BLACK AND WHITE LABOR MARKET OUTCOMES IN THE 19TH CENTURY AMERICAN SOUTH

SCOTT ALAN CARSON

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Abstract

Modern labor studies consider the relationship between wages and biological markers. A relevant historical question is the relationship between occupational status and biological markers. This study demonstrates that 19th century stature and BMIs were significant in Texas occupation selection; however, stature and BMIs were not significant in the decision to participate in the Southwest's labor market. In the post-bellum south, labor markets were segregated, and white laborers were at a distinct occupational and social advantage relative to their black counterparts. It is documented here that the probability of being farmers and unskilled workers were comparable by race. However, whites had greater access to white-collar and skilled occupations.

JEL Code: J15, J24, J70, N31.

Keywords: 19th century US labor markets, labor force participation, stature and BMI.

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1. Introduction

Labor market outcomes are related to physical health, and healthy workers are more productive and able to undertake more strenuous work loads than workers in poor health. Attention has been directed toward the historical relationship between body dimensions, health and labor force participation (Riley, 1994, p. 474-476; Costa, 1998; Kanjanapipatkul, 2003, pp. 235-243), and the allied relationship between body dimensions and occupation selection also is of interest. These biological decisions to work are interesting in past populations, as development occurred, particularly in the late 19th and early 20th century American South, when occupation selection may have been more related to physical dimensions and hiring decisions were plagued by overt forms of racial prejudice. Racial segregation in antebellum labor markets was effectively complete; without property rights and capital accumulation, slaves were foreclosed from opportunity. In the post-bellum South, labor markets continued to be segregated, and white laborers were at a distinct occupational and social advantage to their black counterparts (Woodward, 1951, pp. 221-222; Rosenbloom, 2002, pp. 35-44; Allen, 1941, p. 9; Carrington, 1975, pp. 21-25). Between Reconstruction and 1920, Southern labor

markets transformed, and former white plantation bosses and overseers migrated from rural field work to cotton textile and light manufacturing positions (Allen, 1941, p. 13). Throughout this process, worker health played a critical role in their occupation selection and labor force participation decisions. However, it is yet to be documented the relationship between black and white physical dimensions and how physical dimensions related to occupation selection in the 19th century American South.

Two commonly used biological markers related to the decision to work are stature and the body mass index (BMI). A populations' average stature reflects the net cumulative balance between nutrition and calories required for work and to fend off disease. By considering average versus individual stature, genetic differences are mitigated, leaving only the net cumulative influence of environment on stature (Tanner, 1994, pp. 1-5). BMI reflects the current balance between nutrition, disease, work and the physical environment, and by considering average BMI, only current environmental influence remains (Fogel, 1994, p. 375). Hence, 19th century stature and BMI provide significant insights into understanding historical biological relationships between occupation selection and labor force participation.

A primary obstacle in observing historical relationships between biological markers and labor market outcomes is locating reliable samples, where height and weight were recorded with occupational status. Using over 42,000 male black and white inmates incarcerated in the Texas state prison, the current study considers the relationship between physical dimensions, socioeconomic status and labor force participation in America's 19th century South. Three questions are addressed. First, what was the relationship between stature, BMI and occupation selection in Texas? If taller statures

with heavier BMIs were required in agricultural occupations, farmers would have been taller because of their close proximity to nutritious food sources and removal from population centers with accompanying disease vectors. Alternatively, skilled workers may have been shorter because stature was not required in agricultural occupations, and lack of physical activity may have contributed to heavier BMIs for skilled workers (Asao, Kao, and Baptiste-Roberts, 2006, 1632, 1634; Fogel, 1993, p. 8; FAO/WHO/UNU, 1985, pp. 76-77, 186-91; Fogel, 1997, p. 448). Second, how were physical statures and BMIs related to workers' decisions to participate in the labor force? If stature and BMIs were required to complete physically demanding tasks, taller, heavier workers may have been more likely to participate in the Texas agricultural economy. Third, how did these biological and occupational relationships vary by race and how did access to skilled occupations vary by race, nativity and time of observation? Over time, If whites were more likely to fill skilled occupations, blacks were increasingly foreclosed from opportunity. Depending on access to skills in different US regions, nativity may have been associated with black access to white-collar and skill occupations.

2. Data

Data used to study Texas anthropometrics and labor force participation is a subset of a much larger 19th century prison sample. All available records from American state repositories have been acquired and entered into a master file. These records include Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Texas, Utah and Washington. Data from the 19th century Texas state prison at Huntsville are used here to assess the relationship between bodily dimensions and Southern labor market outcomes. Between 1873 and 1920, prison guards

at the Texas state prison routinely recorded the dates inmates were received, age,

complexion, nativity, height, weight, pre-incarceration occupation and crime.

Fortunately, inmate enumerators were quite thorough when recording inmate complexion

and occupation.[1] For example, enumerators recorded black inmates' race in a

complexion category as black, light black, dark black or various shades of mulatto.[2]

While mulatto inmates possessed genetic traits from both European and African ancestry,

they were treated as blacks in the American South and are grouped here with black

inmates.[3] Blacks were more common than whites in the Texas prison, but there is little

evidence that blacks were targeted by Texas law enforcement officials. Rather, their

disproportional representation is likely due to no legal representation at trial (Walker,

1988, pp. 114-115). Enumerators recorded white inmate complexions as light, medium

and dark. The white inmate complexion classification is further supported by the

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[1] Although the Texas Prison data set allows access to a large and valuable set of inmates of Mexican

nativity residing in Texas, the focus of this paper is the comparison between white and black inmates.

[2] Like Komlos and Coclanis (1997), inmates with complexions recorded as black, brown, copper, dark

brown, dark mulatto, ginger, light brown, light mulatto, mulatto and yellow are considered as black.

Inmates with complexions recorded as fair, florid, dark, light, ruddy, sallow, sandy and swarthy are

considered as from European ancestry.

