Explaining the Disparity between the Black and White Arrest Rates

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Abstract

What explains the differences in the black and white arrest rates? Previous authors have reached conflicting conclusions – differences in arrest rates can either be explained through black individuals committing a greater amount of crimes, or through a racial bias in policing methods. I create a model which explains how the racial composition of arrests changes as the ratio of black to white individuals varies between states. Using this model along with arrest and socioeconomic data by race at a state level, I estimate the difference in probability of arrest for a black individual compared to a white individual. These probabilities are used to determine the difference in the frequency with which blacks and whites commit crimes and the probability of arrest when committing a crime for both racial groups. I find that on average, blacks commit three to four times as many crimes as whites, and that the probability of arrest when committing crimes is three times greater for blacks than it is for whites, which is due to a racial bias in police methods. I conclude that the discrepancy between black and white arrests rates can be attributed to both of these factors.

I. Introduction

In the United States, one in forty-five blacks are incarcerated compared to just one in three hundred and twenty whites (Butler, 2010). There are two competing explanations for the seven to one incarceration rate disparity. The first is that blacks simply commit more crimes than whites which leads to a higher rate of incarceration. The other explanation is that a racial bias exists somewhere in the process of incarcerating an individual – either in police methods or the judicial system. However, these explanations are not mutually exclusive. It is possible that blacks commit more crimes than whites yet are also subject to a racial bias. This paper focuses solely on the discrepancy in black and white arrest rates, ignoring any potential bias in the judicial system. What explains the disparity between black and white arrest rates? In this paper, I explore the two possible causes for the disparity by examining arrest data by race at a state level. I develop a model a model that generates testable predictions about the relationship between the ratio of blacks to whites in states and the ratio of black to white arrests. Using this model, I estimate the difference in frequency of criminal activity between blacks and whites. I also control for factors that are correlated with the frequency of committing crimes and race. Under this model, if the relationship between the ratio of black to white arrests is greater than one, this suggests that there is evidence of a racial bias in police methods.

II. Literature Review

In the literature, there are conflicting explanations for the disparity between black and white arrest rates. New Century Foundation (2005) use data from the National Crime Victimization Survey (NCVS) to estimate the proportion of criminals who are reported as black for violent crimes in order to make a comparison with the proportion of blacks who are arrested for violent crimes. The authors estimate that 55% of all robbers are black, yet only 54.1% of arrests for robberies are blacks. The proportion of black criminals and proportion of arrests of blacks also do not deviate significantly for the crimes of rape, assault, or burglary. Thus, the authors conclude that there does not appear to be any racial bias in police methods for violent crimes. In turn, the disparity in arrest rates must be due to differences in frequency of criminal activity. Interestingly, the authors also find that victims are more likely to report a crime to the police when the criminal is black. This is due to the fact that crimes that are more violent are reported more frequently, and blacks are three times more likely than other races to use a gun and twice as likely to use a knife when committing crimes.

Blumstein (1982) uses a similar method to New Century Foundation (2005). The author finds that eighty percent of the disproportionality between black and white incarcerations is due to the difference in the proportion of criminals who are black versus white for violent crimes. The remaining twenty percent is unknown, but the author suggests it is perhaps due to increasing overrepresentation by blacks as the severity of the crime decreases. However, the author finds that overall there is little evidence of a racial bias.

Other authors have reached a contrasting conclusion. Walker (1987) finds that young black males are stopped in the streets of London twice as often as young white males while either walking or driving. This higher probability of being stopped would at least partially explain the overrepresentation of black arrests compared to their relative population. However, there are a few possible explanations besides a racial bias that can explain the author's findings. The first is that people who are unemployed are more likely to be stopped by police, and blacks have a higher unemployment rate (Walker, 1987). Also, one third of police stops occurred during night hours, so perhaps black youths are simply more likely to be out on the streets at this time than white youths (Walker, 1987). Therefore, any evidence of a racial bias is at the very least somewhat confounded by externalities that are unaccounted for.

