

The External Effects of Black Male Incarceration on Black Females

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This article examines how the increase in the incarceration of black men and the sex ratio imbalance it induces shape the behavior of young black women. Combining data from the Bureau of Justice Statistics and the Current Population Survey to match male incarceration rates with individual observations over two decades, I show that black male incarceration lowers the odds of black non-marital teenage fertility while increasing young black women's school attainment and early employment. These results can account for the sharp bridging of the racial gap over the 1990s for a range of socioeconomic outcomes among females.

I. Introduction

Over the past three decades, the United States has experienced a dramatic surge in imprisonment, especially in the black community. Blacks are now incarcerated at nine times the rate of non-Hispanic whites and comprise more than 40% of inmates. One in eight black males ages 25–29

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was behind bars in 2004.¹ Given current trends, one black male child out of three will go to prison or jail at some point in his lifetime. In fact, imprisonment already represents the modal experience for young black male high school dropouts (Pettit and Western 2004).

The prevalence of black imprisonment is more than 15 times higher for men than for women. Further, few black women pair with nonblack men. Hence, black women face a momentously unfavorable sex ratio.² The analysis of black women's choices when facing a shortage in the supply of men thus provides distinctive tests of predictions from models of market behavior in family economics, notably in the realm of the demand for children, human capital accumulation, the sexual division of labor, and mate selection and marriage (Becker 1973; Roth and Sotomayor 1990).

Of course, incarceration affects nonblack men as well, mostly from low socioeconomic backgrounds. Hence it would be wrong to assume that male incarceration and its consequences make up an exclusive "black problem." More likely, this forms a predicament of the destitute. Yet, because of the overlap between race and poverty, because incarceration affects blacks so disproportionately, and because same race-based matching is so prevalent it makes sense to concentrate this investigation on the external effects of black male incarceration.

This article is thus among the first to expressly analyze the degree to which law enforcement-based approaches to reducing crime affect black communities via mass imprisonment's effect on black female outcomes. Once quantified, those unintended collateral effects of male incarceration may be factored in when evaluating the costs and benefits of criminal justice policies. For example, considerations of external effects may be relevant for offenders at the margin between incarceration and probation or parole. Further, it will be useful to determine the responsibility shares

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¹ This figure is drawn from the Bureau of Justice Statistics (BJS) 2004 "Prison and Jail Inmates at Midyear" report (not counting those under bail, probation, parole, or hiding from the justice system, etc.). In contrast, 1 in 28 Hispanic males and 1 in 59 non-Hispanic white males were incarcerated in the same age group.

² This imbalance is made even worse by the greater tendency of black males to marry nonblack females than the reverse, the greater enlistment in the military, the higher mortality rate among adult black males, the higher rate of mental institutionalization, etc. See the vivid excerpts from black female interviewees in Lane et al. (2004).

of policy programs versus male incarceration in explaining several socioeconomic trends observed among American women, and African American women in particular.

The mass confinement of black men is likely to trigger a series of effects. For example, free men receive an increase in bargaining power and some would be able to secure more sexual relations, some of them unprotected, following a mechanism analyzed in Willis (1999). Against that, the increased prospect of being abandoned (combined with the possibility of one's partner incarceration) might induce a higher take-up of birth control measures. Moreover, the sheer magnitude of the male shortage could actually mean fewer sexual relations altogether on the female side. Therefore, it is conceivable that a growing fraction of young black women would decide to or have to forgo early motherhood. One would also expect more black women to continue their studies or become financially independent through employment as an insurance against the decreased odds of finding a suitable mate.

A number of stylized facts appear to corroborate the above hypotheses. Indeed, the black nonmarital teen pregnancy rate, although higher in absolute terms, has decreased faster than its white counterpart in the last 20 years (Martin et al. 2007). Further, black women have been bridging the racial educational gap (Allen et al. 2005) and the racial labor market gap (Offner and Holzer 2002; Western and Pettit 2005) at a faster rate than black men relative to whites.

To examine how the rising levels of incarceration of black men lead young black women to change important lifetime decisions, I compiled data on the number of male prisoners by race, gender, state, and year from the Bureau of Justice Statistics (BJS). From there, I constructed male prison rates per adult male population using the U.S. Census. I then merged Census-adjusted BJS prison statistics with individual-level information on fertility, schooling, employment, and marriage from the June and March supplements of the Current Population Survey (CPS, June 1979–2000 [not all inclusive] and March 1979–2000) so that they match on a race, year, and state basis. When applied to the resulting pooled cross-sectional data set, a fixed-effects linear model permits the disentangling of incarceration from year effects, state effects, and secular trends in socioeconomic changes within states, as well as from other identifiable variables that could possibly affect the outcomes of interest within states over time. The frequency of the CPS waves allows testing the robustness of the results using various lags between incarceration and observed outcomes. It also allows us to focus on states and periods where some identifiable, plausibly exogenous shocks are driving the growth of incarceration.

In terms of my main findings, the models show that higher rates of black male incarceration have significantly lowered the odds of nonmarital

teenage motherhood among young black females, with the caveat that the average effect is driven by a small number of repressive states. I also find evidence of a positive effect of black male incarceration on black women's school attainment and early employment. In contrast, I cannot reject the null hypothesis of no effect when testing for the impact of white male incarceration on the same outcomes for white women. Finally, the evidence in support of a negative effect of black male incarceration on marriage is somewhat weaker.

This work relates to several branches of a literature that spans different disciplines. Social scientists have long been intrigued by the consequences of sex ratio imbalances. For example, one area of research exploits exogenous shocks in sex ratio on female marriage (Francis, forthcoming) and labor supply (Angrist 2002). In an influential book, Wilson (1987) expressed concern over the decline in acceptable marriage partners, or "quality men" in the black community, usually defined as men with a stable job. Wilson's theory of how family structure and marriage rates were endogenous to the effective "sex ratio" sparked a body of research on the impact of "quality men's" scarcity (Kiecolt and Fossett 1997; Neal 2004). However, male (un)availability originates from multiple factors (imprisonment, mental institutionalization, enrollment in the military, etc.) that were often left aggregated. Each of those factors, in turn, may have a different effect that needs to be separately estimated.

As incarceration—fueled by the "War on Drugs" and other sentencing reforms—followed a steep upward trajectory,³ legal scholars, psychologists, and sociologists devoted more attention to the consequences massive incarceration may have on inner cities communities (Vera Institute of Justice 1996; Hagan and Dinovitzer 1999; Lynch and Sabol 2003a, 2003b), yet little work has been done on the effects of imprisonment on family structure.⁴ Looking into the contribution of economics to crime and criminal policy, most of the research has focused on the criminals themselves, whether on the determinants of criminal activity, the deterrence effectiveness of various policies, and so on. The role of aggregate male incarceration on single women's fertility, human capital accumulation, or employment decisions has been neglected, despite plausibly large distortions and significant welfare effects.

The present study is closest to that of Charles and Luoh (2010), who estimate the impact of male incarceration on selected female outcomes using Census data. They observe that women overwhelmingly marry

³ Increase of more than 360% in prisoners per inhabitant between 1978 and 2004—see Mincy (2006).

⁴ Some research investigated the impact of incarceration within the inmates' families, not so much on single women who are secondary victims of mass-scale male incarceration (Garland 2001; Mauer and Chesney-Lind 2002).

slightly older men from the same race and state. Since the U.S. Decennial Census tells us who is institutionalized, which can serve as an approximation for incarceration, Charles and Luoh use the last three waves of that data set to match outcomes of women of different age groups, race, and state to the corresponding incarceration rates among slightly older men. The authors find that rising levels of male incarceration have lowered the likelihood that women marry and have caused a shift in the gains from marriage away from women. They also find that women have increased their schooling and labor supply. Building on the present essay, Kamdar (2008), also using the Census, argues that teen fertility is significantly negatively related to the incarceration rates of males likely to father the babies of teen mothers and unrelated to the incarceration rates of males unlikely to father those babies.

Charles and Luoh's (2010) and Kamdar's (2008) analyses differ from the present one on several counts. First, I use annual—as opposed to decennial—waves from a different data set, with a different measure for incarceration. This enables me to flexibly link male incarceration rates with individual female observations⁵ and to better pinpoint which states and subperiods are driving the results; second, I use a more comprehensive set of controls, in particular through using the list of welfare policy variables analyzed in Fang and Keane (2004) and through checking whether women were born before or after abortion legalization (imputing state of birth with state of residence at the time of survey). In turn, some of my results depart from those found in those two other studies.