[3] While some studies in 19th century African-American anthropometric history find a "mulatto advantage,"

there is little evidence that farer skinned African-Americans in the Texas prison had a distinct stature

advantage over darker skinned African-Americans.

complexion of European immigrants, who were always of fair complexion and were also recorded as light, medium and dark.[4]

All historical height and BMI data have various selection biases. The prison data likely selected many of the materially poorest individuals who were most vulnerable to economic change (Bogin, 1991, p. 288; Godoy, 2005), although there are skilled and agricultural workers in the sample. For the study of height as an indicator of biological conditions, this kind of selection is preferable to the type of selection that marks many military records – minimum height requirements (Fogel, 1978, p. 85). Moreover, these records contain similar individuals and have as rich and reliable occupation description combined with biological information as any other 19th century samples. However, because these are prison records, observed occupation distributions may also reflect the types of crimes committed and prosecuted. For example, economic growth slowed during the late 1880s, and expanded during the early 1900s. If theft crimes were countercyclical, we may expect that incarceration for theft crimes to be higher during the late 1880s and lower during the early 20th century.

Fortunately, prison enumerators were quite thorough when recording prisoners' occupations because occupations had the legal ability to identify inmates in case they escaped. Enumerators recorded a broad continuum of occupations and defined them narrowly, recording over 200 different occupations. These occupations are classified here into four categories. Workers who were merchants and high skilled workers are

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[4] I am currently collecting 19th century Irish prison records. Irish prison enumerators also used light, medium, dark, fresh and sallow to describe white prisoners in prisons from a traditionally white population. To date, no inmate in an Irish prison has been recorded with a complexion consistent with African heritage.

classified as white-collar workers; light manufacturers, carpenters, and craft workers are classified as skilled workers; workers in the agricultural sector are classified as farmers; laborers are classified as unskilled workers.[5] Occupations were recorded when inmates were received into the prison, therefore, reflect pre-incarceration occupational status and not prison occupations. By having the same prison official record characteristics over much of the period, the consistency of the Texas prison sample creates reliable comparisons across race and time.

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[5] Prison guards who recorded occupation did not distinguish between farm and common laborers. This potentially overestimates the biological benefits of being a common laborer and underestimates the advantages from being a farm laborer, since common laborers typically came to maturity under less favorable biological living conditions. The occupation classification system used here replicates that used by Ferrie "Entry into U.S. Labor Markets," p. 325; *Yankeys Now*, 1999. See the appendix for the occupation classification system used here.

Table 1, Texas Prison Inmate Demographics and Occupations

Age	Black		White		Occupations	Black		White	
	Percent	N	Percent	N		Percent	N	Percent	N
Teens	19.00	5,123	15.68	2,513	White-Collar	2.43	654	11.13	1,784
20s	54.56	14,712	51.22	8,211	Skilled	2.64	712	12.25	1,963
30s	16.37	4,413	20.43	3,275	Farmer	14.39	3,879	16.21	2,598
40s	6.66	1,795	8.04	1,289	Unskilled	17.43	21,146	56.56	9,067
50s	2.40	647	3.57	572	No Occupation	2.12	572	3.86	618
60s	0.86	231	0.90	145					
70+	0.16	42	0.16	25	*Nativity*				
					Northeast	0.14	38	0.86	138
Birth Decade					Middle Atlantic	1.06	285	4.68	751
1820s	0.55	148	0.45	72	Great Lakes	0.91	246	6.94	1,113
1830s	1.78	479	1.63	261	Plains	1.51	407	6.87	1,102
1840s	5.34	1,439	6.33	1,014	Southeast	23.57	6,355	32.18	5,158
1850s	15.73	4,242	18.21	2,919	South	72.59	19,573	47.21	7,568
1860s	23.55	6,350	20.65	3,310	Far West	0.22	59	1.25	200
1870s	23.03	6,209	23.25	3,727					
1880s	18.51	4,992	18.31	2,935					
1890s	10.49	2,829	10.54	1,690					
1900s	1.02	275	.064	102					

Source: Date used to study Texas anthropometrics is a subset of a much larger 19th century prison sample. All available records from American state repositories have been acquired and entered into a master file. These records include Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Texas, Utah and Washington. Prison records used in this manuscript are from Texas.

Age percentages demonstrate that black inmates were incarcerated in their younger ages, and white inmates were incarcerated in their older ages (Table 1).[6]

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[6] Higgs, *Competition and Coercion,* p. 1, indicates that effective discrimination by public institutions during the 19th century, which suggests that young blacks may have been targeted by law enforcement.

Southern slave law evolved to favor plantation law, which generally allowed slave-owners to recover slave labor on plantations while a slave was punished (Wahl, 1996 and 1997; Friedman, 1993, pp. 84-106). As a result, birth decades indicate that white inmates born before the Civil War took up larger shares of the Texas prison population than black inmates. However, with the 13th Amendment's passage, slave-owners no longer had claims on black labor, and freed-blacks who broke the law were turned over to the Texas penal system to exact their social debt.

Whites were overwhelmingly more likely than blacks to be listed as white-collar and skilled workers. White inmates were 363 percent more likely than blacks to occupy white-collar occupations and 366 percent more likely than blacks to occupy skilled occupations. Even in agriculture, whites were also more likely than blacks to come from planting and stock raising occupations. The difference, of course, was in the unskilled category. Incarcerated blacks were 39 percent more likely than whites to occupy unskilled occupations, making occupations within the Texas prison segregated; white-collar, skilled, and agricultural occupations were filled by whites and unskilled occupations were filled by blacks. Inmate nativity in the Texas prison was predominantly North American and was largely from the lower South, although some came from the upper South. Because the comparison here is between American black and white males, immigrants and females are excluded from the analysis.

Higgs, *Competition and Coercion*, 10, also indicates that Blacks were more likely to be convicted and receive longer sentences or larger fines than comparable white offenders. Friedman, *Crime and Punishment*, pp. 90, 94, 96, and 156 indicates that 19th century blacks may have been targeted by prejudiced public institutions.

