The Location of Women's Prisons and the Deterrence Effect of "Harder" Time

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Abstract

Most studies of the deterrence effect of incarceration treat a year in prison as having the same deterrence effect regardless of the conditions of incarceration. In contrast, we estimate both the impact of custody rate and prison location changes on female crime rates. We take advantage of the natural experiment created by recent expansions of the female penal system; many states witnessed a rapid doubling of prison capacity. The physical expansion of the penal system decreased the distance to prisons for some cities while increasing it for others. Movement in both directions is particularly helpful because it ensures that we are not identifying relationships off coincidental one-directional trends. Our results suggest that prison location has a sizable deterrence effect. Increasing the average distance to a woman's prison by 40 miles reduces the female violent crime rate by approximately 7 percent.

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1. Introduction

Hard time, to paraphrase a *New Yorker* article, is getting harder.[1] Many states have increased sentence lengths, others have instituted mandatory sentences, and still others have moved to "three-strikes" rules. In addition to longer sentences, inmates are being denied air conditioning,[2] weight sets, exercise time, visitation, phone calls, and television. Alabama, Arizona, Florida, Iowa, Massachusetts (*Charleston Daily Mail*. June 17 1999) and Wisconsin (*Milwaukee Journal Sentinel* November 14, 1997) have even reintroduced chain gangs. And in Georgia prisoners are again forced to wear striped uniforms.

There are two standard arguments for making prison time more punitive: retribution and deterrence. The case for retribution rests on the presumption that punishing criminals increases the utility of victims, and perhaps other members of society as well. Punishment has a long history as a consumption good. Romans staged elaborate games in which condemned criminals fought to the death for the entertainment of the populace; medieval executions were festival days; and in colonial America, criminals were placed in stocks for public ridicule. Despite current demonstrations of support during executions, consumption arguments for punishment have fallen out of favor with modern politicians and policy makers. Deterrence is now the most commonly stated reason for increased punitiveness.

The deterrence argument is consistent with Becker's (1968) economic model of crime. The decision to commit a crime is determined by the marginal benefit the perpetrator expects to receive from the crime relative to its expected marginal cost. In this simple model marginal cost is a function of the likelihood and severity of punishment (Becker 1968, Stigler 1970, and Polinsky and Shavel 1984). Several studies have tested the prediction that more

[1] "Lockdown: Life inside is getting harder," *The New Yorker*, February 24 and March 3, 1997.

severe sanctions, traditionally measured by the likelihood and duration of incarceration, deter crime (examples include Tauchen, Witte and Griesinger (1994) and Levitt (1997 and 1998), see Avio (1998) for review of the literature). There have also been several attempts to estimate the cost of punishment, in terms of subsequently lower wages and employment probabilities, across individuals with different attributes (Lott 1992a, 1992b, Waldfogel 1994, and Grogger 1992, 1995).

To the best of our knowledge, there has been no systematic attempt to estimate the deterrence effect of punitiveness other than incarceration length.[3] Testing the deterrence effect of "harder" time is hampered by the difficulties inherent to measuring the punitiveness of sanctions. Previous studies have treated a year of imprisonment as having the same deterrence effect regardless of the conditions of incarceration (Ehrlich 1973, Marvell and Moody 1994, and Levitt 1996). In contrast, we focus on the deterrence effect of punitiveness that is not related to incarceration length by exploiting recent female prison building in many states. Penal system expansion has increased the average distance between prisons and some cities while decreasing average distance for other cities.

We find sizeable deterrence effects for both custody rate and punitiveness (distance) changes. A 10 percent rise in the custody rate for women reduces female violent crime by approximately 5 percent. The impact of distance is more dramatic. Increasing the average within state prison distance by 40 miles reduces the female violent crime rate by approximately 7 percent. These results suggest that visitation is a key component of the opportunity cost of punishment for women. It is important to note that we focus on the first-

[2] The Virginia Poverty Law Center recently deemed Virginia prisons unsafe and unhealthy. Lack of air conditioning was one of the stated reasons. (*The Washington Post* July 10, 1999)

[3] In one sense, Ehrlich's (1975) paper on the death penalty is an exception. Unless you believe that there truly is a "fate worse than death," the death penalty is an upper bound on how punitive the state can make sanctions.

round deterrence effects. It is certainly possible that the indirect effects on children lead to quite different long-run general equilibrium outcomes.

The remainder of the paper proceeds as follows. Section 2 discusses the expansion of the female penal system and the exogeneity of prison distance. Section 3 discusses the punitiveness of incarceration location. Section 4 presents the data. Section 5 presents the results from our panel data estimation of the effect of punishment on female crime rates. Section 6 concludes and discusses possible policy implications.

2. The Expansion of the Female Prison System from 1981-95

Between 1981-95 many states increased their female prison capacity by as much as fifty to one hundred and fifty percent with the construction of one or two institutions. As shown in Table 1, the average number of prisons per state rose from 1.7 in 1981 to 3.1 in 1995.[4] To give a few examples, during this period California built two prisons, Texas three, New York one, and Florida one. This prison building translates into a wide variety of changes in the distance between major cities and female penitentiaries. The expected, or prison-population-weighted straight-line distance between Los Angeles and a women's prison was 42 miles in 1981 and 174 miles in 1995 compared to a reduction from 380 to 215 miles for San Francisco over the same time frame. In contrast, the average distance between New York City and a female prison fell from 170 to 150 miles between 1981 and 1995, while it rose from 148 to 170 miles for Buffalo.