II. Data

A. Incarceration Data

This work uniquely combines different data sets to assess the impact of black male incarceration rates on black female outcomes by linking state-, year-, gender-, and race-specific male incarceration rates with individual female observations. My statistics for incarceration come from the “Correctional Population in the United States” series (1985–2003) and the “Prisoners in State and Federal Institutions on December 31st” series (1978–1984), both from the BJS. Prison statistics by race were first released in 1978. Coincidentally, 1978 roughly corresponds to the beginning of the giant wave of incarceration that has been sweeping the United States since.

⁵ In particular, I use male incarceration rates preceding the outcomes under investigation, which allows testing the robustness of the results over different lag structures or assumptions about the age at which incarceration plays the most relevant role. Conversely, working with rates concomitant to the observations is inevitable when using the Census, unless one implausibly links current observations with incarceration rates from 10 years before.

With a few exceptions, these data give the numbers of prisoners by gender and race for every year in every state.⁶ I focus on prison statistics because of the misleading and inconsistent nature of jail statistics.⁷ I cannot subtract the number of federal prisoners from total prisoners in each state and year, so the numbers collected represent both types; however, the overwhelming majority of prisoners are state prisoners (89% in 2000).⁸ Note that the proportion of state prisoners incarcerated in a state different from the one they lived in at the time of committing their offense is negligible and does not affect the assignment of prisoners by state.⁹ This is of great importance because it gives us confidence that the evolution of male incarceration in one particular state would directly affect females in that state.¹⁰

To transform the raw figures of inmates into percentages of the adult population in each year and state, I use the U.S. Census Estimates 1970–2000 provided by the Centers for Disease Control and Prevention (CDC) Wonder Web site, which gives in each state and year the number of inhabitants by gender, race, and 5-year age group. Unfortunately, the BJS, which releases data by gender, race, state, and year, does not break them down by age. Since roughly 95% of prisoners are between the ages of 20 and 54 for each race throughout,¹¹ I use the number of males ages 20–54 as the deflator. The main explanatory variable of interest is therefore the

⁶ For prisoners at the state level, there was no specific category for Hispanics before 2000. States could include Hispanics under whites, or could categorize them as Unknown Race. Also, some states changed their labeling over time, making comparisons across years difficult. In such cases, with great caution, I retained as much information as I could so that within each state, the white male prisoners' series displays consistency (notably, this led to the deletion of the white prisoners' series for California after 1994 and for Texas before 1986). These considerations only play a role for the estimations requiring data on the number of white male prisoners since the fraction of black Hispanics is negligible (~ 2%).

⁷ It is difficult to separate jail and prison populations and to prevent double counting as more jails began to hold state and federal prisoners through the years. In a few small states, the prison figures used systematically include both jail and prison inmates because jails and prisons are combined into one system in those jurisdictions.

⁸ Federal prisoners may be held in another state because of the relatively small number of federal prisons.

⁹ Some states use other states' facilities to hold some of their populations. Yet, even if state prisoners are held outside a state prison, they are in their jurisdiction counts, even if another state has actual custody.

¹⁰ It is of course possible that a criminal committed an offense in a state in which he does not live. Charles and Luoh (2010) present evidence that this is negligible.

¹¹ According to the U.S. Bureau of Justice Statistics; the "Prison and Jail Inmates at Midyear" and "Prisoners in Year X" combined series provide data by race and age (but not by state) for males for 1980, 1990, 1991, 1996, 1997, 1999, 2000–2004.

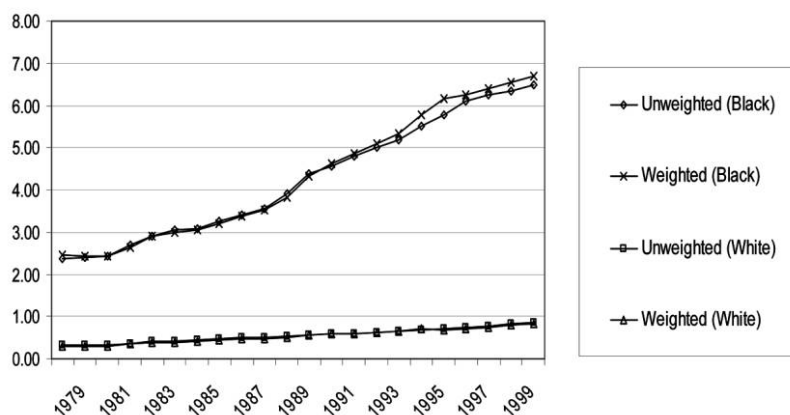


FIG. 1.—Male incarceration, adjusted for male population, ages 20–54, by race. The weights correspond to the share of the total black or white male population ages 20–54 in each state. Sources: BJS “Correctional Population in the United States (1985–2003)” and “Prisoners in State and Federal Institutions on December 31st (1978–1984)” series and U.S. Census data (from the CDC Wonder Web site).

incarceration rate of black males adjusted for black male population, ages 20–54.¹² Upon tabulation, it can be observed that the main differences in yearly levels are not so much by region but by state. At the aggregate level, the evolution of male incarceration rates by race over time reveals a dramatic increase in the black group, yet the pattern is monotonic and smooth, making any graphical inference problematic (fig. 1).

B. Outcomes of Interest

I use CPS data for the dependent variables and individual covariates, including indirectly CPS data for black male unemployment rates, which have been compiled and released through the Bureau of Labor Statistics. I also use different measures of state level welfare generosity collected by Fang and Keane (2004) over the same period. Tables 1 and 2 show the summary statistics of all the variables used in the regressions.

For the estimation of teenage fertility, the information comes from the

¹² Obviously, the young women analyzed in this study do not consider all men in that broad age range as potential partners. The driving assumption is that the constructed incarceration rates reasonably proxy the most relevant incarceration rates for these women—those of males their age or slightly older than them for the matching market, but perhaps also affecting family or community members that form their support system. I also provide specifications using the number of black prisoners adjusted for black male population, ages 20–34. Between 57% and 75% of black prisoners fall within that age range over the period considered.

Table 1
Summary Statistics of Dependent Variables in Tables 3, 4, and 5

	White		Black	
	Observations	Average	Observations	Average
Whether a mother	28,987	.063	5,369	.300
Educational attainment*	11,010	38.69 (1.320)	1,916	38.400 (1.351)
Employed full-time	56,567	.390	8,324	.290

NOTE.—Standard deviations are given in parentheses. CPS education coding: 10th grade, 36; 11th grade, 37; 12th grade (no diploma), 38; high school graduate (diploma, GED, etc.), 39; some college but no degree, 40; associate's college degree (OCC/VOC program), 41; associate's college degree (academic program), 42; bachelor's degree (BA, BS, AB, etc.), 43; master's degree (MA, MS, MBA, etc.), 44.

* 1992–2000. Education minimum cutoff set at 36. Including women with lower education has no significant impact on the regression results given the small number of such observations.

June CPS. To that effect, I construct two indicators. The first one simply measures whether a woman is a mother.¹³ The second one combines the variables “number of children” and “year of birth of last child” to generate a variable revealing whether a woman gave birth on the year of the survey—this manipulation is necessary because age of the mother at birth of first child is not available after 1995; it assumes away inaccuracies resulting from twin births.

Total nonmarital teenage pregnancy rates exhibit a relative stability among white females since the mid-1970s: more precisely, an increase in the mid-1980s to early 1990s, followed by a decrease later on. For black females, the same movement occurs in the mid-1980s and early 1990s, but the decline is more pronounced. The general decline in teen pregnancies over the 1990s led a columnist to write: “In the past decade, possibly no social program has been as dramatically effective as the effort to reduce teen pregnancy, and no results so uniformly celebrated. Between 1990 and 2000 the U.S. teen pregnancy rate plummeted by 28 percent. . . . Births to teenagers are also down, as are teen abortion rates. It's an achievement so profound and so heartening that left and right are eager to take credit for it, and both can probably do so” (Mundy 2006).

Many hypotheses can be advanced to account for this phenomenon: liberal sex education, welfare reforms, and so on. Yet one can check that it is unclear graphically alone whether male incarceration rates contributed to the decline in teenage motherhood, especially since black teen fertility started going down prior to the start of the prison population explosion.¹⁴

¹³ Prior to 1990, fertility questions were asked only of married women or women ages 18 and older. Years 1986–88 are excluded because the question on fertility was asked to married women only. Also, fertility was not part of the questionnaire in 1991, and the June CPS is not available for years 1993, 1996–97, and 1999, which leaves us with 1979–85, 1990, 1992, 1994–95, 1998, and 2000.

