolitan area specific crime trends occurring over the 2000 to 2008 period that influence within metro area place crime trends. Including these ensures that coefficients are estimated using only the variation in the housing choice voucher and crime rates occurring across communities within each of the metropolitan areas.

The models also include controls for a host of observable time varying place characteristics that are directly related to crime. These include place size, the percentage of the place population that is black (or Latino), and most importantly the poverty rate of the place, variables that are demonstrated to be highly correlated with crime (Ellen, et. al., 2012; Kneebone and Raphael, 2011; Raphael and Sills, 2005). Moreover, we include the percentage of the place's rental units that are up to 50 percent of fair market value (FMR) to control for rental housing supply that influences the locational choices of HCVRs. The availability of rental housing has been shown to be one of the biggest factors determining the location decisions of HCVRs (Teater, 2009).

To conduct the analysis, we convert the HCVR rate to equal the number of voucher recipients per 100,000 people per place to make it equivalent in scale to the crime rate

variables.[12] The following equation will be used to estimate the impact of HCVRs on crime rates:

$$\Delta 2000-2008 CI_{im} = \Delta 2000-2007 HCVR_{im}\beta_{11} + \beta'_{12}\Delta X_{im} + \gamma_m + e_{im} \quad (1)$$

where *i* indexes places and *m* indexes metropolitan areas; *CI* is the violent or property crime index in place *i* in metropolitan area *m*; *%HCVR* is the number of HCVRs per 100,000 people; *X* is a vector of housing and demographic controls that include the percentage of rental housing that is FMR, population size, the percentage of the population that is black, Latino, foreign born, or poor, and crime trends between 1990 and 2000 to control for preexisting place specific crime trends. Gamma represents coefficients for metropolitan area fixed effects. The eror term is expected to be normally distributed.[13]

We lag the measure of voucher users by one year to mitigate potential problems from reverse causality and to allow for more accurate estimates of voucher holders potential influence on crime. Reverse causality is a greater threat when voucher use and crime are measured in the same year since voucher holders are likely to live in higher crime areas (Ellen, 2012). In addition, lagging the measure of voucher use provides time for crime to occur as a result of changes in voucher holders' presence since the crime data measures crime throughout the entire year and the count of voucher holders in the HUD data captures the number of voucher holders in an area at the end of the year.

Table 3 presents unweighted regression results for both violent and property crime rates based on equation (1). The first five columns show these for violent crime, while columns (6) through (10) does so for property crime. The first column displays a simple bi-variate relationship between violent crime and HCV presence. The simple bi-variate coefficient between violent crime and voucher use rates is 0.023 and statistically significant (at the .01 level),

[12] Specifically, we multiple the % of the population that is HCVRs by 100,000 to achieve this equivalency.
[13] Because of potential concerns regarding spatial auto correlation, we cluster standard errors by metropolitan area. The results, however, were unaffected by doing so.

indicating that an increase of about 50 HCVRs per 100,000 people is associated with an increase of about 1 violent crime per 100,000 people – that is that places where violent crime grew also saw increases in voucher use.

In column (2) we include metropolitan fixed effects, and the coefficient estimate is largely unaffected, indicating that overall metropolitan area specific crime trends over the 2000 to 2008 period do not account for the statistically significant association between HCV presence and crime (which cannot be caused by the change in HCVR presence in a specific place).

Next, in column (3) we include controls for population size of place and the percentage of rental units in the place that fall at or below 50 percent of fair market value. The coefficient estimate of HCV on crime is largely unaffected by their inclusion. In column (4) we add the demographic variables to control for characteristics of places that are associated in the crime. Addition of these is a more strict test since HCVRs are disproportionately poor, black and Latino. The coefficient estimate for HCVRs is largely unaffected by their inclusion. Finally, in column (5) we include the violent crime tend from 1990 to 2000, and the coefficient is reduced by over half and remains marginally statistically significant, indicating that place specific preexisting crime trends account for a large part of the effect.

Columns (6) through (10) repeat these exercises for the property crime rate. The simple bi-variate coefficient between property crime and voucher use rates in column (6) is 0.036 and statistically significant (at the .01 level), indicating that an increase of about 30 HCVRs per 100,000 people is associated with an increase of about 1 property crime per 100,000 people – that is voucher use is positively associated with property crime.

Including metropolitan fixed effects and controls for population size and fair market rental housing availability does not appreciably affect the results. Including controls for demographic and socioeconomic status changes over the period does as shown in model (9), and reduces the coefficient by about a third. This change is mostly driven by adjusting for changes in

the percentage of the place that is poor or black. This suggests that increases in HCV presence also occurred in those places where the percentage of the population that is black or poor also grew and that changes in these characteristics are strong predictors of property crime rate changes. We add the property crime trend from 1990 to 2000 in column (10), and this inclusion knocks out the remaining statistically significant result.

A major concern is that the models are not weighted by HCVR size and thus reflect average effects across places irrespective of where most HCVRs live. For example nearly 60 percent of HCVRs in the data live in places at the highest quintile of place population size where crime rates fell over the period. At the same time many places in the lowest quintiles of place size have no or few HCVRs, but crime rates rose over this period. Thus, the coefficient on HCVR presence does not capture the experience or contribution of the typical HCVR.

To address this concern, we weight the models in Table 3 by the number of HCVRs across places, and the results are provided in Table 4. Weighting the regressions by the number of HCVRs in a place allows places with larger numbers of HCVRs to have more influence in estimating the relationship, so that it (perhaps appropriately) reflects the effect on crime of places with larger numbers of HCVRs rather than that of the typical place.[14]

The presentation of results is identical to that shown in Table 3. Regarding the violent crime rate, weighting the model by the number of HCVRs results in no significant coefficient estimates of HCVR presence on crime. This indicates that there is no relationship between violent crime rates and the average HCVR.