These examples reflect considerable changes in the geographic distribution of punitiveness between 1981 and 1995 (see Table 2). During this period, twenty-four cities experienced substantial decreases in average prison distance: fourteen cities experienced a

30 mile or greater decrease, and twenty cities saw a decrease of 10 to 29 miles. Seventy-two cities experienced small changes; a distance change of -9 to 10 miles. Finally, forty-eight cities witnessed an increase in the average distance to a women's penitentiary: it increased between 11 and 30 miles for twenty cities and by more than 30 miles for 28 cities.

In addition to differences in the magnitude and direction of distance changes, the timing of changes also vary substantially across states. California, for example, opened two new penitentiaries in 1987, another in 1990 and closed a female prison in 1993. In contrast, Texas closed a prison in 1983 and didn't open a new facility until 1994, when it opened four in a single year.

The large discrete distance changes between cities and female penitentiaries between 1981 and 1995 form a natural experiment for evaluating the harshness of punishment. Most efforts to increase the punitiveness of incarceration suffer from the usual endogeneity problems inherent in anti-crime policies. For example, Levitt (1996 and 1997) discusses the endogeneity issues associated with expanded prison capacity and policing respectively. The problem arises because an increased police presence may be caused by, or causing, changes in the crime rate. The location of women's prisons does not suffer from this problem when the analysis is conducted at the city level.

While the building of new prisons may be endogenous, the location is not. First, prison location decisions are made at the state, not the city level. Second, locating a prison farther from one metropolitan area often means locating it nearer to another. Third, although most large cities do not want prisons located in close proximity, many small communities have actively sought prisons to reap economic benefits. For example, the most recent addition to the Missouri corrections system is being built in the small town of Charleston,

[4] Our sample includes states with at least one city with a population of 100,000 in all years from 1981-95.

which "won" the prison in competition with more than two dozen other communities. Charleston's fight to win the prison was fueled by economic impact studies predicting that the maximum security prison will bring 400 new jobs and $10 million in annual payroll (*St. Louis Post-Dispatch* June 15, 1999). Fourth, since few new penitentiaries are built in major metropolitan areas, it is unlikely that female criminals are moving to small towns/cities with nearby prisons to reduce potential incarceration costs. This potential source of endogeneity is further mitigated by restricting our analysis to cities with populations of 100,000 or more.

While we have argued that distance is exogenous at the city level, our results are in fact robust to endogeneity at any rate. One might believe that endogeneity arises because prison building usually entails increasing the number of prisoners the state can incarcerate. If states build new penitentiaries far from metropolitan areas our results might merely be picking up the incapacitation effect caused by increases in capacity. It is for this reason that prisons movements in both directions are particularly helpful because they ensure that we are not identifying relationships off coincidental one-directional trends. In fact, we find statistically significant deterrence effects for distance even if we split the sample into cities, and time-periods, where the average distance increases and those where it decreases (see Section 5.2).

3. The Punitiveness of Prison Location

Reductions in visitation due to increased transportation costs clearly constitute increased punitiveness. In 1994, the Bureau of Justice Statistics reports that 78.1 percent of female prisoners had children.[5] Of those with children, 71.7 percent were primary caregivers prior to incarceration. The majority of these women must rely on grandparents or relatives,

other than the father, to care for the children while in prison. The loss of parental rights while incarcerated is compounded by distance. Baunach (1985),

> The most direct way to retain ties with children during incarceration is through visits. However, slightly less than half (47 percent) of the children visited their mothers regularly, once a month or more. The most frequently given reasons for few visits were the distance from the children's placement or the lack of transportation.

Similarly, the Bureau of Justice Statistics (1994) reports that 52 percent of women with children receive no visits from their children and that the most common reason for the lack of contact is the cost associated with traveling to distant prisons. Further evidence of a distance effect is found in the fact that 72 percent of inmates with children receive phone calls from children and 79 percent receive mail. The relative frequency of phone calls and letters, which have no distance cost, clearly suggest a desire on the part of the inmate, her children, and the children's current guardian to maintain contact. Anecdotal evidence supporting this view is easy to find. An Ohio sixth grader recently brought a gun to school in an effort to be sent to prison with his mother who had been moved from a local jail to the Ohio Reformatory for Women in Marysville located 150 miles away (Salon, March 29, 2000). In a recent Los Angeles Times article Alice Sanchez, a custodial grandmother, explains that her granddaughter has not visited her incarcerated mother in eight years because the distance to the prison, the ordeal of entering the penitentiary as a visitor, and the cost of the trip are prohibitive (Los Angels Times, May 22, 2000).

Since men commit the vast majority of crime in the United States, our focus on women may seem odd.[6] It is not that we are arguing that prison location does not affect men, in fact distance from family, friends, and gangs is likely punitive for men. The difficulty

[5] The numbers are comparable for black (79.6 percent) and white (73.9 percent) women.

with examining the deterrence effect of distance for men is that there is no corresponding natural experiment for men during our 1981-95 sample period. Although a substantial number of men's prisons were built during this period, the vast majority of states already contained many male penitentiaries at the beginning of the period. While an increase from one to two female prisons clearly changes a woman's perception about where she expects to be imprisoned, it is much less clear how a change from fifteen to sixteen male prisons changes a man's perception about where he expects to be incarcerated. Further, men's prisons are more likely to be classified as minimum, medium or maximum security. This makes it far more difficult to construct a reasonable measure of where male criminals expect to be sent. Women's prisons, by contrast, generally house many or all classifications making a distance measure easier to construct.