Butler (2010) finds evidence for a racial bias by examining incarcerations for drug offenses. The author finds that three-fourths of drug related incarcerations are of blacks and Latinos despite the fact that both ethnicities use drugs at a rate nearly equal to whites. One possible explanation is that blacks and Latinos distribute or sell drugs more frequently than whites, and the higher incarceration rate for these groups is a reflection of this fact. Another finding by Butler (2010) is that on the New Jersey Turnpike, forty two percent of all police stops were of black individuals, and seventy three percent of stops that led to arrests were of black drivers. However, only fifteen percent of drivers are black and whites were actually more likely to be found carrying illegal drugs in their cars. Therefore, the authors conclude that a racial bias does exist against blacks, and this racial bias is at least part of the cause for the discrepancy in arrest rates.

The findings of New Century Foundation (2005) and Blumstein (1982) seem to be in contradiction with the conclusions of Walker (1987) and Butler (2010). However, the authors that find little to no evidence of a racial police bias primarily analyze violent crimes, while the authors that find evidence of racial bias primarily focus on more petty crimes. It is entirely plausible that racial discrimination only exists for less severe crimes because there is more police discretion over whether to make an arrest. My research contributes to the literature by first examining how much more frequently blacks would have to commit crimes compared to whites under the assumption of no racial bias. Second, I examine how the ratio of black to white arrests changes as the ratio of similarly situated blacks to whites changes in order to determine if there is evidence of a racial bias.

When analyzing crime data, it is important to understand the motivation that leads individuals to commit crimes. This is studied in detail in Becker (1968) from a theoretical perspective. The incentive for an individual to commit a crime is a function of the benefit the individual receives, the probability of being caught, the probability of being convicted, and the punishment for the crime (Becker, 1968). Individuals who have a lower socio-economic status receive more benefit from committing crimes, so are more likely to commit crimes. Also, individuals who live in areas with a greater police presence have a higher probability of being caught, so are less likely to commit crimes.

The theoretical model developed in Becker (1968) has also been strengthened through empirical research. There are several location specific and individual specific factors that affect the frequency of criminal activity. Higher levels of unemployment have a positive relationship with crime (Chiricos, 1987; Raphael & Winter-Ebmer, 2001). Interestingly, Raphael & Winter-Ebmer (2001) find that higher levels of unemployment have a strong positive correlation with property crime but a negative correlation with violent crime. The cause of the negative correlation with violent crime is unknown, but is perhaps due to violent crimes giving the criminal no additional benefit when he is unemployed versus employed.

Ultimately, unemployment differences between states and between blacks and whites are important to control for in order to receive unbiased results about the racial composition of arrests in states.

Income inequality and poverty has also been shown to have an association with crime rates. There is a significant positive relationship between income inequality and reported crime (Brush, 2007). Additionally, there is a strong association with the absolute levels of poverty and crime rates (Patterson, 1991). As a result, it will be important to control for the income inequality between blacks and whites and also for differences in poverty levels between states.

The age and gender of the population also plays a large role in determining the amount of crime. The proportion of criminals in an age group increases in the teenage years then decreases with age, and the median age of a criminal is twenty one years old (Farrington, 1986). Due to this trend in criminal activity, the age group often cited as the "criminal-age" population is between eighteen and twenty four (Bowles & Pradiptyo, 2005). Additionally, females are far less likely to commit crimes compared to males (Nagel & Hagan, 1983). Thus, a useful tactic will be to analyze not only the ratio of blacks to whites between states, but also the ratio of black to white males ages eighteen to twenty four and the relationship this ratio has with the racial composition of arrests.

There is also a relationship between educational attainment and criminal activity. Lochner & Moretti (2003) find that higher levels of schooling significantly reduce the probability of incarceration. Additionally, the authors find that twenty three percent of the black to white gap in male incarcerations is due to differences in educational attainment. Thus, not only will it be important to control for differences in educational attainment between states; differences in black and white educational attainment will be important to control for as well.

One location specific factor that affects crime rates is the size of a police force. There is a large volume of literature that provides evidence showing the size of a police force has a negative relationship with crime rates (Levitt, 2002; Klick & Tabarrok, 2005; Di Tella & Schargrodsky, 2004). The elasticity of

crime with respect to the number of police officers has been consistently estimated to be between -0.3 and -0.5. As a result, differences in the number of police officers per capita between states will have an effect on crime rates.