On the other hand, weighting the property crime rate model results in a negative and statistically significant coefficient on HCVRs, indicating that increase in HCVR presence is associated with declines in property crime rates for the typical HCVR. The negative and statistically significant coefficient is not accounted for by metropolitan area property crime

[14] Because of concerns of weighting the regressions by a count of the primary independent variables, we also weighted the regressions by population size. we get nearly identical results by doing so.

trends nor by changes in socioeconomic characteristics of places. Combined, these results provide little evidence for the hypothesis that HCVR cause crime.[15]

Weighting in this manner, however, introduces another concern; places with a larger number of HCVRs could put undo influence on the estimates of the influence of HCVRs on crime. We explore whether this concern has merit by examining scatterplots of the relationship between crime and HCVR rates.

Figures 1a and b present simple two-way scatterplots of the changes in the violent (and property) crime rate respectively, and changes in the percentage of the population that are HCVRs. They also include a fitted regression line of this relationship (which is equivalent to the estimate in columns (1) and column (4) in Table 3 for the violent and crime rate respectively). Figure 2a and b present similar scatterplots except that places are weighted by the number of HCVRs in the place so that places with larger populations of HCVRs receive larger circles.

If places with larger HCVR populations are putting undo influence in estimating the weighted relationship between crime rates an HCVR presence, we would expect to see bigger circles located nearer to either tails of the scatterplots. The scatterplots in both Figures 2a and b indicate that the places with larger number of HCVRs are located closer to the middle of the scatterplots, suggesting that they are not putting significant upwards or downwards influence on the estimates. Thus, the concerns about weighting by the number of HCVRs in places are not fully warranted, and for the remainder of the analysis all models are weighted by the number of HCVRs.

Non-Linearities

The potential influence of HCVRs on crime could be non-linear so that the effect on crime rates does not occur until a certain threshold of change in HCVR presence is achieved. If

[15] As robustness check, we produced similar results using the change in absolute violent (property) crime as a function of the absolute change in voucher holders (with controls included in Model 4 and 8 in Table 4), whose estimates predict the marginal change in voucher holder size on crime rates, and thus takes into account the unequal distribution of HCVRs over place size.

this is true, the previous model specifications prevent us from detecting this. To examine this possibility more carefully, we pursue two strategies. First, we square the change in the percentage of the population that is HCVR variable. Second, we split the change in the percentage of the population that is HCVR variable into treciles. We then include these new variables in separate models. The squared voucher variable permits us to examine whether the influence of voucher holders on crime is affected by whether the change in the percentage of voucher holders in a place is higher or lower. Alternatively, the categorization of the changes in voucher holder presence over the 2000 to 2007 period into treciles characterized by small, medium, and large changes (with small as the reference category), allows us to examine whether larger changes in the presence of vouchers holders have a bigger influence on crime rate changes, if any.

The results of these different models are presented in Table 5. Columns (1) and (2) explore these for the violent crime rate, while columns (3) and (4) do so for the property crime rate. The first column present results with the inclusion of the squared change in HCVR variable, and the results indicate the squared term is not significant. Column (2) presents results for the trecile categorical variables for the change in HCVR presence over the study period. The results of these additional variables are not statistically significant. Combined, these results provide no evidence for non-linear influences of HCVR presence on violent crime. Columns (3) and (4) repeat these exercises for the property crime rates, and again the insignificant results provide no evidence of non-linear influences of HCVR presence on property crime.

Heterogeneity

We further explore whether a positive influence of HCVRs on crime is masked in the data. We explore potential heterogeneous effects across a variety of factors including by the specific crime, by the race of the HCVR, and by the size and type of place. Aggregating crime within broad categories of violent and property could mask the influence of HCVRs on specific

crimes. Table 6 provides coefficients estimates of the change in specific crimes from 2000 to 2008. Each column represents a separate model for eight different mostly felony crimes. Each model is estimated using the fully specified model that includes controls for the demographic and housing variables, crime trends the decade prior, and metropolitan fixed effects, and is weighted by the number of HCVRs. The results indicate that the change in the presence of HCVRs from 2000 to 20007 is positively and statistically significantly associated with the change in murder and robbery (at the .01 percent level) and aggravated assault (at the 10 percent level) over this period. Below, we further tease out whether these results are causally related. Alternatively, we find negative and statistically significant associations between HCVR presence and simple assault, larceny, and motor vehicle theft over this period.

Table 7 present results of the change in violent and property crime rates by the change in HCVR presence by race of the primary HCV holder.[16] Again, each model is estimated using the fully specified model, and is weighted by the (respective) number of HCVRs (by race). Given that crime rates are positively associated with the percentage of a place that is black, and to the extent that black HCVRs are located in or move to primarily black neighborhoods, we might expect that the change in crime rates are positively associated with the change in the presence of black HCVRs in the area.

The results in Table 7, however, do not support this expectation. In fact, the change in both violent and property crimes rates from 2000 to 2008 are negatively and statistically significantly associated with the change in the presence of black HCVRs. This is also true in the case of the change in the percent of HCVRs that are Latino.