4. Data

Our primary data source is the Federal Bureau of Investigation's 1980-1995 Unified Crime Reports (UCR) which contain data on all crimes reported to the police and all crimes cleared by arrest. The crimes are classified into seven categories known as index crimes and two broad aggregates (violent and property crimes).[7] One important limitation in all crime data is that the personal characteristics of criminals, such as gender, race, and age, are only observed for those crimes cleared by arrest. Similar to Levitt (1999), we use the UCR arrest data to estimate the female crime rate. The female crime rate is therefore the fraction of female arrests for a city and year multiplied by the number of reported crimes.

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[6] Women's crime is not, however, inconsequential; 22% of those arrested in 1998 were women. Despite this, female crime has been largely ignored (exceptions include Bartel (1979) and Phillips and Votey (1984)).

[7] The Unified Crime Report lists seven crime categories: murder, non-negligent manslaughter, forcible rape, robbery, assault, burglary, larceny and motor vehicle theft. The first four are categorized as violent crime and the latter three are listed as property crimes (See Appendix II of *Crime in the United States*).

$$Crime_{ijt}^{f} = \frac{Arrests_{ijt}^{f}}{Arrests_{ijt}^{m} + Arrests_{ijt}^{f}} \times Crime_{ijt} \quad (1)$$

where *i* denotes the type of offence (violent or property), *j* is the city and, *t* is the year, *m* denotes male, and *f* denotes female. For comparability across cities, $Crime_{ijt}^{f}$ is translated into the rate per 1000 women, $CR_{ijt}^{f} = (1000 \times Crime_{ijt}^{f}) / (\textit{female population})$. The natural log of the crime rate, $\ln(CR_{ijt}^{f})$, is the dependent variable throughout the analysis.

Following Levitt (1996 and 1999), we approximate the punitiveness of each state's judicial system by its custody rate. The custody rate is defined as the stock of female prisoners sentenced to a year or more at the state-level divided by the number of violent crimes committed by women in the state in any given year.[8] As Levitt (1998 and 1999) notes, this measure suffers from ratio bias because the crime rate (the dependent variable) appears in denominator of the female custody rate. If ratio bias exists it will tend to overstate the impact of custody rates on crime (Ehrlich 1973). For this reason, the custody rate is lagged by one year. Alternatively, custody can be measured as the number of women in custody per 1000 women[9] in the population (see Marvell and Moody 1994). The general smallness of the female crime rate makes this ratio effectively zero in most cases causing serious downward bias (Levitt 1999). For this reason we focus on incarceration divided by the violent crimes, although the results for both measures are reported.

Expected prison distance is defined as the average distance from a given city of residence to each possible prison weighted by the prisons relative population. Each city-to-prison distance is approximated by its straight-line distance. A complete list of prisons is

[8] Prison population by gender is available from the Bureau of Justice Statistics. State level female arrests are approximated by summing female arrests in cities with populations over 100,000 in any year from 1980-95.
[9] The FBI only reports total population. We therefore estimate the female population as half of the total.

available for 1980, 1985, 1992, and 1995 in the Census of State and Federal Correctional Facilities produced by the Census Bureau for the Department of Justice. We supplement this information with opening and closing dates for prisons that appear or disappear between census years.[10] To avoid creating an artificial trend in distance, 1995 prison populations are used as weights for all years.[11] In the few cases where a prison closed prior to 1995, the most recent population available is used as the weight.

An alternative, and some might argue preferable, distance measure might weight distance by space relative to capacity at each prison since convicts are most likely sent to institutions with the space to accommodate them. Unfortunately, reported capacity rarely reflects actual capacity. In fact, in recent years population more frequently exceeds capacity than the other way around. Since prisons are more likely to have excess capacity in the first few years of operation, and hence be an above average destination, we rerun the regressions removing first the year of an opening or closing and then removing the first two years after an opening or closing. Even if average distance is an imperfect measure of expected distance in years directly surrounding facility changes, by year three most prisons are full making average distance a good measure of expectation on the part of potential criminals.

If, for some years, a state has no women's penitentiary we assume that women are sent to local jails. More precisely, we assign zero distance to these observations. As a robustness check we also run regressions including a dummy variable for those state-years with no prison and excluding states that do not contain at least one prison throughout the sample period (see Section 5.2).

[10] Opening and closing dates are from data provided by corrections departments on the web and from the *Juvenile and Adult Correctional Departments, Institutions, Agencies and Paroling Authorities Directory* (1999).
[11] All results are similar if distance is weighted by population interpolated between census years and are therefore not reported.

Since female crime rates tend to be low, and hence volatile for small communities, we restrict our analysis to cities with populations of 100,000 or more throughout the 1981-95 period. To control for other socioeconomic and law enforcement factors we include controls for city level unemployment rates, population sizes, and police officers per capita,[12] and state level measures for the percent black, average income, the birth rate, the female labor force participation rate, poverty rates, and the average welfare payment.[13] Police presence is included to capture the law enforcement effort in each city. The birth rate, percent of the population aged 18-24, and the percent black are included to capture demographic changes. To control for the economic model of crime's prediction that as the return to legitimate activity increases individuals respond by spending less time in criminal activities, we include unemployment, average income and welfare payments. Greater access to welfare, lower unemployment rates and higher income should therefore reduce female crime rates (Ehrlich 1973).[14] Finally, female labor force participation is included to capture the increased opportunities for criminal activity that labor market participation affords women (Witt and Witte 1998). Summary statistics are provided in Table 3.