One problem in studying arrest data is overcoming a potential reporting bias for crimes. Research has suggested that non-whites report crimes less frequently than whites (Shah & Pease, 1992). This is important due to the fact that blacks commit a greater proportion of crimes on whites than whites do on blacks after controlling for the population proportions of both races (New Century Foundation, 2005). Therefore, it is possible that reporting bias at least partially explains the overrepresentation of blacks in arrests. Another key aspect of reporting bias is that crimes involving more violence are more likely to be reported to the police and more likely lead to an arrest (Blumstein, Cohen, Martin, & Tonry, 1983). Thus, it is also possible that non-whites simply commit more violent crimes or use more violence in the crimes they commit which leads to more frequent police reports and arrests.

III. Data & Methodology

For my research, I perform a cross sectional analysis on how the ratio of black arrests to white arrests varies as the ratio of blacks to whites changes across states. Data for my research comes from two sources. The first source is the Bureau of Justice Statistics (BJS) which contains crime data by race at the state level. The second source is the American Community Survey (ACS) of 2006 which provides socioeconomic data from a nationally representative sample of the US. This data is sorted by race then aggregated up to the state level in order to provide measures of how blacks and whites differ in a socioeconomic sense in each state.

A mathematical framework is needed in order to explain empirical results. To do this, I will examine the ratio of black to white arrests which can be defined in the following way: Ratio Black to White Arrests = $\frac{\# blacks arrested}{\# whites arrested} = \frac{B * P(B)}{W * P(W)}$

where B = number of blacks

W = number of whites $P(B) = P(C_B)P(A_B | C_B) = probability black individual is arrested$ $P(W) = P(C_W)P(A_W | C_W) = probability white individual is arrested$ $P(C_r) = probability an individual commits a crime$ $P(A_r | C_r) = probability an individual is arrested given a crime is committed$

How does the ratio of black to white arrests change as the ratio of blacks to whites changes? This can be seen from the following derivative:

$$\frac{\partial(\text{Ratio Black to White Arrests})}{\partial(\frac{B}{W})} = \frac{P(B)}{P(W)}$$

Thus, changes in the ratio of blacks to whites in states changes the ratio of black to white arrests dependent on the probabilities that each group is arrested for a crime. If blacks and whites have equal probabilities of being arrested, a one unit change in the ratio of blacks to whites will result in a one unit change of the racial composition of arrests.

One key assumption in this model is that the probability of arrest for both racial groups is constant between states. This means that for the ith state:

 $P(B_i) = P(B)$ and $P(W_i) = P(W)$

Which implies:

$$P(C_{Bi}) = P(C_B), P(A_{Bi} | C_{Bi}) = P(A_B | C_B)$$
$$P(C_{Wi}) = P(C_W), P(A_{Wi} | C_{Wi}) = P(A_W | C_W)$$

The probability of arrest is independent of the state, which in turn means that the probability any given individual commits a crime, and the probability they are arrested for that crime, is independent of the state they live in. In order to strengthen this assumption, I will include controls such as income,

unemployment, educational attainment, and size of police force, which vary by state and are correlated with crime as outlined in the literature.

The baseline regression will take the form:

Proportion Black to White $Arrests_i = \beta_0 + \beta_1 (Proportion Blacks to Whites)_i + u_i$ The explanatory and response variables are indexed by i which represents the state. As per the model, the coefficient β_1 will give the ratio of the probability a black individual is arrested for a crime to a white individual. The probability an individual is arrested for a crime is a function of the probability any given individual commits a crime, and the probability they are arrested for a crime if they commit one. Assuming a police racial bias does not exist is an assumption that the probability of arrest for an individual who commits a crime is equal for whites and blacks:

$$P(A_B \mid C_B) = P(A_W \mid C_W)$$

which implies:

$$\frac{P(B)}{P(W)} = \frac{P(C_B)P(A_B \mid C_B)}{P(C_W)P(A_W \mid C_W)} = \frac{P(C_B)}{P(C_W)}$$

This assumption ignores the possibility that either racial group is more or less elusive in committing crimes, or commits more crimes that have a higher probability of arrest. However, under the assumption that no racial bias exists in police methods, β_1 will indicate how much more frequently blacks commit crimes compared to whites.