¹⁴ Because those graphs showing the evolution of the dependent variables do not provide, by themselves, compelling intuition for the regression results, I summarize their appearance here without providing them. They are easily constructed from publicly available sources and are of course available on request.

Table 2
Summary Statistics of Independent Variables (from the Samples Used in Table 3)

	Observations	Average	Standard Deviation	Minimum	Maximum
Prison rate:					
Adjusted for black male age 20–54 population	5,369	3.894	2.015	.181	13.689
Adjusted for black male age 20–34 population	5,369	7.223	4.400	.225	27.560
Adjusted for white male age 20–54 population	28,987	.461	.257	.076	1.904
Age	5,369	18.938	.813	18	20
Black unemployment rate	5,133	13.74	5.231	3.100	35.600
Whether born after abortion legalization	5,369	.281	...	0	1
Whether state will give a woman a fixed amount given by pass-through*	5,369	.956	...	0	1
ddisregard: no pass through is given†	5,369	.004	...	0	1
State takes away all child support income (no pass-through, no disregard)	5,369	.040	...	0	1
Pass-through amount	5,369	47.930	17.350	0	395
Disregard amount	5,369	.042	5.763	0	80
Percentage income disregard rate	5,369	.357	3.117	0	50
Disregard rate × ddisregard	5,369	.001	...	0	1
Flat income disregard	5,369	39.470	37.710	0	252
Administrative expenditures for child support enforcement per state female population	5,369	9.900	9.000	.740	113.700
Welfare payment standard for a family with 3 persons	5,369	303.440	135	96	923
Welfare payment standard for a family with 4 persons	5,369	354.450	157.98	120	1025
Whether work requirement during welfare waiver and TANF‡	5,369	.139	...	0	1
Degree in which work requirement binding for year‡	5,369	.091	...	0	1
Whether exemption if the woman is disabled or ill‡	5,369	.089	...	0	1
Whether exemption if family member is disabled‡	5,369	.069	...	0	1
Whether exemption if child care not available for kid < 6‡	5,369	.057	...	0	1
Whether state has full sanction‡	5,369	.077	...	0	1
Age in months of youngest child that state allows a woman to be exempt from work requirement‡	5,369	1.205	4.266	0	36

SOURCE.—Fang and Keane (2004).

* The remainder is completely taken away by the state.

† Rather, child support is regarded as income and state subtracts disregard amount from it when calculating how much should be taxed. Except for Delaware and Wisconsin, all states use the standard earned income tax rate when taxing this income.

‡ Imputation of 0 when missing value.

I also look at education, labor force participation, and marriage. For those variables, I use the March CPS, since the data collection contains fewer gaps. To summarize the patterns that characterize educational attainment of women by race, a convergence in attainment between black and white females in terms of high school completion is apparent, but that movement started well before the shift from the long-run incarceration trend in the late 1970s.

Overall, female employment increased at a declining rate from the late 1970s to the early 1990s, after which it leveled off before picking up again in the mid-1990s. We observe a catch-up between black and white young women over the period in terms of full-time employment, in particular a general decrease for whites as well as a slight increase for blacks, especially in the 1990s. While it is not apparent that incarceration rates can explain the convergence, the absence of decline in employment rates among young black women is puzzling.

As for the proportion of unmarried women by race and age brackets, the essential feature is a slow, continuous evolution capturing the decline in the institution of marriage, for both races and for all ages. Yet, there is no graphical evidence to support the hypothesis that marriage and male incarceration are causally related since the growth in male incarceration is consistently higher than the growth in the proportion of never married women (especially for blacks).

III. Methods and Estimation Strategies

A. Assumptions

Let us consider a linear model estimating the impact of male incarceration on any single female outcome:

$$\text{Outcome} = \alpha + \beta \text{Incarceration} + \sum_j \lambda_j \text{Characteristics}_j + \varepsilon. \quad (1)$$

At the aggregate level, large male-incarceration rates should have some impact over a female individual's lifetime, yet the main difficulty in assessing this relationship lies in the assignment of incarceration rates to individual observations. Matching based on race and state is intuitive.¹⁵ But at what age are these rates most relevant? Further, should one consider some average local male-incarceration rate over a certain number of years before the time when the individual is observed? The absence of clear

¹⁵ The fraction of black women marrying nonblack men has been less than 5% on average in the last 30 years (U.S. Decennial Census 1980, 1990, and 2000; see also Fryer 2007). It would be interesting to see if aggregate black male incarceration has a marginal impact on husband's race among black women—the June CPS does not contain enough information on spouse's race to run this analysis. Similarly, the percentage of marriages where the bride and the groom are residents of different states is negligible.

answers to such measurement questions must have played a role in the relative absence of quantitative studies on this issue.

The present work focuses on women in their late teens and early twenties. This narrow age range corresponds to a particularly critical point in a woman's life-cycle—that is, when she is at risk of not completing high school, of becoming a single teenage mother and not joining the labor market. Further, if local incarceration plays a role in such decisions, it is likely that the most influential incarceration rate is that which shortly precedes those decisions (even though some of these young women may have experienced the incarceration of their father earlier in life, which would be impossible to measure). In this way at the very least one conservatively limits the chances of mismatch between relevant incarceration rates and outcomes of interest. In this article, I present the results obtained with various plausible lags between incarceration rates and observed outcomes to capture the response of women to the recent (in one case, the latest) incarceration rate they have experienced. With a one year lag, the model is written as

$$\text{Outcome}_{ist} = \alpha + \beta \text{Incarceration}_{st-1} + \sum_j \lambda_j \text{Characteristics}_{stj} + \varepsilon_{ist}, \quad (2)$$

where i , s , and t index the individual, state, and year, respectively.

A potential problem is that considering the race-specific prison rate per adult population induces measurement bias if the age distribution of prisoners shifts over time. Although average time served by prison inmates has increased only modestly and stays well below 3 years, the prison population is ageing—thus the bias should work against finding significant effects. However, this occurs significantly more for whites than for blacks, and more importantly, the proportion of late teens/early twenties males out of the total black male inmate population is stable at least over the 1990s.¹⁶ Therefore the variations in total black male incarceration rates as described above should be a satisfactory estimate of the variations in black young adult male incarceration rates. Note further that changes in the ratio from one year to the next are driven by the numerator given the slow evolution of demographic characteristics within any state.

Like the other articles on mass imprisonment and female outcomes mentioned earlier, I assume throughout that decisions made by young women do not cause the behaviors that result in men being incarcerated, such as drug possession or violent crimes, nor do they cause the policies that influence incarceration, such as legal changes, changes in law en-

¹⁶ The Bureau of Justice Statistics "Prison and Jail Inmates at Midyear" and "Prisoners in Year X" combined series provide data by race and age (but not by state) for males for 1980, 1990, 1991, 1996, 1997, 1999, 2000–2004.

forcement personnel per capita, or the construction of prisons. The possibility of reverse causality, that is, black male incarceration being partly a consequence of black female empowerment (through increased schooling, employment, etc.) would make the problem infinitely more complex to analyze. Although I acknowledge that determining the direction of causality from aggregate trends is only tentative, at a minimum, the raw facts do not support such a hypothesis: black women make steady progress regarding educational and employment outcomes in the 1990s at the same time as actual (black) male criminal behavior is declining.

A related concern is that women's decisions are driven by males' conduct. In that case, young women would change their behavior over time because men are becoming less suitable as husbands, not because they are locked up. However, I now present evidence that changes in male-incarceration rates over time are not caused by changes in male behavior but rather by changes in criminal policy.

The National Crime Victimization Survey shows long-term declines in victimization rates for a variety of violent crimes—although there is some cyclicity around these long-term trends. Similarly, property crimes have gone down since the mid-1970s. The Federal Bureau of Investigation's Uniform Crime Reports (UCR) series exhibits more contrasted patterns. For homicides, it shows increases peaking in the early 1980s, a decline through the mid-1980s, and then an increase from the mid-1980s to the early 1990s as part of the crack epidemic. Other violent crimes in the UCR show similar cyclical patterns. Both series show a strong decline in all categories of violent crimes starting from the early 1990s.¹⁷

The UCR displays a dramatic increase of arrests for drug abuse violations starting in the early 1980s. For drug charges, according to the U.S. National Household Survey on Drug Abuse, an estimated 14.8 million Americans—about 6.7% of the household population ages 12 and older—used illegal drugs on a regular basis in 1999. Note that the proportion of blacks is close to that of whites (7.7% vs. 6.6%), though blacks are arrested on drug charges at several times the rate of whites (the racial disparity in arrests on drug charges increases significantly over the period). Yet this number of past-month drug users declined by more than 50% from the 1979 high of 25 million (14.1% of the population). This is precisely the beginning of the period covered here. Similar drug offenses, notably possession—for which, again, prevalence does not increase—are prosecuted more aggressively, resulting in a higher likelihood of being brought to courts.¹⁸

¹⁷ A good overview is provided on <http://www.ojp.gov/bjs/glance.htm>.