5. Estimation and Results

This section presents the panel estimates for the response of female crime rates to judicial sanction and the opportunity cost of that sanction. The basic specification is

[12] This measure is also lagged by one year to mitigate possible endogeneity.
[13] The data on police are from the *Unified Crime Reports.* The city level unemployment data are from various editions of the *Employment and Earnings* report from the Bureau of Labor Statistics. The remaining data is from the *Statistical Abstract of the United States.* All currency values are reported in 1995 dollars.
[14] Higher returns to legitimate activities have a theoretically ambiguous impact on criminal participation (Block and Heineke 1975, Witte 1980 and Grogger 1997). There is, however, a substantial empirical literature exploring the relative importance of labor market opportunities and deterrence (Witte 1980, Myers 1983, and Cook and Zarkin 1985). These studies suggest that there is a substitution effect between legitimate labor market activity and crime, but the case is far from settled (see Freeman 1996 for a review of the literature). It should be noted that none of these studies examine the effect of legitimate income changes for women separately.

$$\ln(CR_{ijt}^{f}) = b_0 C_{jt-1} + b_1 D_{jt} + b_2 D_{jt}^2 + X_{jt}\, g + l_t + q_j + e_{jt} \qquad (2)$$

where *C* denotes the custody rate, *D* denotes distance, *X* includes the demographic and law enforcement variables described in the previous section, l_t are year dummies, and q_j are city fixed effects. Distance enters as a quadratic to allow for the possibility that ever greater increases have a relatively lesser impact. The year controls are census division specific to capture regional changes in crime rates. The crack epidemic is a good example of a regional effect. According to Grogger and Willis (1998) the date of crack's introduction varies considerably across metropolitan areas and regions. Equation (2) is estimated separately for violent and property crimes.

5.1 Violent and Property Crime

Given our interest in the crime deterrence effects associated with child rearing, we initially restrict our sample to women aged 18-34. The violent crime results for equation 2 are given in Table 4. Column 1 presents the results using only distance, city fixed effects and regional year controls. Both distance and distance squared are statistically significant with distance having a negative impact on the violent crime rate over the entire sample range.[15] The results suggest that a 40 mile increase in the average distance to a women's prison reduces the female violent crime rate by 6.6 percent. Note that we assume that all women are incarcerated in their state of residence. To the extent that states export female convicts to other states our measure understates actual distance and renders our estimates lower bounds.

The second column adds the female custody rate to the list of regressors. Consistent with other studies, we find a statistically significant and negative relationship between the

custody and violent crime rates. Increasing the female custody rate by 10 percent reduces the crime rate by 6.1 percent while a 40 mile increase in average prison distance reduces the female crime rate by 4.9 percent.

Column 3 adds the full set of socioeconomic controls. Increases in income are associated with reductions in female violent crime. Increases in the percentage of the city's population who are black are associated with decreases in the crime rate while higher birth rates are associated with increases in the crime rate. Perhaps the most interesting finding is that higher welfare payments reduce female violent crime. A one standard deviation increase in welfare payments ($184) reduces the female violent crime rate by 14.9 percent. As noted above, increases in the return to legitimate labor market activity should cause potential criminals to reduce their participation in illegal activities. Freeman (1996), for example, argues that the rise in crime during the 1980s can be explained in part by the 'collapse' of the job market for unskilled workers. Without job prospects young men turned to crime. Our results suggest that similarly positioned young women turn to welfare if the payments are sufficiently high. Finally, distance and custody retain their statistical significance and magnitudes when the full set of controls are included.

Column 4 estimates the basic model using national level year controls rather than census level year controls. The results are largely the same as all other specifications. The fifth column replaces the custody rate per violent crime with the custody rate per 1000 women in the state. The estimated impact of the custody rate per 1000 women is not statistically different from zero at the 10 percent level. Distance, however, retains its statistical significance and is comparable in magnitude to other estimates.

[15] The mean difference in distance between 1981 and 1995 is 14 miles with the largest negative distance change being -177 miles and the largest positive change being 208 miles. Based on the estimates presented in Table 4,

Table 5 presents the results for female property crime rates. This table is arranged in a similar fashion to Table 4. When the full set of control variables are included, Column 3, a 40 mile increase in distance reduces female property crime rates by 5.4 percent while increasing the female custody rate by 10 percent reduces the property crime rate by 1.9 percent. These smaller effects, relative to violent crime, may result from a lower incarceration probability, lesser sentences, a propensity for judges or corrections officials to place non-violent criminals in facilities located closer to home, or a substitution from violent to property crimes as custody rates and prison distance rise. In addition, the number of police officers per capita has a statistically significant negative impact on property crime. An increase of 10 police officers per 100,000 residents reduces the property crime rate by 2 percent.

Our results are consistent with the view that increasing the average distance between home city and prison location increases the severity of punishment for female inmates. We interpret this deterrence effect as resulting from the reduction in visitation caused by the increased cost of transportation. The implications, however, go far beyond the optimal location for a prison. Recent efforts to make hard time "harder" are in effect raising the opportunity cost of a year in prison to the offender. While distance is one way to lower the utility of mothers in prison, many of the measures currently employed by states affect a far broader class of prisoners. It is also important to remember that we are measuring first round deterrence effects and that indirect effects on children may lead to very different general equilibrium crime rates in the long-run.

Note that any reduction in crime resulting from increased prison distance, or any method of increasing the sentence harshness, is likely due to deterrence not incapacitation

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the relationship between distance and violent crime becomes positive at about 300 miles; far out of our sample.