A common difficulty in analyzing military samples is the application of a minimum stature requirement (Sokoloff and Vilaflor, 1982, p. 457, Figure 1; Fogel, 1978, p. 85). However, a minimum stature requirement does not apply to this sample, as the adult stature distributions were approximately normal. Likewise, no conditions were placed on adult inmates' BMI distributions, which are also distributed approximately normal (Figure 1).[7]
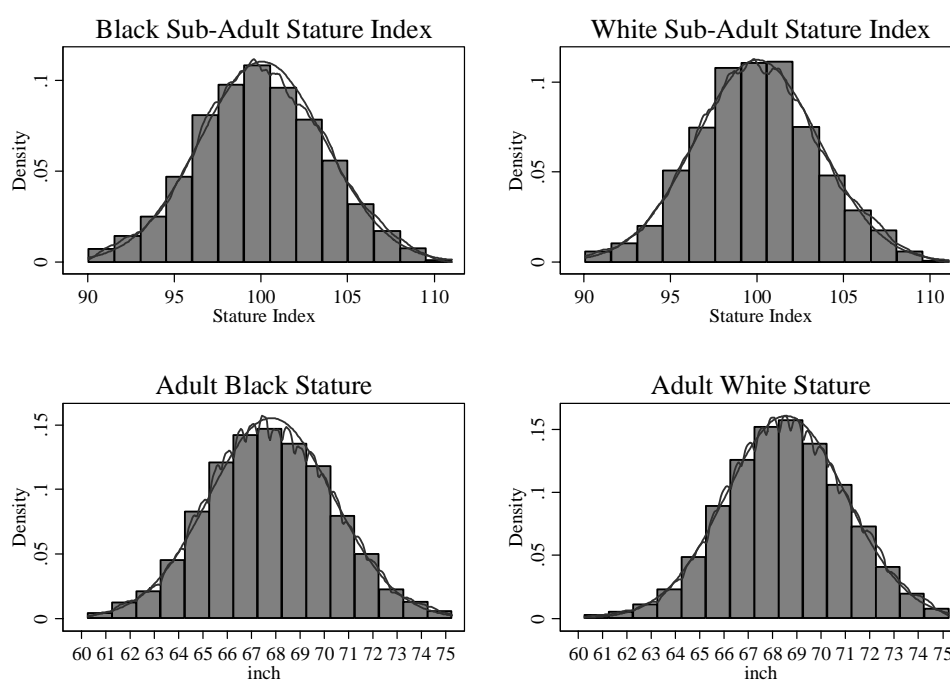

Figure 1, Adult Mexican and Hispanic Stature and BMIs

Source: See Table 1

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[7] The test for juvenile normality is complicated because juvenile heights are skewed to the right at the beginning of the growth spurt and skewed to the left at the end, a phenomenon caused by early and late maturers.

Table 2, Nineteenth Century Texas Youth and Adult Crime Proportions

| Crime	Black Crime		Mean Stature	Mean BMI	White Crime		Mean Stature	Mean BMI
	N	Percent			N	Percent		
Physical Assault	3,404	12.59	171.80	23.73	725	4.51	174.11	22.35
Fraud	1,665	6.16	172.18	23.72	2,468	15.36	174.22	22.47
Murder	3,036	11.23	172.05	23.75	1,652	10.28	174.76	22.21
Sexual Offense	1,437	5.32	171.64	23.75	843	5.25	173.72	22.56
Theft	16,139	59.71	171.54	23.58	9,657	60.12	173.50	22.38
Other Crimes	1,349	4.99	172.13	23.85	718	4.47	174.11	22.61
Decade Received	Black Percent		Mean Stature	Mean BMI	White Percent		Mean Stature	Mean BMI
1870s								
Murder	7.66		171.86	24.16	7.35		174.61	21.96
Theft	68.94		171.81	24.06	72.19		174.08	22.39
1880s								
Murder	7.52		172.18	23.79	11.82		174.19	22.43
Theft	62.37		171.91	23.51	69.97		174.30	22.15
1890s								
Murder	11.96		172.71	23.67	10.37		174.01	22.44
Theft	59.86		171.50	23.37	61.97		174.34	22.11
1900s								
Murder	12.50		172.46	23.64	10.93		175.26	22.18
Theft	59.57		171.18	23.37	56.46		173.05	22.38
1910s								
Murder	14.69		171.09	23.73	9.81		173.24	22.68
Theft	52.96		171.37	23.54	49.72		172.48	22.48

Source: See Table 1
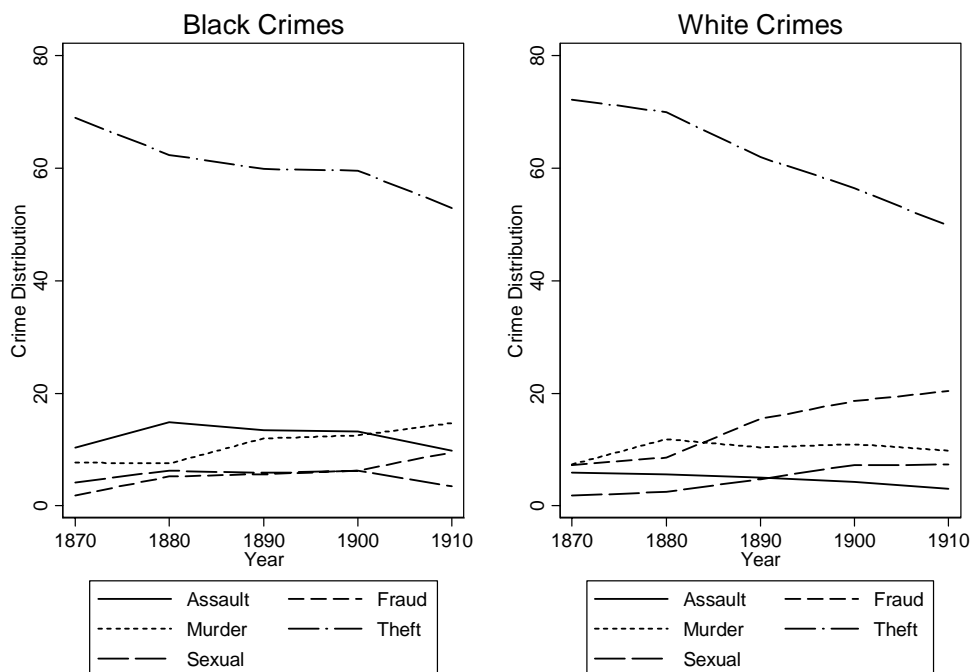
Figure 2, Texas Black and White Crime Distributions over Time

Source: See Table 1.