¹⁸ The fraction of drug offenders increases because a higher fraction of cases brought to state courts are drug related. In contrast, for all drug charges, there is little change in the probability of conviction, or change in the probability of

This being said, the effect of aggregate African American male incarceration on female outcomes can in principle be decomposed into at least two parts: the removal of men from the population (direct effect) and the changes in behavior among those who are not arrested (indirect effect). The direct effect is not simply quantitative: if the probability of being incarcerated is negatively correlated with match quality, as the incarceration rate increases so should the “quality” of the pool of free men (a selection effect). As for the indirect effect, while the changes in behavior may include greater deterrence from criminal activity, it also implies increased male bargaining power, predictably leading men to engage in riskier sexual behavior (Posner 1992). In sum, if the pure male shortage effect/increased bargaining power effect dominate the selection/deterrence effect, this would imply fewer valuable mating opportunities for women. This is all the more plausible since incarceration has increased by many times more than the actual decrease in criminal behavior over the years. It is therefore legitimate to suppose that the shortage/bargaining power effects dominate. In the following discussion, I interpret the effect of incarceration as mostly the shortage/bargaining power effects. Note however, that the selection/deterrence effects should bias the measurement of the shortage/bargaining power effects toward zero.

Finally, a similar selection argument applies to women, though to a far lesser extent. It could be that rising black female imprisonment rates have shifted the distribution of “at risk” women in the population by cutting off one tail of that distribution. In other words, male incarceration rates may potentially be acting as proxies for female incarceration rates, and the results would be partially reflecting the fact that higher fractions of “at risk” females end up incarcerated. To illustrate the reality of the phenomenon, Swann and Sylvester (2006) find that rising black female incarceration rates have caused an increase in foster care caseloads. The increase in black female incarceration, however, is relatively small.¹⁹ It would be ideal to disentangle the first-order, indirect effects of male incarceration from the second-order, direct effects of female incarceration on female outcomes. At a minimum, a back-of-the-envelope calculation imputing to all incarcerated women outcomes that run against the results found in the CPS samples—for example, assuming all unobservable in-

imprisonment conditional on conviction, or change in the average sentence conditional on imprisonment. See Raphael and Stoll (2007) for a precise causal decomposition of incarceration growth.

¹⁹ From 45 per 100,000 in 1980 to 205 per 100,000 in 2000; 1,111 to 3,457 per 100,000 for black males over the same period—breakdown by age groups unavailable for females before 1997; in 2000: 83 incarcerated black women per 100,000 in the 18–19 age range, as opposed to 2,679 for black men (according to BJS “Prisoners in 1993” and “Prisoners in 2000” reports, tables 14 and 15, respectively).

carcerated women are mothers—suggests that the results presented here would not be qualitatively affected.²⁰ Owing to a lack of exogenous socioeconomic background data, this secondary hypothesis cannot be further tested here, and to date this has not been possible in the literature.

B. Identification

The identification of the causal impact of incarceration is not straightforward because of the numerous potential confounding factors associated with incarceration. It is well known that using a single cross section to tackle such a problem is inadequate. When pooling cross sections, year effects control for the evolving unobserved national attributes that affect the different outcomes of interest (such as the War on Drugs). Similarly, state fixed effects control for time-invariant unobserved influences that vary across states. Yet, the factors that affect incarceration may also vary within a state over time: simply controlling for year and state effects could still bias the estimation of the incarceration coefficients.²¹ To address this problem, the specifications can be made more flexible by adding interaction terms between state effects and a time trend and between state effects and the square of a time trend (see, e.g., Friedberg 1998). These terms, therefore, capture slow drifts in state-level characteristics that may influence the outcomes of interest with the slopes of those trends allowed to vary smoothly within states. Such local changes can be of a political, socioeconomic, or demographic nature.²² The benchmark model can be rewritten as:

$$\begin{aligned} \text{Outcome}_{ist} = & \alpha + \beta \text{Incarceration}_{st-1} + \gamma 1_t + \delta 1_s \\ & + \mu (\text{Trend}_t \times 1_s) + \nu (\text{Trend}_t^2 \times 1_s) \\ & + \sum_j \lambda_j \text{Characteristics}_{istj} + \varepsilon_{ist}, \end{aligned} \quad (3)$$

with 1_s and 1_t denoting state and year dummy variables, respectively.

In theory, variation across time and within states translating into discrete

²⁰ To illustrate, suppose that a proportion α of women becomes incarcerated hence unobservable, while male incarceration shifts the proportion of observed women with outcome x from x_1 to $x_2/(1 - \alpha)$. The worst case scenario puts the lower bound of the effect at $x_2 - x_1$. More assumptions are needed for signing the difference in means of a continuous variable.

²¹ This would happen if those changing factors within states are correlated with variations in incarceration and if such factors do not change at a national level uniformly and do not get picked up by the year effects.

²² Note that they also include the possible social impacts of mass incarceration on disadvantaged minority communities through the increasing concentration of released prisoners over time. These agglomeration effects may affect social norms which in turn can exert an independent impact on female outcomes. For simplicity, I do not consider these possible effects in the present analysis.

jumps in incarceration rates would provide a good source of identification that enables one to tease out incarceration paths from state effects, year effects, and secular trends in socioeconomic changes within states. In practice, however, it can be observed that in almost every state, incarceration increases every year over the period—although not always at the same rate, which is of course crucial. In other words, the causal effects of incarceration need to be identified against the monotonic trends that characterize incarceration paths.

Notwithstanding the difficulty, I use linear probability models that successively control for year effects, state effects, and state linear and quadratic time trends.²³ Because of the “black box” nature of this approach, I further try to characterize which are the main variables potentially correlated with incarceration and the outcomes of interest that those state-level trends absorb. I thus test the sensitivity of the results to adding some relevant variables that change within state over time, notably state-level black male unemployment rates, abortion law within state of residence at time of birth (recall five states legalize abortion in 1970, all others in 1973), and a long list of variables measuring local, time-varying welfare generosity (ideally, those controls would need to be instrumented but that is impossible in practice). Robust standard errors clustered by state account for the heteroskedasticity of the error terms and for serial correlation (Moulton 1990).

The use of individual observations on black women largely self-weights the sample to emphasize those states with a large black population. The interpretation of the coefficients becomes the impact of male incarceration on the average young black woman in the United States, as opposed to the average effect of black male incarceration across states. Conceptually, the former is more important for policy analysis and may also reveal more insights for at least two reasons. First, we may think that the effects should be better captured in the more heavily populated states because criminal activity (hence arrests) exhibits increasing returns with respect to population density, which is correlated with population size. Second, in states with a (relatively) large black population, interracial marriage is more atypical.²⁴ Since the underlying assumption is that the incarceration of black males affects the local relationships market within the black com-

²³ Using Probit or Logit models yields similar results. Linear Probability models are to be preferred in the presence of interaction terms; see Ai and Norton (2003).

²⁴ This can be inferred from the vital statistics section of NCHS: between 1980 and 1988, a majority of states reported the number of marriages by race of bride and race of groom. It is readily seen that for black women, intraracial marriage is positively correlated with the local proportion of black males (relative to total males).

munity, the effects are expected to more accurately reflect the relevant sex ratio in states with a large black population.²⁵

To provide additional robustness checks of the results, I use different strategies. First, I suspect a stronger impact of incarceration for blacks than for whites. This is because the black teenage fertility rate is higher, while black female educational attainment and labor force participation are lower than those of whites, thus leaving more room for a detectable marginal response. Alternatively, even if there is no racial difference but the effect of male incarceration on females is nonlinear (e.g., if there are threshold effects), given that blacks are on average eight to nine times more likely to be incarcerated than whites, an interaction term $\text{black} \times \text{Incarceration}$ would specifically reflect this nonlinear impact. To that effect I assign the white-male incarceration rate to white females and the black male incarceration rate to black females and run regressions over both groups. However, whites are not a perfect control group for blacks; rather, I am evaluating treatment intensities in two groups that otherwise differ systematically. To account for such differences, I control for the race-specific incarceration rate and add all the other controls (year effects, state effects, etc.) interacted with the white/black dummy. The interpretation of the interaction term coefficient is then the pure differential effect of incarceration between blacks and whites, and the race-specific coefficient becomes mechanically the incarceration coefficient for the white group only. With standard notations:

$$\begin{aligned}
 \text{Outcome}_{irst} &= \alpha + \beta \text{Incarceration}_{rst-1} + \phi((1 - 1_r) \times \text{Incarceration}_{rst-1}) \\
 &+ \gamma 1_t + \delta 1_s + \mu(\text{Trend}_t \times 1_s) + \nu(\text{Trend}_t^2 \times 1_s) \\
 &+ \sum_j \lambda_j \text{Characteristics}_{irstj} \\
 &+ 1_r \times \{\gamma 1_t + \delta 1_s + \mu(\text{Trend}_t \times 1_s) + \nu(\text{Trend}_t^2 \times 1_s) \\
 &+ \sum_j \lambda_j \text{Characteristics}_{irstj}\} + \varepsilon_{irst}.
 \end{aligned} \tag{4}$$

I also take advantage of the white male prisoners' series to run so-called false experiments (or placebo tests) by regressing black female outcomes on white male incarceration rates (and vice versa).