Subsequent regressions will also include controls that attempt to make blacks and whites as similarly situated as possible, and the probability of arrest equal among states. Controls that make blacks and whites similarly situated will be measured in terms of the white to black disparity in income, unemployment, and education. A regression with these controls will be as follows:

Proportion Black to White $Arrests_i = \beta_0 + \beta_1 (Proportion Blacks to Whites)_i + \beta_2 (Median Income Households)_i + \beta_3 (Unemployment)_i + \beta_4 (Percent HS Diploma or Higher)_i + \beta_5 (Police Officers per Capita)_i + \beta_6 (Income Disparity)_i + \beta_7 (Unemployment Disparity)_i + \beta_8 (HS Diploma or Higher Disparity)_i + u_i$

The added controls define the assumption that the probability any given individual commits a crime is equal for blacks and whites:

$$P(C_B) = P(C_W)$$

which implies:

$$\frac{P(B)}{P(W)} = \frac{P(C_B)P(A_B \mid C_B)}{P(C_W)P(A_W \mid C_W)} = \frac{P(A_B \mid C_B)}{P(A_W \mid C_W)}$$

Therefore, the corresponding hypothesis test will test the null hypothesis that the coefficient β_1 is one. Due to the assumption that the frequency of criminal activity is equal among blacks and whites, a rejection of this null hypothesis indicates that the probability an individual is arrested when committing a crime is different for blacks and whites. Thus, a rejection of the null hypothesis would also provide evidence that a racial bias exists in police methods.

The final regression will analyze the relationship between the ratio of black to white males ages eighteen to twenty four with the ratio of black to white arrests. In this regression, all other variables such as income, unemployment, and educational attainment will be measured for the relevant age and gender as opposed to the population as a whole. Because the majority of crimes are committed by males in this age group, one possible explanation for differences in arrest rates is due to differences in age and gender composition between blacks and whites. By focusing on the criminal age population of blacks and whites, this will also make blacks and whites more similarly situated within states. The two key variables of interest are the proportion of blacks to whites and the proportion of black to white arrests. Figure 1 shows a scatter plot of these two variables, and clearly there is a very influential and distinct outlier – the District of Columbia. This observation has been omitted from the dataset, and a new scatter plot is provided in figure 2. The data does appear to be heteroscedastic, but does follow a distinct linear trend. Descriptive statistics of the key variables can be seen in table 1. For all three variables, the median lies to the left of the mean indicating a positive skew that is present in all of the variables.



	Table (1)			
	Min	Max	Median	Mean
Ratio Black to White	.01001	.62145	.10365	.16685
Ratio Black to White Males 18-24	.01262	.77151	.14679	.20786
Ratio Black to White Arrest	.02143	2.58856	.59669	.83537

Regression results for the two preliminary regressions are provided in table 2. In the first column, the coefficient on the ratio of blacks to whites represents the ratio of the probability any given black is arrested to the probability any given white is arrested, P(B) / P(W). This model and regression states that on average, a black is four times as likely to be arrested as a white. According to the model and the

assumption of no racial bias in police methods, blacks would have to commit four times as many crimes as whites in order to see these results.

Table (2)						
	(1)	(2)	(3)			
Ratio blacks to whites	4.022	3.97704	3.49971			
	(0.444)***	(0.43353)***	(0.50527)***			
Median income households in \$10,000		0.23275	0.23434			
		(0.07955)***	(0.13587)*			
Percent Unemployed		0.03990	0.00056			
		(0.07259)	(0.06090)			
Percent HS diploma or higher		0.00809	-0.01744			
		(0.01678)	(0.03036)			
Number of police officers per 10,000 people		0.02126	0.02152			
		(0.01330)	(0.01250)*			
Income disparity whites and blacks in \$10,000			0.27597			
			(0.19490)			
Unemployment disparity whites and blacks			-0.00736			
			(0.03065)			
HS diploma or higher disparity whites and blacks			1.19781			
			(1.61213)			
Constant	0.274	-0.50767	-0.69465			
	(0.075)***	(1.41941)	(2.47356)			
R^2	0.70	0.78	0.84			
Ν	41	41	41			