Stature and BMIs by race may have been related to the types of crime committed. The relative proportion of crimes is reported in six categories: physical assault, fraud, murder, sexual assault, theft and other crimes—which include arson and property crimes (Table 2). Youths were incarcerated for theft and other crimes. Adults were incarcerated for fraud, murder, physical and sexual assaults. Both blacks and whites were incarcerated more for theft crimes, although theft crimes became less prominent and fraud more prominent among new entrants toward the end of the 19th century (Figure 2). That theft crimes did not increase during economic contractions nor decrease during expansions indicates occupation selection that coincided with economic transitions are not likely

cause for alarm. A concern about using prison data to reflect biological and occupational conditions in Texas is a potential selection bias where prison officials and executive officers targeted young blacks to satisfy physical requirements on work gangs. Like other state prisons, Texas leased out second grade criminals to railroads and other concerns that demanded large quantities of inexpensive, low-skill convict labor. However, no evidence has surfaced that indicates physical size was a requisite for incarceration (Walker, 1988). Table 2 also controls for stature and BMI by decade received, and neither were systematically related to the types of crimes committed, suggesting that stature and BMI variations primarily reflect biological conditions in Texas and not attributable to incarceration criterion.

To assess the representativeness of the prison sample, the Texas prison occupation distribution is compared to Texas census occupations. There were more white-collar, skilled and unskilled workers, and fewer farmers in prison than in the Texas population, indicating that while prisoners were drawn from lower classes, there were also more white-collar and skilled workers in the prison than the Texas population (Table 3). These striking occupational differences between blacks and whites were undoubtedly due, in part, to Southern institutional arrangements.

Table 3, Nineteenth Century Texas Occupation Distributions by Race

	1860	1870		1880		1900	
	White	Black	White	Black	White	Black	White
White-Collar	9.63	.80	11.37	1.69	8.74	2.30	11.36
Skilled	7.79	.80	21.73	2.15	7.27	1.30	9.46
Farmer	66.29	38.40	59.56	59.97	65.46	54.80	58.89
Unskilled	16.29	60.00	21.73	34.82	17.06	41.60	20.18
No Occupation	0	0	0	1.38	1.46	0	.11

Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. *Integrated Public Use Microdata Series: Version 3.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004.

3. Stature and BMI by Race

Black and White Statures in Texas

The use of height and BMIs is now a well accepted methodology within economics. A population's average stature reflects the cumulative net nutritional difference between calories required for work and to fend off disease, and modern blacks and whites come to comparable terminal statures when brought to maturity under optimal

environmental conditions (Eveleth and Tanner, 1976; Tanner, 1977; Steckel, 1995, p. 1910; Barondess, Nelson and Schlaen, 1997, p. 968; Komlos and Baur, 2004, pp. 64, 69; Nelson et al., 1993, pp. 18-20; Godoy et al, 2005, pp. 472-473; Margo and Steckel, 1982, p. 519). Because stature is sensitive to age, two groups are considered: youths and adults. Table 4 presents black and white stature regressions on age, birth and nativity variables, and Figure 3 presents black and white stature over time.

Table 4, Texas Statures by Race, Age, Birth Period, and Nativity

	Texas		*Blacks*		*Whites*	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Intercept	174.73	<.01	171.34	<.01	173.72	<.01
Age						
15	-8.19	<.01	-8.03	<.01	-9.54	<.01
16	-5.23	<.01	-5.45	<.01	-4.69	<.01
17	-2.86	<.01	-2.96	<.01	-2.62	<.01
18	-1.84	<.01	-1.92	<.01	-1.67	<.01
19	-.986	<.01	-1.02	<.01	-.867	<.01
20	-.091	.50	-.211	.21	.173	.45
21	.093	.50	-.032	.86	.326	.14
22	.241	<.10	.141	.39	.431	.05
23-55	Reference		Reference		Reference	
>55	-1.31	<.01	-.895	.01	-1.81	<.01
Race						
Black	-2.28	<.01				
White	Reference		Reference		Reference	
Birth Year						
1820	Reference		Reference		3.18	<.01
1830	-.413	.49	.268	.71	1.46	.13
1835	-.719	.19	-.628	.33	2.11	.02
1840	.095	.85	.877	.14	1.68	.02
1845	.247	.58	1.15	.04	1.56	.02
1850	.628	.17	1.93	<.01	1.37	.04
1855	.494	.28	1.81	<.01	1.21	.06
1860	.269	.56	1.34	.01	1.34	.04
1865	.115	.81	1.32	.02	.958	.14
1870	-.125	.78	.932	.09	.994	.13
1875	-.083	.86	1.03	.06	.896	.16
1880	-.414	.37	.764	.17	.467	.47
1885	.570	.22	.617	.27	.300	.64
1890	-.452	.33	.970	.08	.016	.98
1895	.028	.95	1.57	<.01	.111	.87
1900	.469	.42	2.18	<.01	Reference	
Nativity						
Northeast	-1.56	<.01	-.396	.62	-1.85	<.01
Middle Atlantic	-2.90	<.01	-1.69	<.01	-3.37	<.01
Great Lakes	-1.55	<.01	-.719	.08	-1.72	<.01
Plains	-1.02	<.01	-.556	.08	-1.16	<.01
Southeast	-.663	<.01	-.854	<.01	-.397	<.01
Southwest	Reference		Reference		Reference	

Far West	-1.67	<.01	-1.42	.10	-1.62	<.01
N	43,078		27,018		16,060	
R^2	.0630		.0447		.0450	
F	97.63		42.72		24.36	