I also tried to identify policy changes that would affect incarceration but not directly the outcomes of interest. As it turns out, various legal changes, though plausibly exogenous, do not provide enough variation in incarceration, at least among those states where a large enough fraction of the CPS samples comes from, to be used as valid instrumental variables

²⁵ Note that results using nonweighted aggregated state-level data support the conclusions advanced in this article and are available upon request.

(IV) once all the other controls are included.²⁶ Identifiable exogenous changes in prison capacity (the series is available from the yearly BJS publication “Prisoners in Year X” starting in 1983) of large enough magnitude—relative to smooth state time trends—offer an interesting alternative, despite an imperfect data collection, in particular missing data for a large number of possible observations. Such discrete capacity expansion changes can be found in Iowa, Rhode Island, Texas, West Virginia, and Wisconsin, mostly from the middle to the end of the 1990s. Given the black population figures in those states, in the CPS samples extracted here the source of identification in a two-stage least squares model using prison capacity as an instrument overwhelmingly comes from 1990s Texas. Since, as it turns out, much of the overall variation in incarceration (after controlling for state-level trends) is also largely driven by 1990s Texas, ordinary least squares (OLS) and IV models would offer somewhat redundant results. In turn, the cost of the loss in efficiency of the IV model is not outweighed by the benefit of disclosing a distinct local average treatment effect. Thus in the following I elaborate specifically on the Texas experience within the discussion of the OLS results.

IV. Results

A. Fertility

The results in table 3 support the hypothesis that out-of-wedlock black teenage fertility declined as a consequence of increased black male incarceration. I present different specifications of the model that provide insight into the identification of the parameter of interest. Specifications that do not include state fixed effects are omitted. In model 1, with year and state fixed effects, the coefficient on incarceration is negative but insignificant at conventional levels.

When adding state-level linear and linear-quadratic time trends, in columns 2 and 3, the coefficient on incarceration remains negative but now becomes more precisely estimated and significant. An *F*-test on all state linear trends rejects the null hypothesis in model 2, and so does an *F*-test on all state linear and quadratic trends in model 3. Incarceration is now

²⁶ To summarize, the sentencing change that appears to influence black male incarceration the most is presumptive sentencing, yet because presumptive sentencing started on or before 1979 in some of the highly populated states where it has been in use, the identification from state fixed effects is necessarily weak. Other changes, including the much publicized “three strikes” laws, have even less impact on black male incarceration.

Table 3
OLS Regressions with Dependent Variable

	Whether a Mother						Birth at Time t				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Black male prison rate	-.002 (.011)	-.039 (.016)*	-.043 (.021)*	-.049 (.020)*	-.057 (.025)*	-.023 (.012) ⁺	-.043 (.024) ⁺	-.052 (.023)*		-.028 (.010)**	-.042 (.010)**
Prison rate									.052 (.052)		
Prison rate × black									-.095 (.058)		
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × trend		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × trend ²			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Extra controls ^a				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	.032	.036	.036	.039	.034	.036	.034	.034	.108	.001	.012
Observations	5,369	5,369	5,369	2,091	5,133	5,369	4,916	4,934	34,356	4,916	3,632

SOURCE.—June CPS unmarried black women ages 18–20 (1979–85, 1990, 1992, 1994–95, 1998, 2000).
 NOTE.—All models control for age, age². Except for model 6, the prison rate is defined as race-specific 100 × number of prisoners ÷ male population ages 20–54. Except for models 7–8 and 10–11, the prison rate is lagged by 1 year. In model 4 the regression is run over the 1990s only. In model 6 the prison rate is defined as total black male population per male population ages 20–34. In model 7 the lag is 2 years, and in model 8 the lag is 1 year for age 18, 2 years for age 19, and 3 years for age 20; incarceration at age 17 is the variable of interest. In model 9 using both blacks and whites, the prison rate is race-specific and all the controls interacted with the race dummy are added; see eq. (4). In models 10–11 the dependent variable is whether a birth occurs in year t and the lag is 2 years to approximate a 1-year lag between incarceration and conception, if any. In model 11 specification 10 is applied to nonmothers at $t - 1$ only. Robust standard errors clustered by state.

^a State-level black male unemployment rate, different measures of state-level welfare generosity, and whether born after abortion legalization in state of residence (see text for details).
⁺ 10% significance.
^{*} 5% significance.
^{**} 1% significance.

purged of the local effects previously picked up which, to the extent that they change slowly over time, are now well captured by the trend terms.²⁷

When dropping different regions coded by circuit court at a time from model 3, all results hold except when removing circuit court 5. Indeed, if Texas alone (5% of the sample) is removed the coefficient becomes smaller in magnitude and significant at the 10% level. As we shall examine shortly, this result comes from the dramatic and much publicized increase of incarceration in Texas over 1990–2000.²⁸ To strengthen this intuition, I partitioned the sample to single out those states which, at the end of the 1990s, reached Texas-like rates of adult black male incarceration (Connecticut, Delaware, Iowa, Oklahoma, Rhode Island, Wisconsin): keeping those states only, plus Washington, DC (but without Texas), yields a (not significantly) larger negative coefficient at close to the 10% significance level with only 10% of the original sample (and under the 10% level over 1990–2000)—incidentally, recall that Iowa, Rhode Island, and Wisconsin are also states that were identified earlier as experiencing abrupt expansions in prison capacity. Moving to checking the sensitivity of the results to the period considered, keeping only the 1990–2000 period is enough to retain a 5% level, with again a (not significantly) larger coefficient. The 5% level significance is also preserved without the inclusion of state-level trends over that period (model 4, to be compared with model 1). However, eliminating the 1990s leaves the results insignificant at conventional levels.

Adding variables corresponding to different measures of state welfare generosity, state-level black male unemployment or a dummy indicating whether the respondent was born before abortion legalization in her current state of residence (model 5) does not alter the results qualitatively. The welfare variables, however, are jointly significant.²⁹ To explain this, one may think of states' discretion in their use of Temporary Assistance for Needy Families (TANF) funds.³⁰ At the same time, it is plausible that

²⁷ The increase in adjusted R^2 , although small, is noticeable given the large number of variables added. Yet, in model 3, the near stability in adjusted R^2 compared to model 2 suggests that there is nothing to be gained by adding higher-order terms.

²⁸ I also tested the hypothesis that the changes driven by the inclusion of state trends reflect the rapid increase in Hispanic population in some states. However, when removing states other than Texas with a large Hispanic population (California, New York, Florida, Illinois, Arizona, and New Jersey), the results are virtually unchanged.

²⁹ This result accords with the findings of Offner (2003) and Kaestner, Korenman, and O'Neill (2003).

³⁰ The stated purposes of TANF are to (a) provide assistance to needy families so children may be cared for; (b) end the dependence of needy parents on government benefits by promoting job preparation, work, and marriage; (c) prevent and reduce the incidence of out-of-wedlock pregnancies; and (d) encourage the formation and maintenance of two-parent families.

changes in state-level welfare generosity, while not necessarily causal in nature, would be correlated with state-level incarceration policy, both of which being shaped by the same “tougher” ideology toward social issues and by an evolution of local norms regarding tolerance and work ethic.

Using the specification of model 3 with a black male population ages 20–34 to compute incarceration rates offers a smaller and slightly less significant coefficient (model 5)—but this is still significant at 5% when using model 4’s specification. The alternative lag specifications in models 7 and 8 present results very close to those of model 3, further suggesting that incarceration rates at or around age 17 are critical for late teen decisions over unwed motherhood. Regressions using black women ages 15–17 where the data are available (from 1990 on) yield small, insignificant coefficients with an unstable sign although specifications using ages 16–17 only, despite a small sample size, return a systematically negative coefficient, some of them significant at the 10% level.