On the other hand, we find a positive and statically significant (at the .01 percent level) association between the changes in violent crime and the changes in the percentage of HCVRs

[16] Since we weight each model by the number of HCVR for the respective, specific racial./ethic groups, we estimate separate models by race. Including variables measuring the percent of HCVR that are of each race (with other as the reference category) and weighting the models by the total number of HCVRs in the place does not produce dissimilar qualitative results.

that are white. The distribution of HCVRs by race over place size affects these results as black and Latino HCVRs are more likely than their white counterparts to live in the top quintile of place size where crime rates fell over the period, while white HCVRs are more likely to live in the lower quintiles where crime rates rose. Moreover, Galvez (2010) reports that while the average neighborhood poverty rate for voucher holders is similar to that for poor MSA residents as a whole, for poor white households, the average neighborhood poverty rate for voucher holder is higher than that for the typical poor white.

Finally in Table 8, we explore heterogeneity by the place type (city versus suburb) and size. A priori, we have no expectation of the direction and magnitude of the potential effects. On the one hand, as Table 1 and 2 demonstrates, HCVR presence grew the most in central city places and in places with larger populations; precisely those areas where crime rates declined the most from 2000 to 2008. On the other hand, crime rates are higher in these places.

Table 8 presents the results. Panel A shows these results for violent and property crimes by the type of places (suburban versus central city), while Panel B shows these by place size. The regressions in each panel include all controls. In Panel A, the base change in crime rate variable is entered as well as the term of interest: the interaction between the change in crime rates and the categorical variable measuring whether the place is suburban. That interaction is positive and statistically significant (both at at least the 5 percent level) for the violent and property crime rates, providing evidence that the change in HCRs is associated with growth in crimes rates in the suburbs but not in the city.

Panel B presents results by place size, where the base change in crime rate variable is included along with the interactions between the change in crime rates and the quintile categories measuring place size (with the lowest quintile as the reference category). The results indicate positively and statistically significant associations between changes in crime in violent

and property crime and changes in HCVR presence in smaller places (i.e., those with population sizes below about 30,000).

Lags and Leads

To summarize, our investigation into heterogeneity in the influence of the change in HCVR presence on crime rates indicates positive and statically significant results for murder, robbery and aggravated assault, for white HCVRs, and in suburbs and smaller places. We further test for whether these positive and statistically significant results are causally related by using lags and leads of important variables. Regarding the lagged crime rate variable, the growth in HCVR presence over the 2000 to 2007 does not effect changes in crimes rates from 1990 to 2000. Moreover, the choice of use of a lagged dependent variable is further strengthened by the timing of the changes in the use of HCV that expanded the allowable places where such voucher could be used. Many of these changes were introduced in the late 1990s, after the measured of lagged crime rates begins. Thus, the conclusion that the positive and statically significant results of the change in HCVRs and crime rates that we observed are causally related would be further strengthened if the change in crime rates between 1990 and 2000 are unrelated or negatively related to the current change in HCVRs. In other words, this strategy permits us to examine alternatively whether HCVRs are moving to areas where crime had been growing the previous decade, in which case we would observe a positive and significant relationship between older crime rates and current changes in HCVR presence.

Equation (2) below provides the model specification for this strategy:

$$\Delta 1990-2000CI_{im} = \Delta 2000-2007HCVR_{im}\beta_{21}\Delta + \beta'_{22}\Delta X_{im} + \gamma_m + e_{im} \qquad (2)$$

where $\Delta 1990-2000CI_{im}$ is the decade lagged crime rate change for the violent crime rate. Using this model, we can examine whether HCVRs are moving to places between 2000 and 2007 that had higher murder, robbery and aggravated assault crime rates between 1990 and 2000. We can also assess whether white HCVRs are moving to places between 2000 and 2007 where crime

rates grew the decade prior, and whether HCVR are growing in suburban and smaller places where crime rates increased the decade prior.

Following Ellen, et al., (2012), the second strategy uses a lead measure of HCVR moves, to be included on the right-hand side. This follows from the observation that HCVRs who have not entered a place cannot be causes of crime in the current period, i.e., 2000 to 2008. Fortunately, we have data on HCVRs for 2010, and thus we can measure the change in HCVRs presence between 2008 and 2010. The downside of this approach is that the data allows for lead changes in HCVR presence of only two years. The estimate of changes in HCVR presence are thus bound to be more noisy in measuring changes over the lead period than compared to our lagged period of crime. As a result, we expect to be more confident in the estimates using the lagged measure of crime as our test.

Nevertheless, Equation (3) below provides the model specification:

$$\Delta 2000-2008CI_{im} = \Delta 2000-2007HCVR_{im}\beta_{31} + \Delta 2008-2010HCVR_{im}\beta_{32} + \beta'_{33}\Delta X_{im} + \gamma_m + e_{im} \quad (3)$$

where $\Delta 2008-2010\%HCVR_{im}$ is the lead change in HCVRs presence between 2008 and 2010. Using this model, we assess for example whether increases in murder, robbery or assault are then followed by increases in HCVRs presence, rather than the reverse. A similar logic applies to the other characteristics of changes in HCVR presence that are of importance. A positive and statistically coefficient on lead HCVR changes would provide more evidence for the null hypothesis of no effect.

Table 9 presents the results based on these specifications, which includes all control variables previously identified (except crime trends the decade prior) and is weighted by the number of HCVRs. Panel A and columns (1) through (6) focus on leads and lags analysis for the statistically significant specific crimes dependent variables while Panel B and columns (7) and (8) focus on the results for white HCVRs influence on crime rates. For the specific crime rates,

columns (1), (3) and (5) provide results from the lagged crime rates models for murder, robbery and aggravated assault respectively, while the even number columns report results for the lead HCVRs measures on the respective crime rates.