(Levitt 1998). While an increase in the custody rate could cause a reduction in crime through either deterrence or incapacitation, it seems unlikely that convicts are more incapacitated when incarcerated far from home. Distance could generate incapacitation if it hinders the ability to manage a criminal network. For example, Al Capone's network was apparently destroyed by his incarceration. Given that most violent crimes committed by women are assaults and robberies and nonviolent crimes are larcenies and burglaries it seems unlikely that crime syndicates could be driving the results.

5.2 Sensitivity Analysis

Three states in our sample have a span of time with no female penitentiary: Iowa prior to 1982, Mississippi prior to 1986, and New Mexico prior to 1989. Thus far we have assumed that female prisoners in these states were held in local jails. Since the cities used in the analysis are major population centers, assigning zero distance to these observations is a reasonable solution. However, it is likely that these states used a combination of local jails and out of state facilities. To ensure that our results are not driven by the assumption that female convicts were held in local jails prior to the opening of a state penitentiary, we re-estimate equation (2) adding a dummy variable for states with no female prison and then excluding Iowa, Mississippi, and New Mexico altogether (columns 1 and 2 in Table 6). Under both specification, and for both violent and property crimes, distance retains statistical significance and is larger in magnitude.

The second issue is the importance of any one state, or small group of states. As can be seen from columns 3-6 in Table 6, excluding any one of California, Texas, New York or

Florida does not change the impact of distance.[16] This further means that neither New York City nor Los Angles are driving the results. Finally, several states do not build (or close) any women's prisons during our sample period. Column 7 presents the results when these states are excluded. Again, the results are similar.

To ensure that we are not simply picking up spurious correlation between new construction far from metropolitan areas and rising crime rates, we split the sample into cities, and time spans, where average distance rose and those where average prison distance fell. More specifically, a city-year observation is included in the 'farther' sample if it either proceeds or follows a prison opening/closing that increases average distance and is included in the 'closer' sample if it proceeds or follows an opening/closing that decreases average distance.[17] Columns 1 and 2 in Table 7 report the estimates for these sub-samples. Similar to other specifications, decreases in distance are associated with higher crime rates while increases in distance are associated with lower crime rates.

To check that the results are not driven by possible imperfections in our expected distance measure, columns 3 and 4 in Table 7 report the distance estimates for samples excluding the year of prison opening/closings and the first two years after opening/closings respectively. Removing these observations ensures that excess capacity in the first few years of operation, and hence above average destination years, are not driving the results. The results are again similar.

All results presented to this point have been restricted to crime rates for women aged 18-34. Table 8 repeats the analysis from Tables 4 and 5 including crimes committed by women of all ages. The results for violent crime are consistent with earlier results. The

[16] In fact, the results are similar when any single state is omitted.

distance and distance squared terms are significant and indicate a negative relationship between distance and crime for all in-sample changes. A 40 mile increase in average distance reduces the overall female violent (property) crime rate by 2.7-6.7 (2.0-5.9) percent depending on specification. While not all distance terms are individually significant under all specifications, distance and distance squared are jointly significant at better than the 1 percent level in all cases.

The most notable difference between the results in Table 8 and those in Tables 4 and 5, is the smaller impact of distance when the crimes of all women are included in the crime rate. Under most specifications, a 40 mile increase in average prison distance has a 0.5-1.5 percent lower impact on violent crime rates and a 2-4 percent lower impact on property crime rates. There are several possible reasons for these lesser effects. First, fewer women over the age of 34, or under the age of 18, have small children. Secondly, it is unlikely that women under the age of 18 will be sent to prison; they are more likely to be placed on probation or sent to a juvenile facility. As a result, the distance to female penitentiaries simply does not affect their behavior.

6. Conclusion

This paper is one of the first attempts to estimate the impact of increasing the severity of a given year of punishment rather than the amount of punishment. Our results support the economic model of crime's prediction that higher punishment costs deter crime. We take advantage of the policy experiment afforded us by the expansion of the female penal system between 1981 and 1995 to estimate the impact of more punitive sanctions on crime rates. The location of new prisons changes the distance from home at which women expect to be

[17] States with no distance changes as well as those with no prison at the beginning of the sample are excluded.

incarcerated. The evidence suggests that an increase in average prison distance leads to a decrease in crime. Our estimates show that a 40 mile increase in the average distance to a female penitentiary reduces female violent and property crime rates by approximately 7 and 5 percent respectively.

The relative cheapness of the policy prescription suggested by the distance results is a key difference between our findings and those of Levitt (1996 and 1997). For example, President Clinton's program to put 100,000 new police on the streets would have raised the police force by 0.4 per thousand people. Our estimates suggest that this would result in an impressive 8.1 percent reduction in the female property crime rate. However, using Levitt's (1997) estimate that each police officer comes at an average annual cost of $41,000, the national bill would be $4.1 billion per year.[18] Doubling the female custody rate from 0.16 to 0.32 women per violent crime would also reduce the crime rate by 7.8 percent. This policy would require approximately 75,000 new prisoners at a cost of approximately $23,000 each (Levitt, 1999) for a total cost of $1.7 billion. While a policy of remote prison building might entail somewhat higher transportation and operational costs, its seems very unlikely that the annual cost increase would be anywhere near that of police force expansion or higher custody rates. It should also be noted that doubling the incarceration rate would certainly involve building new prisons. Our results suggest that building these prisons farther from metropolitan areas would increase the deterrence effect of any prison expansion.