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

The second column contains controls in an attempt to make the frequency of criminal activity and probability of arrest when an individual commits a crime equal among states. The coefficient on the ratio of blacks to whites decreases very slightly, which coincides with the expectation of no change in the coefficient. This is due to the fact that the controls in column two only attempt to make individuals in different states similarly situated, but do nothing to control for socioeconomic differences between blacks and whites. Interestingly, the coefficient on the median income of households is positive and highly significant. This suggests that states with higher levels of income tend to arrest a greater ratio of blacks to white after controlling for the racial composition of the state. It isn't the case that states with higher incomes have larger police forces which arrest happen to arrest blacks more frequently, as the size of a police force is controlled for as well. One possible explanation for this effect is that in states with a higher income, the income disparity between whites and blacks increases. Perhaps most of the income in these states is being generated primarily by white individuals. This would cause the criminal offense rate of whites to decrease relative to the offense rate of blacks and cause the ratio of black to white arrest to increase as seen in this regression. After income disparity is included in the regression, the significance of the median income of households nearly disappears, suggesting that this is a reasonable explanation.

The final regression is provided in column three, which includes variables for the white to black disparity of income, unemployment, and educational attainment in an attempt to make both racial groups as similarly situated as possible. While none of the controls are statistically significant, the sign of each variable contains valuable information. This regression suggests that as the income disparity between whites and blacks increases, the ratio of black to white arrest rates increases after controlling for all other variables. This is consistent with the expected result, as we would expect black individuals to commit more crimes in states where they are poorer relative to whites, and thus be arrested more frequently. The negative sign on unemployment disparity is also a logical result. Areas where whites have a greater unemployment compared to blacks should have relatively more crimes committed by whites leading to less arrests of blacks relative to whites. The positive sign on the white to black disparity of educational attainment is also consistent with expectations. Increases in the disparity of high school graduates between whites and blacks reflect an increase in the educational attainment of whites relative to blacks. Higher levels of educational attainment coincide with lower levels of criminal activity; therefore, as this disparity increases we would expect blacks to commit more crimes and be arrested more frequently. Overall, the validity of this model is strengthened by the fact that the sign for each of these disparity controls is consistent with previous research outlined in the literature.

As expected, the coefficient on the ratio of blacks to whites decreases in the third regression from the regressions in columns one and two. This coefficient predicts that a black individual is still more than three times as likely to be arrested as a white individual, and this coefficient is also statistically different from one. Under the assumption that blacks and whites commit crimes with the same frequency, this coefficient predicts that a black individual is more than three times as likely to be arrested when committing a crime than when a white individual commits a crime. This indicates that there is evidence that a racial bias exists in police methods which causes blacks to be arrested with a greater probability when committing crimes. While the literature does describe a large variety of factors that are correlated with crime rates, it is impossible to know and control for every possible variable that influences an individual's decision to commit a crime. Therefore, there is the possibility that blacks with a similar socioeconomic status to whites still commit crimes more frequently. If this is the case, my results would overestimate the difference between the probability a black individual is arrested when committing crimes than whites, or commit more crimes that more frequently lead to arrests. These two factors can at least partially explain this disparity, although the black to white difference in the probability of arrest when committing a crime is large enough that I do not believe they can account for the entirety of the disparity.

Another interesting result of this regression is that the size of the police force has a positive, significant effect on the ratio of black to white arrests. States with more police officers per capita tend to arrest more black individuals relative to white individuals. This is additional evidence for the presence of a racial bias in police methods. If police were targeting black and white individuals equally, I would not expect there to be any correlation between the size of a police force and the racial composition of arrests. One alternative explanation is that there is a correlation between the size of a police force and the frequency with which blacks commit crimes relative to whites. Perhaps in states with large police forces, there is also some underlying factor such as the presences of gangs, which results in black individuals more frequently committing crimes compared to whites and explaining their higher rate of arrest.

Table (3)						
	(1)	(2)	(3)			
Ratio black to white males 18-24	3.25927	3.29752	2.98919			
	(0.36498)***	(0.36289)***	(0.35234)***			
Median income households ages 18-24 in \$10,000		0.28517	0.30450			
		(0.08614)***	(0.07409)***			
Percent unemployed males 18-24		0.02194	0.01733			
		(0.05178)	(0.05633)			
Percent HS diploma or higher males 18-24		0.00589	-0.01270			
		(0.02285)	(0.02225)			
Number of police officers per 10,000 people		0.01595	0.01353			
		(0.01006)	(0.01227)			
Income disparity white and black males 18-24 in \$10,000			-0.04474			
			(0.24505)			
Unemployment disparity white and black males 18-24			-1.05039			
			(0.82456)			
HS diploma or higher disparity white and black males 18-24			1.22167			
			(0.63506)*			
Constant	0.28556	-2.24934	-0.77863			
	(0.07255)***	(2.01933)	(2.13662)			
R^2	0.70	0.82	0.84			
Ν	41	41	41			