In general, the results do not provide support the hypothesis that the previous results are casual influences of HCVR presence on murder, robbery and aggravated assault crime rates. [17] For example, the analysis of leads in column (2) provides evidence of the reverse; that increases in murder rates are then followed by increases in HCVRs presence. Moreover, the evidence from the lagged crime rate results in columns (3) and (5) is consistent with HCVRs moving to or expanding their presence in areas where robbery and aggravated assault crime rates were already increasing the decade prior.

We reach similar conclusions regarding the influence of white HCVRs on crime rates. Column (7) and (9) present evidence that the change in white HCVR presence in a place is positively and significantly associated with changes in violent and property crime rates the decade prior. This indicates that white HCVR are moving to places where crimes rates were already increasing. The average poverty rate for black voucher holders remained higher than that for white voucher households (17 percent) or poor whites generally (15 percent), but in keeping with the average for all poor MSA residents (22 percent). This suggests that the voucher may allow black households to access lower-poverty neighborhoods than they would have without the voucher. 8 However, results are the opposite for white voucher holders: the typical white voucher household lived in a tract with poverty rates slightly higher than the average for poor white MSA residents (Galvez, 2010).

Table 10 presents results of the lags and leads analysis regarding the influence of HCVR by place type and size. The presentation of results is similar to that in Table 9. The first four

[17] Incidentally, the leads and lags results shown here are not general to the sample as a whole, providing more evidence for the null hypothesis. We conducted similar analysis for the sample as a whole and found for both violent and property crime, a negative and statistically significant coefficient of the change in HCVRs on crime the decade prior, and of the lead changes in HCVRs crime for the current period.

columns focus on place type while the last four do so on place size. The results of lagged dependent variables for the violent and property crime rates respectively are presented in the odd number columns in the table, while the even numbers present the lead analysis results.

The lag results for suburbs show a positive and significant coefficient on the interaction term between suburban place and change in HCVRs presence indicating that increases in violent and property crime rates in suburban areas are then followed by increases in HCVRs in those areas. Again, these results are not consistent with the interpretation of a causal influence of HCVR on suburban crime rates, but instead that HCVRs are moving to suburban areas where crime rates were already increasing. Moreover, evidence, albeit weaker, from column (4) also support this conclusion as the results indicate that changes in HCVR presence in suburban areas between 2008 and 2010 positively and weakly significantly predict property crime rates in the current period. Since the additional HCVRs in suburban areas between 2008 and 2010 cannot cause crime in the 2000 to 2008 period, this indicates that HCVR continue to move to suburban areas where crime rates are increasing.

We find similar results for the influence of place size. The lag results in columns (5) and (7) indicate that in smaller areas HCVRs are moving to areas that experiencing increases in violent and property crime the decade prior. There is also weaker evidence, at least for property rates, that growth in HCVRs in smaller areas predicts crime rates the period prior. Both results are more consistent with the null hypothesis of no effect of HCVRs on crime.

Conclusion

In this paper, the hypothesis that HCVRs cause crime is tested, an idea that has entered the public market place through various journalistic and anecdotal stories. To do so, voucher data as well as actual crime data is used from the FBIs Uniform Crime Reports for the 100 largest metropolitan areas in the U.S. in the 2000 decade. A variety of modeling strategies to tease out causality of the results is also used, and little evidence that HCVRs cause crime is found.

Further tests for possible non-linearities of the relationship, as well as potential heterogeneity of the results, are explored but not found. Instead, the findings support the idea that some HCVRs are moving to areas where certain crimes are increasing or where specific crimes had been increasing in the past. The results strongly indicate that there is little evidence that HCVRs cause crime.

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Table 1: Crime Rates (per 100,000) and Percentage of Population with Housing Choice Vouchers or Poor, 2000 and 2008

A. Un-weighted				
	Violent Crime	**Property Crime**	**HCVRs**	**Poor**
2000	842	2,222	0.010	0.089
2008	877	2,234	0.028	0.103
Change: 2000 to 2008	32	12	0.018*	0.014*
B. Weighted by Place Population				
2000	1,474	3,535	0.015	0.120
2008	1,402	3,211	0.039	0.128
Change: 2000 to 2008	-58	-317*	0.025*	0.010
C. City/Suburb of Place[a]				
City:				
2000	2,328	5,351	0.020	0.180
2008	2,127	4,476	0.053	0.183
Change: 2000 to 2008	-188*	-885*	0.034*	0.005
Suburb:				
2000	1,060	2,653	0.012	0.089
2008	1,060	2,616	0.032	0.101
Change: 2000 to 2008	4	-46	0.021*	0.012*

Note: Voucher data is from 2000 and 2007.
[a]Data is weighted by place population.
*Indicates change significant at 5 percent level

Table 2: Crime Rates, Voucher Holders and the Poor in 2000 and 2008 by Quintiles of Place Size					
	First Quintile	**Second Quintile**	**Third Quintile**	**Fourth Quintile**	**Fifth Quintile**
Violent Crime					
2000	561	727	772	864	1,650
2008	592	797	845	919	1,540
Change	34	63	68	72	-92
Property Crime					
2000	1,442	1,901	2,126	2,317	3,890
2008	1,576	2,050	2,174	2,374	3,459
Change	81	139	33	50	-415
HCVRs					
2000	0.007	0.011	0.011	0.013	0.015
2007	0.019	0.026	0.028	0.033	0.041
Change	0.012	0.017	0.018	0.021	0.027
Poor					
2000	0.104	0.089	0.077	0.078	0.131
2008	0.119	0.105	0.090	0.092	0.137
Change	0.015	0.017	0.013	0.015	0.008
Note: Weighted by population size of place. Quintile categories: 1^{st}: 0 – 2,301; 2^{nd} : 2,302-6,085; 3^{rd} :6,086-13,443; 4^{th} : 13,444-31,514; 5^{th} :31,515-8,345,075.					