Source: See Table 1

Figure 3, Average Texas Inmate Stature by Complexion
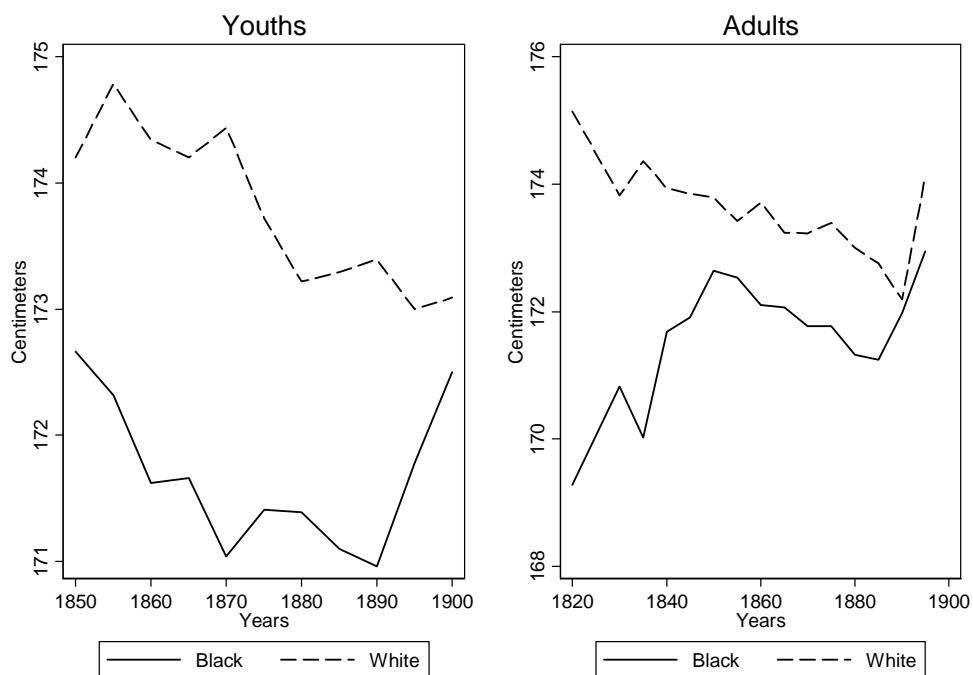
Note: Stature patterns determined using time coefficients in Tables 1 and 2. Youths are

22 years or younger.

Source: See Carson, Scott. 2008. Carson, Scott Alan. "African-American and White Inequality in the 19th

Century American South: A Biological Comparison," *Journal of Population Economics.*

Whites in the Texas prison reached taller terminal statures than blacks, and although blacks reached shorter terminal statures under slavery, black stature ironically increased relative to white stature throughout the antebellum period (Rees, Komlos, Long, Woitek, 2003, p. 22; Conrad and Meyer, 1964, p. 49; Carson, 2008). White stature remained approximately constant throughout the antebellum period but declined with the removal of slavery. Both blacks and whites born in the South came to taller statures than males born elsewhere in the US, which is surprising because migrants are typically taller than non-immigrants (Boaz, 1912; Sokoloff and Vilaflor, 1982). Although Southern wages were generally lower than Northern wages, West South Central unskilled wages were comparable to those in the middle Atlantic region. Moreover, limited skilled worker immigration into the West South Central created a relative scarcity of skilled labor, which may have increased Southwestern material and biological well-being (Rosenbloom, 2002, pp. 53, 124-125; Margo, 2000).

*Black and White BMIs in Texas*

BMI reflects the net current balance between nutrition, disease, work, and the physical environment (Fogel, 1994, p. 375), and Table 5 presents BMI relationships with demographic, year received cohorts, and nativity.

Table 5, Texas BMIs by Race, Age, Observation Period and Nativity

	Texas		*Blacks*		*Whites*	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Intercept	24.13	<.01	24.34	<.01	22.41	<.01
Age						
15	-2.44	<.01	-2.65	<.01	-1.46	<.01
16	-1.93	<.01	-2.14	<.01	-1.34	<.01
17	-1.37	<.01	-1.55	<.01	-1.06	<.01
18	-1.03	<.01	-1.24	<.01	-.652	<.01
19	-.844	<.01	-1.03	<.01	-.552	<.01
20	-.577	<.01	-.740	<.01	-.305	<.01
21	-.343	<.01	-.428	<.01	-.221	<.01
22	-.324	<.01	-.367	<.01	-.280	<.01
23-55	Reference		Reference		Reference	
>55	.162	.12	.030	.81	.323	.07
Race						
Black	Reference					
White	-1.40	<.01	Reference		Reference	
Year Received						
1870	Reference		Reference		Reference	
1880	-.273	<.01	-.373	<.01	-.139	.05
1890	-.146	<.01	-.260	<.01	.052	.44
1900	-.270	<.01	-.472	<.01	.064	.35
1910	-.162	<.01	-.412	<.01	.230	<.01
Nativity						
Northeast	.401	.02	.301	.39	.417	.04
Middle Atlantic	.274	<.01	.094	.50	.361	<.01
Great Lakes	.368	<.01	-.093	.59	.478	<.01
Plains	.314	<.01	.206	.12	.347	<.01
Southeast	.116	<.01	.134	<.01	.051	.25
Southwest	Reference		Reference		Reference	
Far West	.115	.37	.188	.49	.052	.71
N	73,078		27,018		16,060	
R^2	.0998		.0650		.0232	
F	202.84		105.19		19.58	

Source: See Table 1

Figure 4, Nineteenth Century Black and White Youth and Adult BMIs
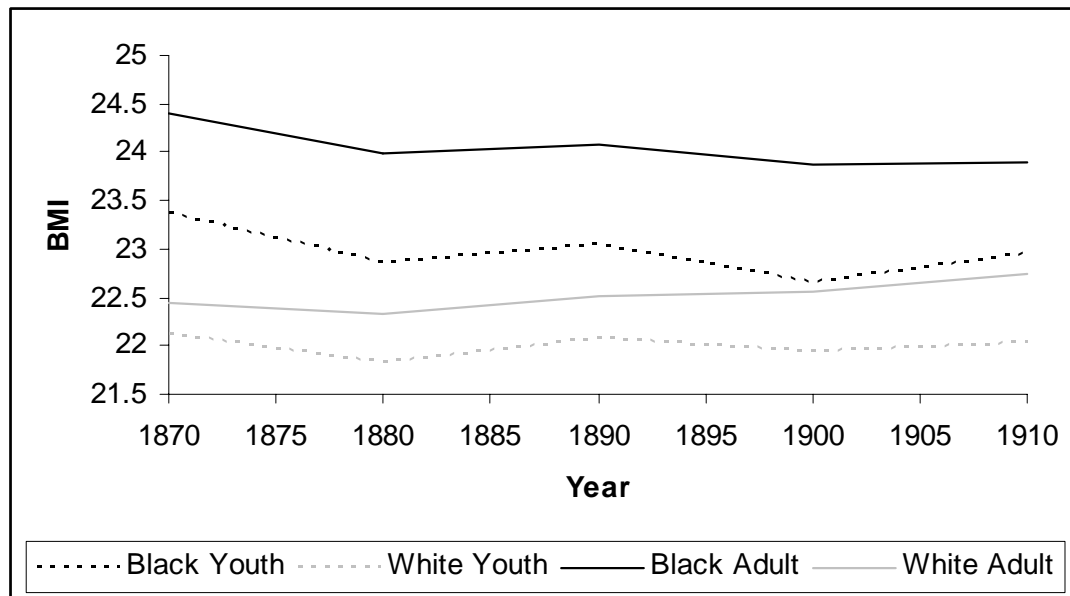
Source: See Table 5.While whites came to taller terminal statures than blacks, black