The evidence presented in this paper suggests remote prison locations and/or restricted visitation as low cost crime deterrence mechanisms. However, our estimates do not quantify the welfare implications of this change. Increasing the distance to women's

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The sample is also restricted to distance changes that are stable for at least two years.

[18] This policy will also, of course, reduce property crimes committed by men.

prisons (or an outright ban on visitation) has clear externalities. There is ample evidence that a mother's incarceration has adverse effects on her children (Baunach 1985). It therefore seems quite likely, although not certain, that even more severe restrictions on maternal visitation would exacerbate an already bad situation. The secondary effects therefore render the long-run general equilibrium effects of prison location on crime rates ambiguous. In contrast, other forms of hardening hard time do not suffer from the same types of externalities. Chain gangs, prison stripes, and loss of recreational privileges generally do not lower the utility of anyone but the convict.

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Table 1. Prisons Per State

Year	National Average	CA	TX	NY	FL
1981	1.7	2	3	3	2
1982	1.7	2	3	3	2
1983	1.6	2	2	3	2
1984	1.6	2	2	3	2
1985	1.7	2	2	3	3
1986	1.8	2	2	3	3
1987	2.2	4	2	3	3
1988	2.3	4	2	3	3
1989	2.3	4	2	3	3
1990	2.7	5	2	4	3
1991	2.7	5	2	4	3
1992	2.7	5	2	4	3
1993	2.6	4	2	4	3
1994	3.1	4	6	4	3
1995	3.1	4	6	4	3

Table 2. Prison Distance Changes from 1981-95

Change in Average Distance	Number of Cities
30 mile or more decrease	14
10-29 mile decrease	20
-9 to 10 mile change	72
11 to 30 mile increase	20
greater than 30 mile increase	28

Table 3. Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum
Female Violent Crime Rate (Per 1000 Women)	3.93	2.84	0.05	17.90
Female Property Crime Rate (Per 1000 Women)	20.04	7.64	0.79	55.76
Female Custody Rate (Per Female Violent Crime)	0.16	0.11	0.02	1.84
Female Custody Rate (Per 1000 Women)	0.26	0.15	0.03	0.99
Average Distance	116.60	90.32	0.00	542.78
Police Officers per 1000 People	2.05	0.71	0.96	5.12
City Population	370,314.10	699,406.20	100,332.00	7,375,097.00
% of Population Aged 18-24	11.24	1.30	8.17	14.46
Unemployment Rate	6.56	2.47	1.80	20.80
Income per capita	20,624.27	3,178.75	12,283.60	30,315.98
% Black	11.38	6.81	0.28	35.68
% Below the Poverty Line	13.76	3.47	2.90	27.20
Female Labor Force Participation Rate	56.46	3.79	46.30	69.80
Average Monthly Welfare Payment	425.78	184.09	119.00	789.04
Live Births per 100,000 Population	16.13	1.93	12.60	27.30

Sample covers 1981-1995 and includes 154 cities with populations of 100,000 or more throughout the sample period, the sample size is 2210 due to occassional missing observations. Crime and arrest rates are resticted to women aged 18-34. All values reported in 1995 dollars.

Table 4. Female Violent Crime Rate Results

	(1)	(2)	(3)	(4)	(5)
Female Custody Rate		**-0.614481**	**-0.490118**	**-0.577611**	-0.253814
		(0.146362)	(0.142623)	(0.128407)	(0.158078)
Average Distance	**-0.001766**	**-0.001433**	**-0.001898**	**-0.001292**	**-0.002059**
	(0.000750)	(0.000721)	(0.000669)	(0.000533)	(0.000680)
(Average Distance)^2	**0.000006**	**0.000005**	**0.000006**	**0.000005**	**0.000007**
	(0.000002)	(0.000002)	(0.000002)	(0.000001)	(0.000002)
Police Officers per 1000 People			0.047692	0.040594	0.057808
			(0.043947)	(0.060657)	(0.044165)
Ln(Population)			-0.059324	0.077821	-0.035237
			(0.123783)	(0.140000)	(0.123735)
% of Population Aged 18-24			0.053861	-0.028377	0.058368
			(0.031320)	(0.024612)	(0.031910)
Unemployment Rate			0.001415	**-0.014223**	0.000836
			(0.008538)	(0.006552)	(0.008603)
Income per capita			**-0.000028**	**-0.000027**	**-0.000031**
			(0.000011)	(0.000011)	(0.000011)
% Below the Poverty Line			-0.005790	-0.005987	-0.006533
			(0.006741)	(0.006445)	(0.006942)
% Black			**-0.062282**	**-0.103912**	**-0.057996**
			(0.027139)	(0.016959)	(0.027467)
Labor Force Participation			**0.032863**	**0.032157**	**0.035036**
			(0.008165)	(0.007636)	(0.008034)
Monthly Welfare Payment			**-0.000809**	-0.000049	**-0.000773**
			(0.000278)	(0.000271)	(0.000280)
Births per 100,000 Population			**0.047597**	-0.011232	**0.060132**
			(0.020466)	(0.013993)	(0.020727)
City Controls	Yes	Yes	Yes	Yes	Yes
National Level Year Controls	No	No	No	Yes	No
Census Division Level Year Controls	Yes	Yes	Yes	No	Yes
Female Custody Rate per Female Violent Crime	No	Yes	Yes	Yes	No
Female Custody Rate is per 1000 Women in the State	No	No	No	No	Yes
P-Value: Joint Significance of Distance	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.8647	0.8669	0.8720	0.8562	0.8710
% Change in the female crime rate implied by a 40 mile increase in average prison distance	-6.1%	-4.9%	-6.6%	-4.4%	-7.1%

Sample covers 1981-1995 and includes 154 cities with populations of 100,000 or more throughout the sample period, the sample size is 2210 due to occassional non-reporting. Crime and arrest rates are resticted to women aged 18-34. The dependent variable in all regressions is the log of female violent crimes per 1000 women, as defined by equation (1). Bold coefficients are individually significant at the 5% level or better. All regressions are weighted by city population and the standard errors are heteroskedastic consistent.