Table 3: Un-Weighted Regression Coefficient Estimates of the Change in Violent and Property Crime Rates, 2000 to 2008

	Violent Crime Rate					**Property Crime Rate**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Change in Percent HCVRs, 2000-07	.023***	.026***	.026***	.023***	.011*	.036***	.030***	.040***	.027**	.012
Metro Dummies	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Pop Size/% Rentals FMR (50%)	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
SES	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Violent Crime Rate, 1990 to 2000	No	No	No	No	Yes	No	No	No	No	Yes
Adj. R-Square	0.04	0.06	0.06	0.07	0.20	0.01	0.06	0.07	0.07	0.15
N	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively

Figure 1a: Scatterplot of Change in Violent Crime Rate and in Change in HCVs, 2000 to 2008

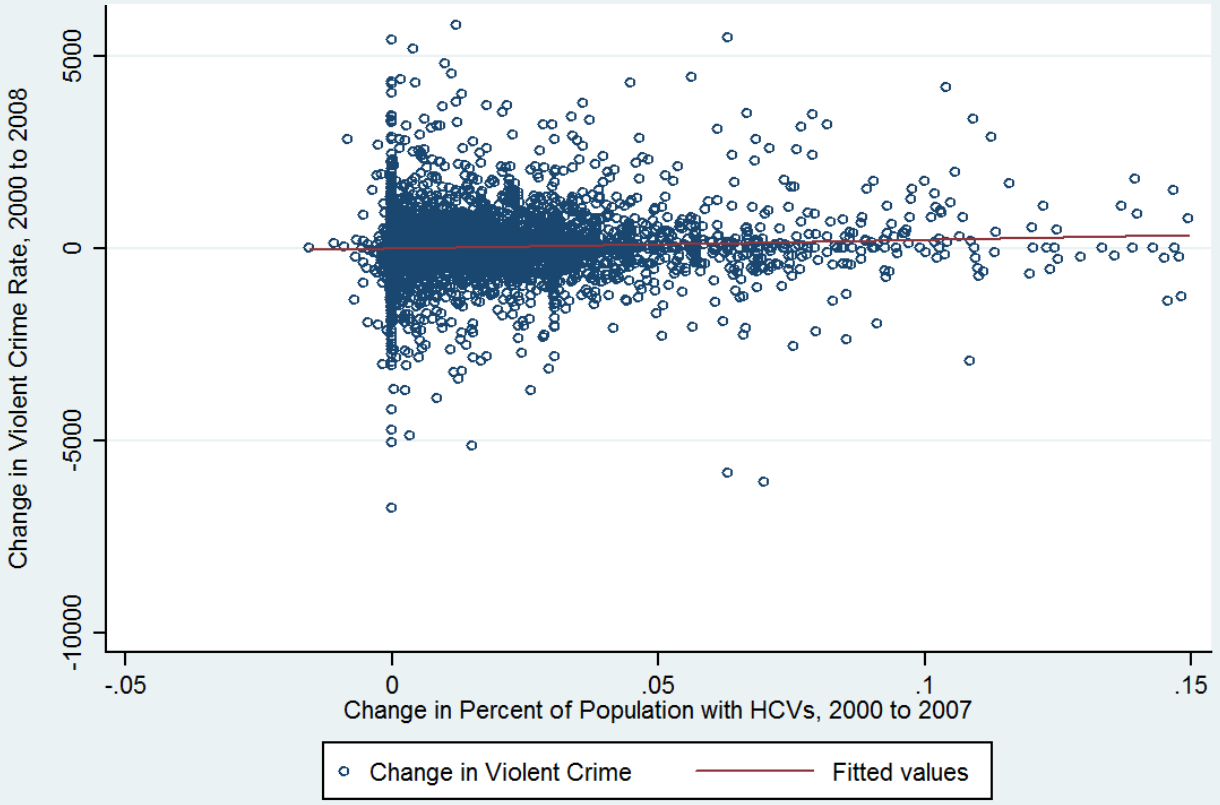

Figure 1b: Scatterplot of Change in Property Crime Rate and in Change in HCVs, 2000 to 2008