BMIs were heavier than white BMIs (Figure 4); black BMIs were heaviest during the

1870s, while white BMIs increased between 1870 and 1920. Leaner Southwestern black

BMIs are consistent with reduced access to occupational opportunities and renewed

violence against blacks in the Southwest (Wesley, 1927, pp. 135 and 236). However,

whites from the Southwest were also leaner than their northern-born counterparts, which

indicates that because Southwestern blacks and whites were more fully integrated into

economic and social networks, they were more physical active. Consequently,

throughout the second half of the 19th century, Texas blacks became shorter and thinner,

while whites became shorter and heavier (Fogel, 1994, p. 372).

4. Texas Occupation Selection, 1873-1919

Health is a critical component of workers' occupation selection and employment. For example, taller workers may have selected into agricultural occupations because taller statures were required to complete physically arduous tasks. Shorter workers may have selected into white-collar and skilled occupations because they were relatively less successful in agricultural labor markets and found employment in skilled occupations. Age is also related to the types of jobs workers selected. In general, younger workers lack labor market experience necessary to advance into white-collar and skilled positions. In particular, young black inmates also faced the difficult task of accumulating skills in a labor market with various degrees of racial prejudice, which limited black occupation mobility, regardless of age. Because stature and BMI are determined endogenously and because age and birth year influence stature, BMI and occupation selection, a two step occupation selection model is constructed. First, stature and BMI are determined endogenously from Tables 4 and 5; these predicted values are then used as stature and BMI instruments in Table 6. F-statistics demonstrate these stature and BMI instruments are relevant.

Table 6, Texas Occupation Selection and Labor Force non-participation, Combined

Sample

	White-Collar $\frac{dF}{dx}$	p-value	Skilled $\frac{dF}{dx}$	p-value	Farmers $\frac{dF}{dx}$	p-value	Unskilled $\frac{dF}{dx}$	p-value	Labor Force non-Participation $\frac{dF}{dx}$	p-value
Intercept										
Age	.004	<.01	.003	<.01	-.002	.12	-.008	<.01	-2.0^{-4}	.96
Age^2	-4.9^{-4}	<.01	$-.3.^{-4}$	<.01	4.4^{-4}	<.01	5.8^{-4}	<.01	-1.21	.84
Ethnicity										
Black	-.124	<.01	-.081	<.01	.010	.56	.205	<.01	-.015	.07
White	Ref.		Ref.		Ref.		Ref.		Ref.	
Body Type										
Centimeters	-.005	<.01	.002	.30	.009	<.01	-.005	.26	-1.9^{-3}	.87
BMI	.019	<.01	.006	.23	-.015	.07	-.004	.73	-7.6^{-4}	.98
Year Received										
1870	Ref.		Ref.		Ref.		Ref.		Ref.	
1880	.037	<.01	.008	.06	.394	<.01	-.210	<.01	-.005	.08
1890	.048	<.01	.001	.74	.431	<.01	-.246	<.01	-.007	<.01
1900	.061	<.01	.013	<.01	.487	<.01	-.308	<.01	-.009	<.01
1910	.076	<.01	.063	<.01	.529	<.01	-.473	<.01	.041	<.01
Nativity										
Northeast	.095	<.01	.086	<.01	-.120	<.01	-.149	<.01	.025	.03
Middle Atlantic	.061	<.01	.082	<.01	-.100	<.01	-.115	<.01	.011	.10
Great Lakes	.028	<.01	.059	<.01	-.082	<.01	-.049	<.01	.013	.02
Plains	.013	.03	.019	<.01	-.055	<.01	.019	.18	.006	.15
Southeast	.009	<.01	.019	<.01	-.018	<.01	-.004	.57	-.002	.36
Southwest	Ref.		Ref.		Ref.		Ref.		Ref.	
Far West	.032	<.01	.072	<.01	-.097	<.01	.017	.55	-.013	.07
N	43,078		43,078		43,078		43,078		43,078	
R^2	.1166		.1232		.0649		.1098		.0821	

Source: See Table 1

Notes: The dependent binary occupation variable is assigned a 1 if they were listed as

white-collar, skilled, farmers and unskilled laborers. The dependant variable non-

participation is assigned a 1 if the individual's occupation was recorded as 'none' or 'no occupation'. In the few cases where occupations were left blank, the observation was recorded as an unskilled laborer. Stature and BMI predicted instruments are from Tables 4 and 5, Texas Model.

For both blacks and whites, relationships between body dimensions, race and occupation selection patterns are consistent with expectations. White-collar, skilled and agricultural occupations required greater experience, which accrued with age. However, unskilled workers were more common at both younger and older ages, indicating that skills in 19th century Southern labor markets required time to acquire, and older workers moved into unskilled occupations at older ages. Figure 5 partitions the Texas sample by race and presents Kaplan-Meier estimates for white-collar, skilled, agricultural and unskilled occupations by age. Blacks, regardless of age, predictably did not become white-collar or skilled workers. The likelihood that blacks and whites were farmers were similar by age, and blacks were more likely than whites to assume and remain in unskilled occupations. Consistent with Ransom and Sutch (1986), whites in the Texas prison were more likely than blacks to move into agricultural and unskilled labor in their older ages.

Figure 5, Survival Analysis for Occupation by Age and Race

Source: see Table 1.

Note: Estimates are Kaplan-Meier graphs by race, and show the age that workers became white-collar, skilled, agricultural and unskilled workers.