Looking into the black/white comparison, the interaction coefficient black \times incarceration rate in model 9 shows that in response to male incarceration in their group, black females reduce their fertility relative to white females, but not significantly at the 10% level. In the white population in the same age range, the effect measured here by the race-specific incarceration coefficient is small and insignificant.³¹ Using the parameterization of model 3, I also regressed black teenage fertility on white male incarceration rates; the effect was found to be negative, large in magnitude, but statistically insignificant.³²

Finally, I also estimated a model that time links birth outcomes and incarceration rates more narrowly. From “whether a mother,” the dependent variable becomes “whether giving birth at time of survey (t).” Model 10 shows that incarceration in year $t - 2$ significantly reduces the probability of having a child in year t . This lag was chosen because it best reflects the influence of incarceration immediately preceding conception, if any. Further, model 11 shows that the postponement effect is concentrated at the first birth stage.³³

A low (adjusted) R^2 is unsurprising given that we are dealing with

³¹ I could not find plausible exogenous background characteristics leading to differential treatment within either group. Selecting white women with below average grade for age yielded inconclusive results. However, the significant effect found for the overall black sample is indeed more pronounced among below average grade for age young women.

³² Regressing white teen fertility on black male incarceration yielded a small positive and significant coefficient but not robust to minor changes in model specification.

³³ Conversely, I found no significant effect of male incarceration on subsequent births when applying the same model to those women who were already mothers by $t - 1$.

individual data with a binary dependent variable. Looking at the preferred specification (model 3), however, the magnitude of the effect is sizable: at the means of the data, a 1 percentage point increase in the adult black male incarceration rate appears to decrease the probability of having a child by about 0.04. Recall that the average proportion of mothers in this sample is close to 30%. Given an average adult black male incarceration rate of around 4%, this corresponds to an elasticity of -0.6 . Such a large effect is reminiscent of the impact of AFDC benefits on early fertility measured by Rosenzweig (1999). Comparing this effect with that of age in absolute terms, the decline in teenage fertility associated with a 1 percentage point increase in adult black male incarceration rate is equivalent to the expected average increase in teenage fertility associated with 7 extra months at age 19.

Extrapolating the marginal effect of black male incarceration to the total increase in incarceration over the period 1978–99 leads to a difficulty of interpretation: it would account for more than the entire decrease in teen fertility observed over that same period. This would suggest that the net effect of other social forces, captured by year dummies and state trends, contributed to increasing black teen fertility (thus attenuating the effects of incarceration), against conventional wisdom. However, such extrapolation can be misleading because of nonlinear effects.³⁴ Another problem is that the coefficient does not so much measure the effect of incarceration but rather that of local deviations of incarceration from its trend. In other words, because incarceration is heavily confounded with time trends at the state level, the effect of differencing the trends out leads to measuring the impact of spikes in incarceration.

The flip side of that argument is that, because so much of the variation in incarceration can be explained by state and time effects alone, by controlling for time trends, the critical variation may have been removed. In other words, if the long-run effects of incarceration were operating through the trends, the inclusion of trend effects would wipe those out. However, as previously shown, the results hold over the 1990s without those local trend effects.³⁵ This is consistent with the interpretation that there are no other important omitted variables that would confound with incarceration over that period.

The driving effect of Texas in the 1990s warrants a detailed investigation. In the raw data for that state, we can observe a sharp and statistically significant drop in black teen fertility between the pre-1995 and post-

³⁴ However, a quadratic incarceration term does not improve the fit of the model, the new coefficient is almost zero, and the joint F -test on incarceration and incarceration squared rejects the null hypothesis at the 10% level only.

³⁵ Replacing individual year effects by a dummy variable = 1 if year > 1994 reveals that the time effect of the mid to late 1990s is positive, twice as big as that of incarceration and significant at the 1% level.

1994 periods.³⁶ It corresponds exactly to an unprecedented acceleration of prison capacity expansion. This explains why an IV model based on prison capacity expansion actually magnifies the OLS results with significant yet imprecise results. Yet, such discontinuity is particularly useful for our purpose if, as I now argue, the opening of new facilities and the change in incarceration that they induce are, from young women's perspective, exogenous.

Decisions to build prisons take years, sometimes more than a decade, before translating into operational facilities. Recall that Levitt (1996) documents the lengthy course of prison overcrowding litigation. In particular, he shows that states where overcrowding lawsuits are filed have higher than average incarceration growth rates before the filing and shorter ones afterward. A common outcome for a state that has been sanctioned by courts for its prison overcrowding practice is to build new facilities, even though overcrowding litigation is not the only reason for the building of new prisons. If prison capacity expansion was simply the consequence of overcrowding in preexisting facilities so as to accommodate the excess number of prisoners already housed, it would have no predictive power on actual incarceration counts, and this seems to be the case for several states (e.g., South Carolina). However, the consequence of capacity expansion for incarceration can still be important: as long as prison overcrowding prevails, judges who are aware of the situation may be reluctant to send minor criminals to prison and may prefer to sentence them to probation. Similarly, at the margin, parole boards should be more generous in granting release and parole officers more hesitant to revoke paroles. Once new facilities are built, the capacity constraint is no longer binding.³⁷ Figure 2 illustrates this phenomenon in Texas. It shows the concomitant sudden increase in prison capacity and black male incarceration starting

³⁶ Specifically, a 12 percentage point decrease. One may ask whether the sample accurately reflects the Texas experience. When looking at vital statistics records, the closest breakdown is the number of births by age (5-year age groups after teen years), marital status, race, state, and year. Unfortunately, from a comparison of the bound volume releases (up to 1993) and the electronic ones (from 1994 on) it is immediately clear that there is a difference in computation methodology which makes the pre-/post-1994 comparison meaningless. What can be ascertained nonetheless is the confirmation of a significant increase in fertility in the late 1980s and early 1990s followed by a substantial drop between 1994 and 2000 among black teens (but not among whites).

³⁷ Empirically, this conjecture is validated in several states, especially for parole (numbers of individuals on probation and parole come from a similar BJS series as for prisoners); there, I find that following a major stepping up of prison capacity, the trend in the number of parolees decelerates or even gets reversed. Most importantly for our purpose, the proportion of offenders sent behind bars increases accordingly.

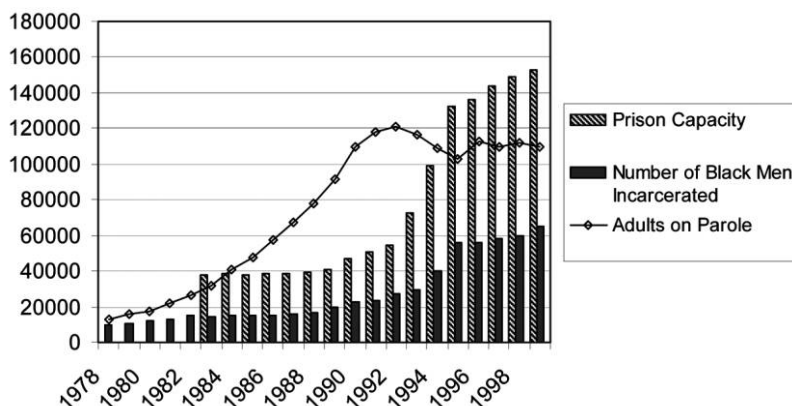


FIG. 2.—Texas prison capacity, black male incarceration, and number of adults on parole. Sources: BJS “Adults on Parole, Federal and State by State (1975–2004),” “Correctional Population in the United States (1985–2003),” “Prisoners in State and Federal Institutions on December 31st (1978–1984),” and “Prisoners in Year X (1983–)” (for prison capacity figures) series; U.S. Census data (from the CDC Wonder Web site).

in the mid-1990s, as well as the abrupt decrease in the number of parolees during that same period.

Although systematic studies of this phenomenon are scarce (e.g., Burke [1988] or Champion [2002], and Davey [1998] for parole and prison capacity as overcrowding regulation mechanisms, respectively),³⁸ there is evidence in the data to support this causal mechanism, and it appears to be part of the culture of numerous state department of corrections officials I talked to.³⁹

Given the importance of Texas in the estimation, it is important to consider whether other specific policies followed in Texas at the time of the prison capacity expansion may have contributed to a decline in teen fertility—albeit among blacks but not among whites. First, the unprecedented opening of new facilities in Texas in the mid-1990s represents the last step of a multistage process that started as far back as 1978: over-

³⁸ This suction effect is reminiscent of the popular movie line “If you build it, they will come” (*Field of Dreams*) and more academically, in the context of education, of the effect of local college openings on women’s education uncovered by Currie and Moretti (2003).