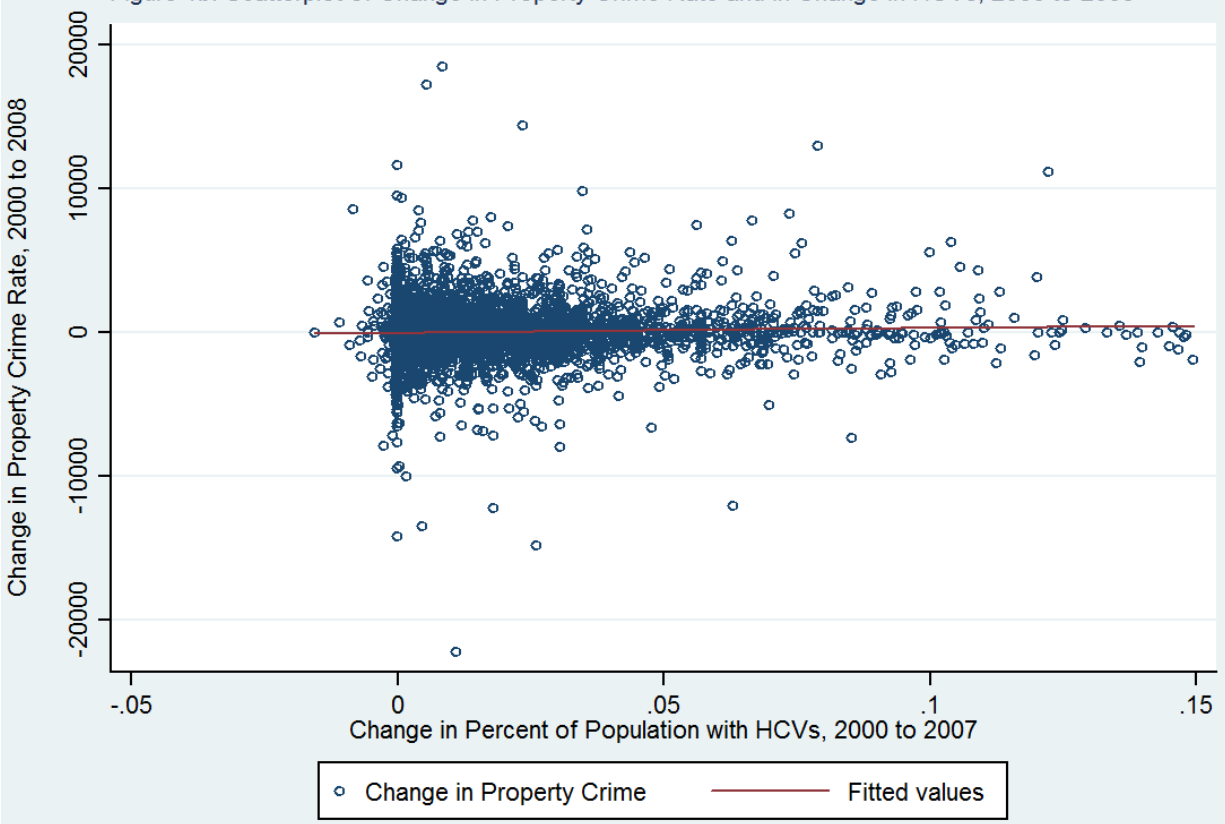

Figure 2a: Scatterplot of Change in Violent Crime Rate and in Change in HCVs, 2000 to 2008
Weighted by HCV Place Population

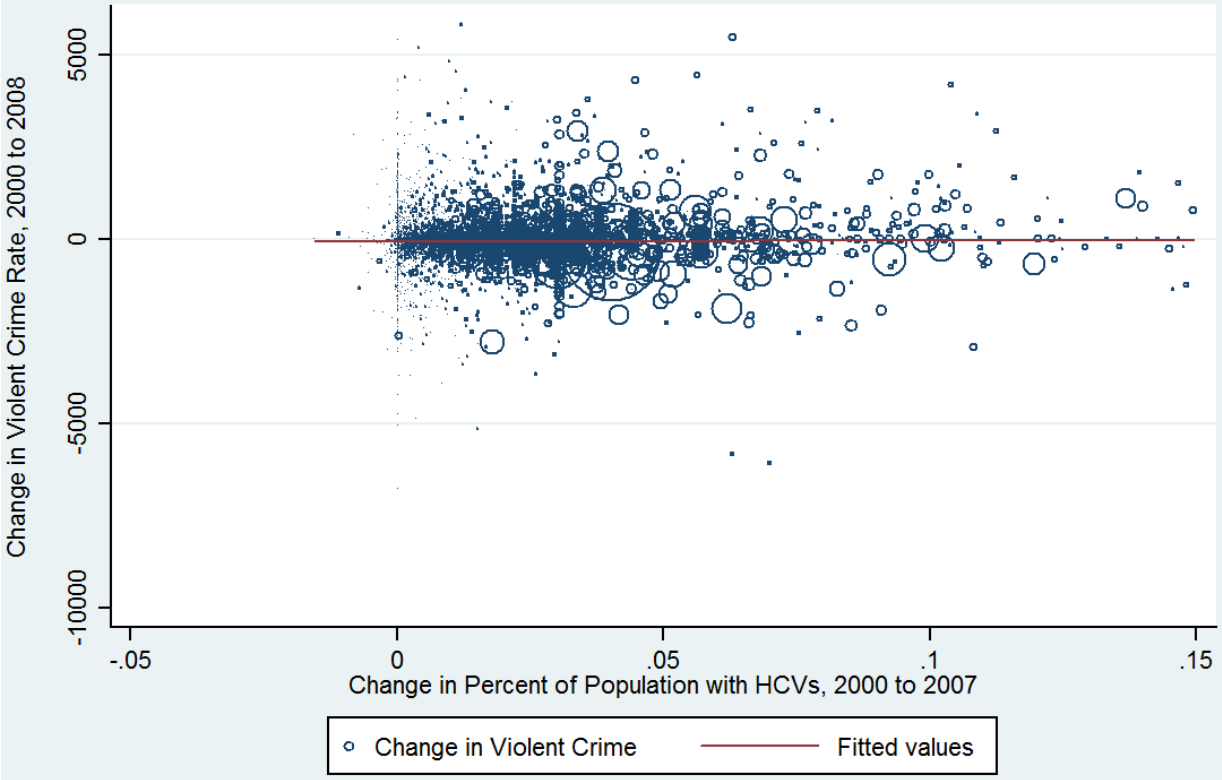

Figure 2b: Scatterplot of Change in Property Crime Rate and in Change in HCVs, 2000 to 2008
Weighted by HCV Place Population