Table 7, Texas White Marginal Probabilities

	White-Collar $\frac{dF}{dx}$	p-value	Skilled $\frac{dF}{dx}$	p-value	Farmers $\frac{dF}{dx}$	p-value	Unskilled $\frac{dF}{dx}$	p-value	Labor Force non-Participation $\frac{dF}{dx}$	p-value
Intercept										
Age	.013	<.01	.009	<.01	-.006	<.01	-.017	<.01	4.8^{-3}	.61
Age^2	-1.5^{-3}	<.01	-1.0^{-3}	<.01	1.0^{-3}	<.01	1.5	<.01	-4.5^{-6}	.71
Body Type										
Centimeters	-.008	.06	-.007	.10	.009	.04	.005	.48	.001	.69
BMI	.044	<.01	.040	.03	-.018	.31	-.039	.17	-.009	.37
Year Received										
1870	Ref.		Ref.		Ref.		Ref.		Ref.	
1880	.043	<.01	.012	.28	.422	<.01	-.192	<.01	4.9^{-3}	.94
1890	.091	<.01	.006	.58	.426	<.01	-.247	<.01	.002	.75
1900	.116	<.01	.032	<.01	.546	<.01	-.369	<.01	.003	.64
1910	.141	<.01	.098	<.01	.530	<.01	-.480	<.01	.049	<.01
Nativity										
Northeast	.138	<.01	.127	<.01	-.124	<.01	-.168	<.01	.042	.05
Middle Atlantic	.092	<.01	.089	<.01	-.110	<.01	-.118	<.01	.028	.09
Great Lakes	.035	.05	.065	<.01	-.082	<.01	-.042	.15	.026	.03
Plains	.008	.56	.011	.47	-.055	<.01	.041	.08	.011	.22
Southeast	.024	<.01	.033	<.01	-.011	.07	-.034	<.01	-.004	.30
Southwest	Ref.		Ref.		Ref.		Ref.		Ref.	
Far West	.056	.02	.080	<.01	-.096	<.01	.025	.52	-.022	.11
N	16,060		16,060		16,060		16,060		16,060	
R^2	.061		.0472		.0818		.0892		.0293	

Source: See Table 1.

Notes: See Table 6.

Table 8, Black Marginal Probabilities

	White-Collar $\frac{dF}{dx}$	p-value	Skilled $\frac{dF}{dx}$	p-value	Farmers $\frac{dF}{dx}$	p-value	Unskilled $\frac{dF}{dx}$	p-value	Labor Force non-Participation $\frac{dF}{dx}$	p-value
Intercept										
Age	.001	.09	.001	.01	.001	.35	-.004	.03	-5.3^{-3}	.23
Age^2	-9.3	.23	-1.1^{-4}	.13	1.1^{-4}	.49	7.3^{-3}	.74	4.1	.46
Body Type										
Centimeters	2.5^{-3}	.85	.003	.02	.010	<.01	-.013	<.01	-4.4	.60
BMI	.005	.20	.002	.69	-.018	.03	.013	.22	.002	.39
Year Received										
1870	Ref.		Ref.		Ref.		Ref.		Ref.	
1880	.025	<.01	.005	.22	.373	<.01	-.189	<.01	-.005	.02
1890	.023	<.01	-.005	.19	.432	<.01	-.217	<.01	-.009	<.01
1900	.025	<.01	-.003	.49	.440	<.01	-.222	<.01	-.013	<.01
1910	.031	<.01	.034	<.01	.524	<.01	-.416	<.01	.033	<.01
Nativity										
Northeast	.135	<.01	9.3^{-4}	.99			-.058	.42	.022	.20
Middle Atlantic	.093	<.01	.037	<.01	-.080	<.01	-.061	.03	-5.4^{-3}	.93
Great Lakes	.079	<.01	.045	<.01	-.083	<.01	-.038	.17	.007	.27
Plains	.044	<.01	.020	.01	-.053	<.01	-.012	.58	.005	.33
Southeast	.007	.02	.011	<.01	-.025	<.01			-.002	.41
Southwest	Ref.		Ref.		Ref.		Ref.		Ref.	
Far West	.046	.04	.114	<.01	-.109	<.01	8.2^{-3}	.99	-.007	.43
N	27,018		27,018		27,018		27,018			
R^2	.0368		.0629		.0573		.0610			

Source: See Table 1

Notes: See Table 6

White-collar workers were typically shorter and heavier, while farmers were taller and thinner. White-collar occupations had sedentary energy requirements, requiring only 1.5 to 2.5 energy units as a multiple of basal metabolic rate. On the other hand, active agricultural workers required between 2.9 and 6.8 energy multiple units of basal metabolic rate (Fogel, 1997, p. 448; FAO/WHO, 1985), indicating that white-collar workers simply put on excess weight in sedentary clerical occupations, while farmers' easier access to nutrition and calories were offset by vigorous physical activity. Skilled and unskilled occupation selection was independent of body dimensions. Skilled workers were a heterogeneous group, which included a broad continuum of occupations, such as physically active blacksmiths, and carpenters, however were offset by other sedentary skilled occupations, such as shoemakers, tailors and weavers, muting the relationship between stature, BMI and skilled occupations. Unskilled occupations were another heterogeneous occupational category and included a broad occupation continuum—such as physically active common and farm laborers—which required more energy units, but also included more sedentary occupations—such as carriage and automobile drivers. Nevertheless, the overall relationship is clear. Homogeneous white-collar and agricultural occupations conform to expectations and white-collar sedentary occupations were conducive to excess weight gain, while physically active farmers' regimens prevented excess weight gain. Heterogeneous skilled and unskilled occupation relationships with biological markers were less pronounced, and the effects of active and sedentary occupations within skilled and unskilled occupations offset each other.