³⁹ To give a recent example, a new prison was opened in Maine in early 2002, and the state prison population went up by more than 11%—by far the highest growth rate in the United States that year (average: 2.6%). Previously, the annual growth rate in Maine had been running below 2%.

crowding litigation filing (1978–79), preliminary court decision (1980–84), final decision (1985–91), and further action (subsequent court intervention, including the appointment of special monitors, contempt orders; 1992–93). The timing of the opening is thus linked to these delays, that is, a series of past, not contemporaneous events. Second, the prison capacity expansion effectively starts—and translates into a discontinuity in incarceration—in 1993/1994, that is, during democratic Governor Ann Richards's tenure. Yet, George W. Bush takes office as governor in early 1995. The movement is therefore unlikely to be a consequence of a broad, new political platform. Further, the decline in black teen fertility is already noticeable by 1995, that is, for conceptions dating from 1994 for the most part. Finally, and this addresses more specifically the overlap of the capacity expansion with Governor Bush's mandates, the sexual education promoted in Texas between 1995 and 2000 focuses exclusively on abstinence. However, abstinence-only policies have been consistently proved to be ineffective at best (DiCenso et al. 2002). Howell and Feijoo (2001) provide evidence that in the specific case of Texas, those policies were overall fruitless. It is therefore all the more striking to observe a decline in black teen fertility in Texas during that period.

To sum up, the results on fertility support the conclusion that the sheer magnitude of adult black male incarceration has been sufficient to significantly reduce black teenagers' nonmarital fertility. This conclusion goes against the qualitative argument that the smaller number of black men leads to more bargaining power on the male side and, in turn, more extramarital relations and pregnancies (Courtwright 1996). Quantitatively, my results run opposite to those of South and Lloyd (1992), who found that in 1980, male scarcity broadly defined had no significant effect on the nonmarital fertility rate for any age range among blacks. However, the study was conducted at a time when black male incarceration rates were much lower than the average in my sample. Further, the effect of the sex ratio need not be linear. This would be consistent with finding a positive (nonsignificant) effect among the white sample and a consistently negative effect in the black sample. Presumably, small deviations from a unitary sex ratio could produce the kind of consequences Courtwright is describing. However, at some point, large shortages of men would inevitably lead to a decrease in early fertility.⁴⁰

According to the much debated argument advanced by Donohue and Levitt (2001), abortion availability, which should contribute to a reduction in teen births, led to a decline in crime with an 18-year lag. In simple terms, the argument here appears to be the reverse, but this time with more immediate effects: in the black community, the marginal impact of

⁴⁰ The analysis of completed fertility seems worthy of interest but falls beyond the scope of the present study.

more men behind bars is now a decrease in early fertility. More research is necessary to identify whether this comes from an increase in the use of abortion or birth control methods, or from fewer sexual relations altogether, or if the incarcerated men were on average more promiscuous. In particular it would be challenging to determine if those women passively forgo early motherhood because of a simple shortage of partners or because they anticipate that the father of a potential child might not be around in case he becomes incarcerated or that he might leave all the more easily since there is an excess supply of women on the market. It goes without saying that finding a new man to support a single mother should be increasingly difficult in an environment where (free) men benefit from a scarcity rent.

B. Other Outcomes

Education

I followed the same methodology to study the impact of male incarceration rates on education for single black women. Unfortunately, the coding of education changes between the pre-1992 and post-1991 periods in the CPS and there is no satisfactory recode that would make the series perfectly consistent over the two periods without too much loss in information.⁴¹ I therefore investigated the two periods 1979–91 and 1992–2000 separately.

I focused on educational attainment for the 18–21 age bracket, because it is likely that the relevant decision would be whether to complete high school or pursue some education beyond high school. For the 1979–91 period, the results point to a strong positive effect at age 20. However, because regressions using slightly younger or older women produce starkly dissimilar results, the validity of the inference remains questionable. I prefer to focus on the 1992–2000 period, which, despite small sample sizes, produces findings more in line with those found in the preceding section. Heuristically, the results are strongest for unmarried women ages 18–19, which corresponds to the critical threshold of high school graduation. Within that age bracket, it also happens that the results are systematically stronger—but not critically so—when focusing on those women who have more than a grade 9 education. Those women with less than grade 10 education at that age (less than 5% of the total) may have their last grade wrongly coded or may be suffering from learning disabilities that shield them from incarceration-induced effects.

To summarize the results for 1992–2000 in table 4, with year and state fixed effects only, the coefficient on male incarceration is positive and

⁴¹ That proposed by Jaeger (1997) still has problems as shown by a comparison of the cumulative distribution functions of grade attainment before and after the recode.

Table 4
OLS Regressions with Dependent Variable “Educational Attainment”

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Black male prison rate	.085 (.040) ⁺	.26 (.110) [*]	.43 (.160) ^{**}	.364 (.167) [*]	.204 (.080) ^{**}	.06 (.126)	.087 (.100)	
Prison rate								.503 (.474)
Prison rate × black								-.074 (.430)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × trend		Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × trend ²			Yes	Yes	Yes	Yes	Yes	Yes
Extra controls ^a				Yes				
Adjusted R ²	.12	.124	.122	.12	.122	.117	.117	.19
Observations	1,916	1,916	1,916	1,833	1,916	1,916	1,916	12,926

SOURCE.—March CPS unmarried black women age 18–19 with more than grade 9 education (1992–2000).

NOTE.—All models control for age. Except for model 5, the prison rate is defined as race-specific $100 \times \text{number of prisoners} \div \text{male population ages 20–54}$. Except for models 7–8 the prison rate is lagged by one year. In model 5 the prison rate is defined as $100 \times \text{number of prisoners} \div \text{male population ages 20–34}$. In model 6 the lag is 2 years, and in model 7 the lag is one year for age 18, two years for age 19, i.e., incarceration at age 17 is the variable of interest. In model 8 using both blacks and whites, the prison rate is race specific, and all the controls interacted with the race dummy are added; see eq. (4). Robust standard errors clustered by state.

^a State-level black male unemployment rate, different measures of state-level welfare generosity, and whether born after abortion legalization in state of residence; see text for details.

+ 10% significance.

* 5% significance.

** 1% significance.

significant at the 10% level (model 1). The inclusion of state-specific linear and quadratic time trends strengthens this finding (models 2 and 3). Again, Texas is driving the results. There is also evidence of a stronger effect among the other states that reach Texas-like levels of incarceration during the period, despite a very small sample size. Hence the convergence with the results obtained on the fertility outcome is noteworthy. Adding the extra controls (state unemployment rates and welfare measures—here, all women are born after abortion legalization) leaves the conclusion unchanged (model 4).

Once again, using the specification of model 3 with a black male population ages 20–34 to compute incarceration rates yields a smaller (yet equally highly significant) coefficient (model 5). However, the results do not hold to the alternative lag specifications used in models 6 and 7, although using incarceration at age 18 for those in the age bracket 19–20 does produce significant results at the 5% level.

The white female educational response to white male incarceration is positive and of roughly the same magnitude as that for blacks but insignificant at any conventional level (model 8), across all specifications; the black/white difference is accordingly insignificant as well. Note that the similarity in absolute magnitudes appears to be spurious based on running

the same model over various subsamples. Neither of the false experiments described earlier yielded a significant coefficient.

Overall, the evidence points to a sizable marginal effect of male incarceration on schooling at the grade 12 juncture among black women (one extra percentage point in incarceration being associated with a 5-month increase in education in the preferred specification; elasticity = 0.23). Education, however, is not the only way through which young women can gain financial independence and self-reliance in response to aggregate male incarceration. Male incarceration could spur women to join the labor-force, become employed full-time, or augment their hours worked. The following section explores the hypothesis.

Employment

Studying the impact of black male incarceration on black-female employment presents more difficulties of interpretation. White and black females compete for the same jobs more than they compete for the same men. Also, the local level of aggregate black male incarceration could be correlated with employers' attitudes (and perhaps bias) toward blacks in general. Another problem is that employment is a flow. The previous two outcomes were the product of irreversible or quasi-irreversible decisions: a woman is a mother by age 20 or she is not, she either graduates from high school or she does not; cases of going back to school in adult life are rare. In contrast, work status is adjustable: one can move in and out of the labor force, partly in response to current labor conditions. Incarceration rates could therefore influence employment at any age. In the following, I concentrate on early employment, that is, the important phase of initial attachment to the labor force.