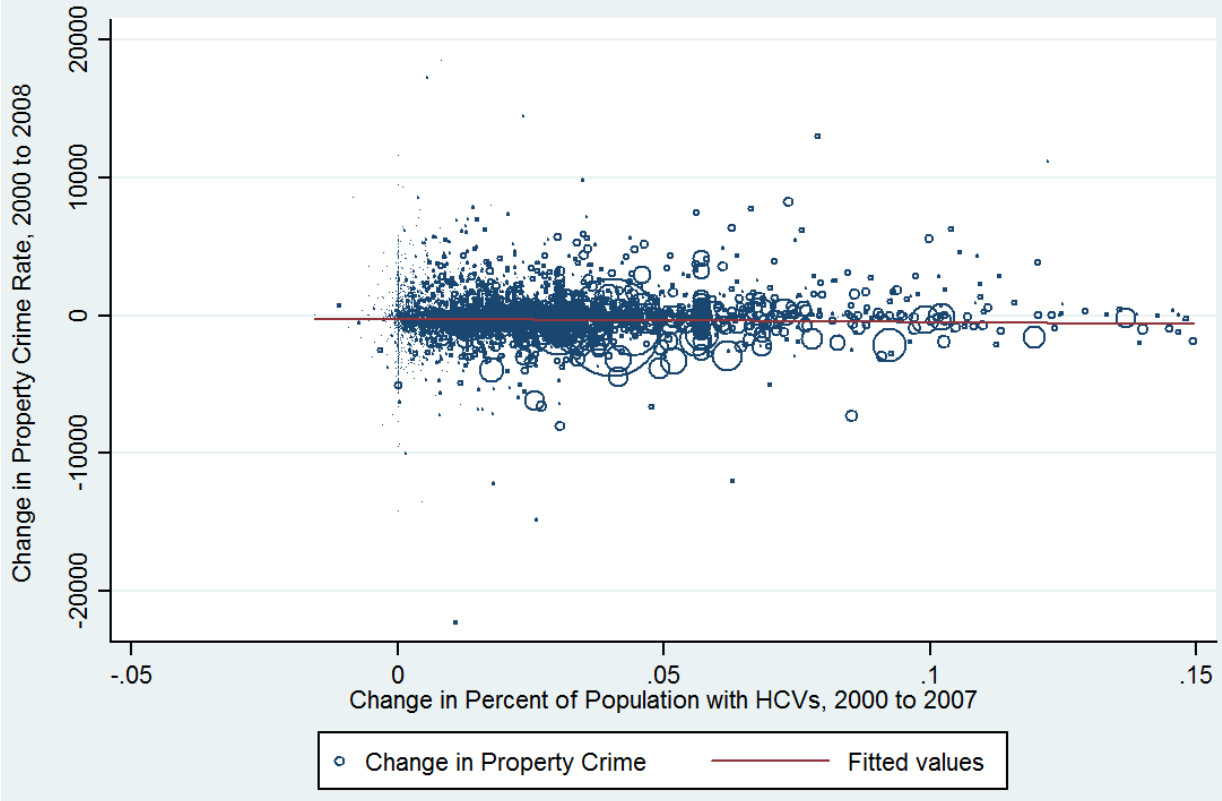

Table 4: Weighted Regression Coefficient Estimates of the Change in Violent and Property Crime Rates, 2000 to 2008[a]

	Violent Crime Rate					**Property Crime Rate**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Change in Percent HCVRs, 2000-07	.005	.001	.004	-.001	-.007	-.022***	-.066***	-.033***	-.061***	-.078***
Metro Dummies	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Pop Size/% Rentals FMR (50%)	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
SES	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Violent Crime Rate, 1990 to 2000	No	No	No	No	Yes	No	No	No	No	Yes
Adj. R-Square	0.00	0.26	0.28	0.31	0.37	0.02	0.19	0.24	0.27	0.34
N	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively
[a]Weighted by HCVR population

Table 5: Regression Coefficient Estimates of the Change in Violent and Property Crime Rates, 2000 to 2008 (Check for Non-Linearitites)

	Violent Crime		**Property Crime**	
	(1)	(2)	(3)	(4)
Panel A.				
Change in Percent HCVRs	-0.018	--	-0.056**	--
Change in Percent HCVRs^2	0.000	--	-0.000	--
Panel B.				
Change in Percent HCVRs-Medium	--	0.098	--	0.034
Change in Percent HCVRs-Large	--	0.093	--	-0.110
Adj. R-Square	0.26	0.26	0.07	0.05
N	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively.
All regressions are weighted by voucher population and includes controls for metro area, population size, % rentals FMR, previous decade crime trends, and socioeconomic status.
Panel B.: Small changes in HCVRs over the decade is the reference category.

Table 6: Regression Coefficient Estimates of the Change in Specific Violent and Property Crime Rates, 2000 to 2008

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Violent Crime Rates					**Property Crime Rates**		
	Murder	Rape	Robbery	Simple Assault	Aggrav. Assault	Burglary	Larceny	Motor
Change in Percent HCVRs	0.0003***	-0.0008**	0.010***	-0.009**	0.029***	-0.002	-0.041***	-0.029***
Adj. R-Square	0.21	0.22	0.42	0.37	0.59	0.27	0.35	0.39
N	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively.
All regressions are weighted by the voucher population and include controls for metro area, population size, % rentals FMR, previous decade crime trends, and socioeconomic status.