Table 5. Female Property Crime Rate Results

	(1)	(2)	(3)	(4)	(5)
Female Custody Rate		**-0.237469**	**-0.189856**	**-0.200331**	-0.195398
		(0.087275)	(0.085720)	(0.082340)	(0.109357)
Average Distance	**-0.001148**	-0.001019	**-0.001538**	**-0.002686**	**-0.001572**
	(0.000558)	(0.000552)	(0.000562)	(0.000447)	(0.000562)
(Average Distance)^2	**0.000004**	**0.000003**	**0.000005**	**0.000007**	**0.000005**
	(0.000001)	(0.000001)	(0.000001)	(0.000001)	(0.000001)
Police Officers per 1000 People			**-0.202337**	**-0.159551**	**-0.199380**
			(0.026990)	(0.023592)	(0.026893)
Ln(Population)			**-0.601484**	**-0.567743**	**-0.593399**
			(0.100695)	(0.093553)	(0.100108)
% of Population Aged 18-24			-0.048513	-0.036864	-0.044755
			(0.029354)	(0.021658)	(0.029026)
Unemployment Rate			0.006050	**0.013076**	0.005853
			(0.006765)	(0.004748)	(0.006759)
Income per capita			-0.000009	**-0.000017**	-0.000011
			(0.000008)	(0.000008)	(0.000008)
% Below the Poverty Line			-0.004758	-0.005017	-0.004471
			(0.004736)	(0.003932)	(0.004808)
% Black			**-0.084852**	**-0.067632**	**-0.079471**
			(0.017358)	(0.012209)	(0.017780)
Labor Force Participation			**0.021389**	**0.022027**	**0.021619**
			(0.006340)	(0.004822)	(0.006305)
Monthly Welfare Payment			0.000474	**0.000458**	0.000485
			(0.000255)	(0.000201)	(0.000254)
Births per 100,000 Population			**0.040986**	**0.023678**	**0.047210**
			(0.014762)	(0.009362)	(0.014973)
City Controls	Yes	Yes	Yes	Yes	Yes
National Level Year Controls	No	No	No	Yes	No
Census Division Level Year Controls	Yes	Yes	Yes	No	Yes
Female Custody Rate per Female Violent Crime	No	Yes	Yes	Yes	No
Female Custody Rate is per 1000 Women in the State	No	No	No	No	Yes
P-Value: Joint Significance of Distance	0.0008	0.0011	0.0001	0.0000	0.0001
R^2	0.7935	0.7944	0.8159	0.7987	0.8158
% Change in the female crime rate implied by a 40 mile increase in average prison distance	-4.0%	-3.6%	-5.4%	-9.6%	-5.5%

Sample covers 1981-1995 and includes 154 cities with populations of 100,000 or more throughout the sample period, the sample size is 2210 due to occassional non-reporting. Crime and arrest rates are resticted to women aged 18-34. The dependent variable in all regressions is the log of female property crimes per 1000 women, as defined by equation (1). Bold coefficients are individually significant at the 5% level or better. All regressions are weighted by city population and the standard errors are heteroskedastic consistent.

Table 6. Sensitivity Analysis - Variations in Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Violent Crimes							
Average Distance	**-0.002493**	**-0.002623**	**-0.002692**	**-0.002307**	**-0.001799**	**-0.001905**	-0.001294
	(0.000715)	(0.000734)	(0.001211)	(0.000691)	(0.000669)	(0.000672)	(0.000698)
(Average Distance)^2	**0.000008**	**0.000008**	**0.000011**	**0.000007**	**0.000006**	**0.000006**	**0.000005**
	(0.000002)	(0.000002)	(0.000004)	(0.000002)	(0.000002)	(0.000002)	(0.000002)
P-Value: Joint Significance of Distance	0.0000	0.0000	0.0202	0.0000	0.0000	0.0000	0.0000
R^2	0.8724	0.8729	0.8661	0.8764	0.8731	0.8782	0.8708
% Change in the female crime rate implied by an 100 mile increase in average prison distance	-8.7%	-9.2%	-9.0%	-8.1%	-6.2%	-6.7%	-4.4%
Property Crimes							
Average Distance	**-0.001503**	**-0.001471**	**-0.002315**	**-0.001562**	**-0.001529**	**-0.001493**	-0.000820
	(0.000618)	(0.000634)	(0.000955)	(0.000579)	(0.000560)	(0.000563)	(0.000590)
(Average Distance)^2	**0.000005**	**0.000005**	**0.000007**	**0.000005**	**0.000005**	**0.000005**	**0.000003**
	(0.000002)	(0.000002)	(0.000003)	(0.000001)	(0.000001)	(0.000001)	(0.000001)
P-Value: Joint Significance of Distance	0.0002	0.0002	0.0530	0.0001	0.0010	0.0001	0.0040
R^2	0.8159	0.8125	0.8159	0.8069	0.8144	0.8306	0.8359
% Change in the female crime rate implied by an 100 mile increase in average prison distance	-5.2%	-5.1%	-8.1%	-5.4%	-5.3%	-5.2%	-2.8%
City Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls for States with no Prisons	Yes	No	No	No	No	No	No
Census Division Level Year Contols	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Female Custody Rate per Female Violent Crime	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State(s) Excluded	None	Those with no Prisons	CA	TX	NY	FL	No Prison Changes
Sample Size	2210	2158	1825	1974	2135	2129	1775