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

Table 3 contains regression results using the sample population of males between the ages of 18 and 24. The coefficient in column one shows that black males between 18 and 24 are just over three times as likely to be arrested as white males in the same age group. This coefficient is significantly smaller than when the regression is run for the population as a whole. This is due to the fact that states with a higher ratio of black to white males have an even greater ratio of black to white males between the ages of 18 and 24. A simple regression between these two variables shows that on average, a one unit increase in the ratio of blacks to whites is associated with a 1.2 unit increase in the ratio of black to whites can be attributed to the fact that, on average, the proportion of black to white males in the criminal age population is greater than the overall proportion of blacks to whites.

When the controls are added in column three, the coefficient of interest decreases again, although not as drastically as it previously did for the population as a whole. Interestingly, the coefficient on the median income of households for males aged 18 to 24 remains highly significant throughout the regressions in columns two and three. When considering the population as a whole, most of the significance vanished after controlling for the income disparity between whites and blacks. However, this regression suggests that in states where the income of households for 18 to 24 year olds is higher, the ratio of black to white arrests is higher as well. The reason for this difference is unclear from these regression results. The sign of the controls are again consistent with expectations, except for the sign on income disparity. This regression suggests that a greater disparity between the income of young white and black males actually decreases the ratio of black to white arrests – opposite of the expected result. However, it should be noted that this coefficient is not statistically different from zero.

If we again assume that the regression in column three makes the frequency with which young black and white males commit crimes, this regression suggests that black individuals are three times as likely to be arrested when committing a crime as white individuals. Again, this provides evidence of a racial bias in police methods, but is far from conclusive due to the assumptions being made and alternative explanations discussed earlier.

V. Conclusion

Explaining the difference in arrest rates between blacks and whites is troublesome due to the two competing explanations. The arrest disparity can be explained by a difference in frequency of criminal activity, a racial bias in police methods, or both. My research shows that black individuals are three to four times as likely as white individuals to be arrested. Under the assumption that no racial bias is present in police methods, I find that blacks would have to commit crimes three to four times as frequently as whites in order to explain the arrest rate disparity. After controlling for variables that are

correlated with race and crime rates, I find that blacks are still three times as likely as whites to be arrested. Under the assumption that these controls make the frequency of criminal activity equal among blacks and whites, I find that blacks are three times more likely than whites to be arrested when committing crimes. This increased probability of arrest for similarly situated whites and blacks is evidence that a racial bias exists in policing methods.

Three key assumptions have been used to obtain my results, which limit the strength and validity of my conclusions. The first is that blacks and whites with a similar socioeconomic status commit crimes with the same frequency. This is a strong assumption, and it is entirely possible that similarly situated blacks and whites continue to have different offense rates. Two, I assume that blacks and whites commit the same distribution of crimes. It is possible that the blacks commit a greater proportion of crimes which more frequently lead to arrests, explaining at least part of the disparity in black to white arrest rates. Three, I assume that the probability of an individual being arrested when committing a crime is only a function of differences in police behavior. This ignores the possibility that either black or white individuals are more elusive when committing crimes, or less deterred by the presence of nearby police when choosing to commit a crime.

One key note is that my research does not show that police are racist. It is likely that police use methods that maximize the amount of arrests. Therefore, police may increase their presence in areas where more crimes are committed which may coincide with areas that have a greater concentration of black individuals. This would explain my results that show blacks are still three times more likely to be arrested than whites when committing crimes.

There are several possible avenues for further research. A dataset containing more detailed crime information would be useful to determine which crimes blacks are arrested more frequently for. It is possible that a large portion of the arrest disparity between blacks and whites can be explained by differences in the racial composition of arrests for specific crimes. Additional research on the

frequencies with which similarly situated blacks and whites commit crimes would help in the interpretation of my results. This information would also allow me to reach a more concrete conclusion as to whether a racial bias exists in police methods, and the extent of the bias.

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