Table 7: Regression Coefficient Estimates of the Change in Violent and Property Crime Rates by Race of HCVR, 2000 to 2008

	(1)	(2)	(3)	(4)	(5)	(6)
	Violent Crime	**Property Crime**	**Violent Crime**	**Property Crime**	**Violent Crime**	**Property Crime**
Change in Percent HCVRs – White	0.053***	0.119***	--	--	--	--
Change in Percent HCVRs – Black	--	--	-0.020***	-0.122***	--	--
Change in Percent HCVRs – Latino	--	--	--	--	-0.010	-0.138***
Adj. R-Square	0.32	0.29	0.44	0.39	0.26	0.38
N	5,565	5,565	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively.
Change in percent HCVRs by race is from 2000 to 2007.
All regressions include weights for race specific voucher holders and controls for metro area, population size, % rentals FMR, previous decade crime trends, and socioeconomic status.

Table 8: Regression Coefficient Estimates of the Change in Violent and Property Crime Rates –Type (Suburban) and Size of Place, 2000 to 2008

	(1)	(2)	(3)	(4)
	Violent Crime	**Property Crime**	**Violent Crime**	**Property Crime**
Panel A.				
Change in Percent HCVRs	-0.022***	-0.159***	-0.036***	-0.145***
Change in Percent HCVRs *Suburbs	0.025***	0.118***	--	--
Panel B.				
Change in Percent HCVRs*Trecile 2 Place Size	--	--	0.008	0.101*
Change in Percent HCVRs* Trecile 3 Place Size	--	--	0.009	0.018
Change in Percent HCVRs *Trecile 4 Place Size	--	--	0.047***	0.141***
Change in Percent HCVRs *Trecile 5 Place Size	--	--	0.014	0.019
Adj. R-Square	0.37	0.35	0.37	0.35
N	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively.
All regressions are weighted by voucher recipients and include controls for metro area, population size, % rentals FMR, previous decade crime trends, and socioeconomic status.

Table 9: Regression Coefficient Estimates of the Change in Crime Rates: Lags and Leads

	Specific Crimes						**Race of HCVR**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Murder Rate- 1990 to 2000	Murder Rate- 2000 to 2008	Robbery Rate- 1990 to 2000	Robbery Rate – 2000 to 2008	Aggrav. Assault Rate- 2000 to 2008	Aggrav. Assault Rate- 2000 to 2008	Violent Crime – 1990 to 2000	Violent Crime – 2000 to 2008	Property Crime – 1990 to 2000	Property Crime – 2000 to 2008
Panel A.										
Change in Percent HCVRs, 2000 to 2007	0.00008*	0.00008	0.029***	0.008**	0.047***	0.017***	--	--	--	--
Change in Percent HCVRs, 2008 to 2010	--	0.0002*	--	0.012**	--	0.022**	--	--	--	--
Panel B.										
Change in Percent HCVRs – White, 2000 to 2007	--	--	--	--	--	--	0.050***	0.018	-0.029	0.085**
Change in Percent HCVRs – White, 2008 to 2010	--	--	--	--	--	--	--	-0.000	--	0.026*
Adj. R-Square	0.37	0.21	0.71	0.38	0.56	0.27	0.34	0.28	0.33	0.31
N	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565

Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively.
All regressions are weighted by voucher recipients and include controls for metro area, population size, % rentals FMR, and socioeconomic status.

Table 10: Regression Coefficient Estimates of the Change in Crime Rates: Lags and Leads								
	Place Type-Suburbs				**Place Size**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Violent Crime: 1990 to 2000	Violent Crime: 2000 to 2008	Property Crime: 1990 to 2000	Property Crime: 2000 to 2008	Violent Crime: 1990 to 2000	Violent Crime: 2000 to 2008	Property Crime: 1990 to 2000	Property Crime: 2000 to 2008
Panel A.								
Change in Percent HCVRs - 2000 to 2007	-0.065***	-0.046**	-0.125***	-0.303***	-0.117***	-0.055***	-0.369***	-0.205***
Change in Percent HCVRs - 2008 to 2010	--	-0.042*	--	-0.193***	--	-0.026	--	-0.123***
Change in Percent HCVRs – 2000 to 2007*Suburbs	0.025***	0.011	0.057***	0.188***	--	--	--	--
Change in Percent HCVRs – 2008 to 2010*Suburbs	--	0.006	--	0.091**	--	--	--	--
Panel B.								
Change in Percent HCVRs – 2000 to 2007*Trecile 2 Place Size	--	--	--	--	0.078***	-0.021	0.229***	0.056
Change in Percent HCVRs- 2000 to 2007* Trecile 3 Place Size	--	--	--	--	0.090***	-0.015	0.305***	0.036
Change in Percent HCVRs- 2000 to 2007 *Trecile 4 Place Size	--	--	--	--	0.098***	0.013	0.308***	0.056
Change in Percent HCVRs- 2000 to 2007 *Trecile 5 Place	--	--	--	--	0.070***	0.029	0.243***	0.081

Size								
Change in Percent HCVRs - 2008 to 2010*Trecile 2 Place Size	--	--	--	--	--	-0.033	--	0.012
Change in Percent HCVRs- 2008 to 2010* Trecile 3 Place Size	--	--	--	--	--	-0.045*	--	0.009
Change in Percent HCVRs- 2008 to 2010 *Trecile 4 Place Size	--	--	--	--	--	0.059**	--	0.099**
Change in Percent HCVRs- 2008 to 2010 *Trecile 5 Place Size	--	--	--	--	--	0.008	--	-0.091*
Adj. R-Square	0.51	0.31	0.38	0.29	0.38	0.32	0.39	0.29
N	5,565	5,565	5,565	5,565	5,565	5,565	5,565	5,565
Notes: ***, **, * indicates 1, 5 and 10 percent significance level, respectively. All regressions include controls for metro area, population size, % rentals FMR, and socioeconomic status.								