Sample covers 1981-1995 and includes 154 cities with populations of 100,000 or more throughout the sample period. Crime and arrest rates are resticted to women aged 18-34. The dependent variable in all regressions is the log of the relevant female crimes per 1000 women, as defined by equation (1). Bold coefficients are individually significant at the 5% level or better. All regressions are weighted by city population and the standard errors are heteroskedastic consistent.

Table 7. Sensitivity Analysis - Variations in Sample Restrictions

	(1)	(2)	(3)	(4)
Violent Crimes				
Average Distance	**-0.006178**	-0.001832	**-0.002229**	**-0.002586**
	(0.002188)	(0.001143)	(0.000730)	(0.000907)
(Average Distance)^2	**0.000009**	**0.000008**	**0.000007**	**0.000008**
	(0.000003)	(0.000004)	(0.000002)	(0.000002)
P-Value: Joint Significance of Distance	0.0190	0.0670	0.0000	0.0005
R^2	0.8642	0.8935	0.8736	0.8800
% Change in the female crime rate implied by a 40 mile decrease/increase in average prison distance	26.2%	-6.1%	-7.8%	-9.1%
Property Crimes				
Average Distance	-0.002219	**-0.002832**	**-0.001478**	**-0.001674**
	(0.001479)	(0.000923)	(0.000588)	(0.000705)
(Average Distance)^2	**0.000005**	**0.000008**	**0.000005**	**0.000005**
	(0.000002)	(0.000003)	(0.000002)	(0.000002)
P-Value: Joint Significance of Distance	0.0819	0.0158	0.0003	0.0027
R^2	0.8735	0.8790	0.8189	0.8223
% Change in the female crime rate implied by a 40 mile decrease/increase in average prison distance	9.7%	-10.1%	-5.1%	-5.9%
City Controls	Yes	Yes	Yes	Yes
Census Division Level Year Contols	Yes	Yes	Yes	Yes
Female Custody Rate per Female Violent Crime	Yes	Yes	Yes	Yes
Restricted to Reduced Average Distance	Yes	No	No	No
Restricted to Increased Average Distance	No	Yes	No	No
First Year After Prison Openning/Closing Omitted	No	No	Yes	No
First Two Years After Prison Openning/Closing Omitted	No	No	No	Yes
Sample Size	766	951	2006	1814

Sample covers 1981-1995 and includes 154 cities with populations of 100,000 or more throughout the sample period. Crime and arrest rates are resticted to women aged 18-34. The dependent variable in all regressions is the log of relevant female crimes per 1000 women, as defined by equation (1). Bold coefficients are individually significant at the 5% level or better. All regressions are weighted by city population and the reported standard errors are heteroskedastic consistent.

Table 8. Sensitivity Analysis - No Age Restrictions

	(1)	(2)	(3)	(4)	(5)
Violent Crimes					
Average Distance	**-0.001652**	**-0.001296**	**-0.001715**	-0.000846	**-0.001887**
	(0.000655)	(0.000626)	(0.000615)	(0.000471)	(0.000627)
(Average Distance)^2	**0.000006**	**0.000005**	**0.000006**	**0.000004**	**0.000006**
	(0.000002)	(0.000002)	(0.000002)	(0.000001)	(0.000002)
P-Value: Joint Significance of Distance	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.9002	0.9030	0.9066	0.8924	0.9053
% Change in the female crime rate implied by an 100 mile increase in average prison distance	-5.6%	-4.4%	-5.9%	-2.7%	-6.7%
Property Crimes					
Average Distance	-0.000591	-0.000571	-0.000743	**-0.001681**	-0.000735
	(0.000409)	(0.000409)	(0.000433)	(0.000339)	(0.000431)
(Average Distance)^2	**0.000002**	**0.000002**	**0.000003**	**0.000005**	**0.000003**
	(0.000001)	(0.000001)	(0.000001)	(0.000001)	(0.000001)
P-Value: Joint Significance of Distance	0.0042	0.0044	0.0018	0.0000	0.0019
R^2	0.8828	0.8829	0.8955	0.8812	0.8955
% Change in the female crime rate implied by an 100 mile increase in average prison distance	-2.0%	-2.0%	-2.5%	-5.9%	-2.5%
City Controls	Yes	Yes	Yes	Yes	Yes
National Level Year Controls	No	No	No	Yes	No
Census Division Level Year Controls	Yes	Yes	Yes	No	Yes
Female Custody Rate per Female Violent Crime	No	Yes	Yes	Yes	No
Female Custody Rate is per 1000 Women in the State	No	No	No	No	Yes

Sample covers 1981-1995 and includes 154 cities with populations of 100,000 or more throughout the sample period, the sample size is 2211 due to occassional non-reporting. Crime and arrest rates include women of all ages. The dependent variable in all regressions is the log of female property crimes per 1000 women, as defined by equation (1). Bold coefficients are individually significant at the 5% level or better. All regressions are weighted by city population and the reported standard errors are heteroskedastic consistent.