In table 5 I present results for full-time employment for women ages 20–22.⁴² Although the coefficient is small and insignificant without time trends in model 1, it becomes large and significant when including those in models 2 and 3 (elasticity = 0.64 in model 3). For the 1990s alone, without the time trends, the coefficient is almost significant at the 10% level (model 4). A more precise estimate can be obtained by increasing the sample size (e.g., enlarging the age bracket to age 23 yields a 5% level coefficient), by removing a small fraction of women who, from their high educational attainment, are presumably attending college (yielding estimates up to 1% level significant) or by focusing on the high incarceration states. Indeed, similar to the fertility and education results, Texas appears to be the driving factor behind the results and removing it from the model downgrades the statistical significance to the 10% level in model 3. With the extra controls the coefficient is actually slightly larger and more sig-

⁴² Information on work status is missing in years 1994 and 1995.

Table 5
OLS Regressions with Dependent Variable: “Employed Full Time”

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Black male prison rate	-.007 (.008)	.035 (.010)**	.046 (.020)*	.022 (.014)	.061 (.022)**	.024 (.010)*	.045 (.023)+	.028 (.026)	
Prison rate									-1.1 (.060)+ -1.59 (.060)*
Prison rate × black									
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × trend		Yes	Yes		Yes	Yes	Yes	Yes	Yes
State × trend ²			Yes		Yes	Yes	Yes	Yes	Yes
Extra controls ^a					Yes	Yes	Yes	Yes	Yes
Adjusted R ²	.038	.044	.045	.046	.044	.045	.048	.046	.03
Observations	8,324	8,324	8,324	3,137	7,919	8,324	7,827	7,817	64,891

SOURCE.—March CPS black women age 20–22 (1979–93 and 1996–2000). Years 1994–95 missing.
 NOTE.—All models control for age, age². Except for model 6 the prison rate is defined as race-specific 100 × number of prisoners ÷ 20–54 male population. Except for models 7–8 the prison rate is lagged by 1 year. In model 4 the regression is run over the 1990s only. In model 6 the prison rate is defined as total black male population per 20–34 male population. In models 7 the lag is 2 years and in model 8 the lag is 1 year for age 20, 2 years for age 21, and 3 years for age 22, i.e., incarceration at age 19 is the variable of interest. In model 9 using both blacks and whites, the prison rate is race-specific and all the controls interacted with the race dummy are added; see eq. (4).

^a State-level black male unemployment rate, different measures of state-level welfare generosity, and whether born after abortion legalization in state of residence; see text for details.
 + 10% significance.
 * 5% significance.
 ** 1% significance.

nificant (model 5). The results are robust to the alternative calculation of incarceration rates (model 6) and to a 2-year lag structure (model 7) but not a triangular one (model 8)—here it is the imputation of incarceration at ages 19–22 that is inappropriate. The black/white differential analysis in model 9, if anything, points to a reverse movement for young white women, which would coincide with the convergence between black female and white female early employment. Regressing white employment on black incarceration or black employment on white male incarceration again yields insignificant coefficients.

Taken together, these results suggest that black male incarceration has led more young black women to work full-time.⁴³ Such a response is consistent with the above findings on fertility and education. Absent exogenous background characteristics, one may still refine these results. I find that they are driven by those women who are in the bottom half of the education distribution, and also by married women. The first observation—that is, women with lower education should be most affected at the margin—makes sense. The second observation is less intuitive. However, married women in that age bracket are on average less educated than single women, so one reason why married women contribute to the increase in employment is because of the overlap with lower education. However, when selecting married women in the top half of the education distribution, the results still hold. I believe an interpretation for this phenomenon is the increasing uncertainty of the returns to marriage for these young women. First, there is a higher chance that their husbands, who are typically slightly older and thus in the most likely age range for incarceration, will become incapacitated. Second, the increased bargaining power of men should spur women to seek countermeasures, and the most obvious way to achieve that goal is to become financially independent (or less dependent): according to Seitz (2007), a decrease in the ratio of men to women translates into decreased intrahousehold transfers to wives, which implies that black women are predicted to work more because they receive lower intrahousehold transfers. Third, those women who decided to increase their education, perhaps as an insurance against an unfavorable marriage market—but still managed to get married—are in a better position to get a job. Given that the effect on education is concentrated at the high school completion stage more so than at the college level, it is therefore unsurprising to see an effect as early as at ages 20–22.

Finally, the June CPS confirms that married black women respond to incarceration more than single women but also reveals that young black married mothers significantly contribute to the increase in full-time employment among young black women in general. This result is consistent

⁴³ This is not simply a move from part-time employment. I also found a sizable effect on labor force participation *per se*.

with the observation that much of the recent increase in women's labor force participation can be attributed to the rising participation rates of women with young children (Cohen and Bianchi 1999).

Marriage

It seems plausible that, by sending men to prison and thereby removing them from the marriage market, the marriage rate should mechanically fall. For Seitz (2007), the options of black women outside marriage, combined with the poor labor market opportunities of black males, provide an explanation for the low marriage rates in the black population: the increased prospect of incarceration for a spouse would thus further contribute to the lower expected returns to marriage. Incarceration could have even larger effects by inflicting the stigma of prison on those who come back to the marriage market after their release. Yet, such hypotheses would only hold if, absent incarceration, those men were indeed to get married.

Using the same methodology as in the previous sections, I found some evidence of a negative effect of black male incarceration on the probability of been married for young black women but it came out less persuasive than with the previous results.⁴⁴ Specifically, the effect was driven by the 1980s. This finding can shed some new light on the debate spurred by Wilson's (1987) conjectures. Whereas Wood (1990) argued that the lack of "quality men" is only marginally responsible for the decline in marriage rates in the black community and Myers (2000) found little support for the hypothesis that there are strong unintended impacts of imprisonment policies on family structure, Charles and Luoh (2007) suggested a significantly negative effect on marriage.⁴⁵ My results thus appear to reconcile those diverging views by suggesting that the effect was indeed present up to the mid-1980s but died out later on.

V. Conclusion

This work shows that the massive incarceration of black males in the United States has perceptible effects on black women by their teen years and early twenties. In particular, black male incarceration decreases early black nonmarital fertility and increases black-female education and early employment. The evidence linking male incarceration and marriage is mixed. Decision makers cannot ignore such indirect, unintended positive consequences of mass incarceration. In particular, they should be careful not to take credit for the improvement of certain black female outcomes that should be attributed, at least partially, to rising black male incarcer-

⁴⁴ Results available from the author upon request.

⁴⁵ Yet their result is also driven by their earlier data (personal communication of Charles to the author).

ation, and not to other policies that they would have implemented concomitantly. Yet, it remains to be examined by which exact channels incarceration operates; for example a direct effect on fertility through a shortage of male partners, and/or an indirect effect through education since more educated women are less likely to become teen mothers.

The conclusion of this work might be construed as running against the traditional wisdom that an unfavorable sex ratio can only result in adverse consequences for the excess supply gender. First, such wisdom has been historically proved erroneous: many European women after World War I accessed new responsibilities and opportunities directly related to the male deficit (see Nicholson 2007). Second, the deduction that black women's welfare has increased overall because of black male incarceration would certainly misrepresent the message conveyed here. In a basic marriage-market model assuming rational agents, a shock in the supply of men such as that produced by massive incarceration should make some women worse off, and logically those should be the least sought-after potential mates.⁴⁶ In particular, while it is premature to conclude whether those marginal teenagers who forgo early motherhood are ultimately better off, young mothers who experience the incarceration of their partner are certainly worse off.

The study of the effects of massive male incarceration on women's outcomes, a case of "tectonic economics," is in its infancy.⁴⁷ For example, Johnson and Raphael (2005) advance that the higher prevalence of HIV among black women is connected to black male incarceration rates. Related to that, Cornwell and Cunningham (2007) finds that skewed sex ratios measured by the relative incarceration of men versus women cause men to have more female partners in the black community. Further exploration will give us a more comprehensive view of the different channels through which aggregate male incarceration affects women, such as, for example, participation in various public assistance and welfare programs.

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⁴⁶ Certainly, this simple argument could be qualified. For instance, the large-scale confinement of working men could become a positive externality on labor-market-oriented women. Alternatively, if women's choices were previously constrained, for example if we believe that some women were bullied into demeaning roles, a decrease in early fertility, and an increase in education and job-market attachment would be logically viewed as beneficial. Still, these indirect effects would have to be extremely large to compensate for the direct decrease in welfare in the context of a crisis of gigantic proportions in the black community.

⁴⁷ Alan B. Krueger, quoted on <http://www.economicprincipals.com>, January 15, 2006.

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