The relationship between occupation selection and observation period indicates that over time Texas white-collar, skilled and agricultural workers became more

prominent while unskilled laborers less prominent and reflects overall increased skill levels in Texas (Table 3) and US labor markets (Rosenbloom, 2002, p. 88, Table 4.1). However, increased access to white-collar and skilled occupations did not accrue equally between blacks and whites (Tables 7 and 8). In 1880, whites were nearly twice as likely as blacks to be white-collar workers. By 1910, whites were nearly five times as likely as blacks to be white-collar workers (Maloney, 2002). Blacks were excluded from training and apprenticeship systems that facilitated their upward mobility. White skilled workers also caused work stoppages with strikes when employers attempted to employ black workers in skilled positions (Wesley, 1927, pp. 236-237. Alternatively, between 1880 and 1920, the likelihood blacks were farmers was comparable to whites, while blacks and whites were less likely to become unskilled workers.

The relationship between nativity and occupation is also consistent with the state of 19th century regional economic development. Southern-born white-collar and skilled workers were less prominent and agricultural and unskilled workers more prominent than workers born elsewhere within the US. Blacks from the Great Lakes and Plains found greater access to white-collar and skilled positions in Texas compared to Southwesterners (Tables 7 and 8). This result is difficult to interpret. Either blacks from Great Lakes and Plains states found greater access to white-collar and skilled occupations because they acquired skills before they migrated, or white-collar and skilled blacks from the Great Lakes and Plains states migrated to Texas to commit crimes in Texas, such as fraud, only later to be apprehended and incarcerated. Wesley (1927, p. 300) indicates black skilled laborers became increasingly common in Middle Atlantic and Plain States, suggesting that blacks who migrated to Texas probably acquired skills prior to migration.

Southwestern black and white workers were most likely to be farmers and unskilled

workers. During the late 19th century, many Southern black and white farmers

encountered droughts, floods, insect infestation, neglect and ignorance failed as farmers

and may have turned to crime (Wesley, 1927, p. 146; Maloney. 2002).

5. Texas Labor Force Participation, 1873-1919

The 19th century Texas sample also allows consideration of the relationship

between Southern worker's health and labor force participation decisions, which has been

considered in other historical populations. For example, Fogel (1994, p. 370) indicates

that 10 percent of 18th century French and 3 percent of 18th century British workers were

too emaciated to be meaningfully considered part of the labor force. Although not a

direct measure for emaciation, unemployment by race in Texas was low: 2.12 percent of

blacks and 3.85 percent of whites were enumerated as not having an occupation. If

workers did not have an occupation, enumerators simply recorded 'none' in the

occupation category, and only these workers are considered as not participating in the

Texas labor force.[8]

To illustrate the relationship between health and labor force participation, Table 6

regresses a binary labor force non-participation variable on Texas demographic, stature,

BMI, period received and nativity. Unlike other historical labor studies, age, stature and

BMI in the Texas prison were not related to workers' labor force participation decisions

(Costa, 1998, p. 75-78; Kanjanapipatkul, 2003, pp. 235-243), and these inmates worked

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[8] In some cases, 'na' or categories were simply left blank. However, these were few, and only inmates with an occupation listed as 'none' are considered here to eliminated the misrecording of no occupation when the inmate had an occupation, but it was recorded improperly. However, these were infrequent, and most workers were recorded with an occupation.

of age and body size. Labor force participation decisions were related to the state of the

Texas labor market, and toward the end of the 19th and early 20th centuries, individuals

were increasingly more likely to be listed without an occupation. The 1910s brought

considerable displacement to US border economies, with large influxes of Mexican labor

into the Texas labor market (McWilliams, 1968, pp. 162-164, 167-169, 175; Gamio,

1969, p. 47). Consequently, inmates in the Texas sample were less likely to be active

labor-market participants between 1900 and 1910. Individuals native to the South were

also most likely to participate in the Texas labor force, in part, because they had greater

familiarity with local labor markets and were integrated into employment information

systems that facilitated their employment in Texas labor markets (Rosenbloom, 2004).

6. Summary

Prison records are a valuable source to illustrate the historical relationship

between biological markers and labor market outcomes. Nonetheless, the source of these

records cannot be ignored. These individuals were healthy enough to commit crimes, but

sufficiently lacking in material wealth to resort to criminal behavior, which may limit

inferences to the larger 19th century Southwestern population. While stature and BMIs

were significant in Texas occupation selection, they were not significant in Texas labor

force participation decisions, and black and white workers worked out of necessity.

Black statures were shorter and BMIs heavier than whites, but blacks were less likely to

fill sedentary white-collar occupations, where excess weight gain occurred. No evidence

was found that African-American lack of access to white-collar or skilled occupations

were related to physical dimensions. On the other hand, farmers were more physically

active, and before Texas' agriculture mechanized, farmers exerted more energy and remained thinner.

Occupation selection and race are consistent with 19th century social and economic institutions, and blacks were significantly less likely than whites to be white-collar and skilled workers. Agriculture was the great leveler, and blacks were just as likely as whites to be Texas farmers and unskilled workers, reflecting the racially polarized Texas labor market, where blacks were segregated into low skilled occupations and whites filled white-collar and skilled occupations. These striking occupational differences between blacks and whites were undoubtedly due, in part, to Southern institutional arrangements. Under slavery, blacks were trained in plantation skills, and did not choose the occupations they desired (Ransom and Sutch 1977, p. 17; David and Temin, 1976, p. 45-46). After slavery, blacks could not acquire the skills they desired because they were denied access to the education and training to facilitate their upward occupational mobility into white-collar and skilled occupations (Carrington, 1975, pp. 19-25; Wesley, 1927, pp. 236-237).[9] Moreover, blacks faced rigid hiring processes after

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[9] Ransom and Sutch. *One Kind of Freedom*, pp. 28-30, 177-179; In the face of postbellum Reconstruction, blacks demonstrated remarkable resilience to acquire what had so long been denied them. Marable, , "Politics of Black Land Tenure," p. 140, suggests that by 1910 blacks had succeeded to a limited degree to attain economic advancement. Despite exclusion from general human capital accumulation acquired in more traditional educational institutions, blacks banded together to establish institutions where they could acquire market specific skills. Examples include the Agricultural and Mechanical College for Negroes, the Utica Institute and Booker T. Washington's Tuskegee Institute, pp. 145-147. Southern blacks also attempted black owned banks, 144-145. Unfortunately, these extraordinary examples of black progress during Reconstruction did little to influence black biological living conditions at the lower ordinal ranks of late 19th century southern society.

slavery was abolished and were unlikely to be hired into skilled positions.[10]

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[10] Maloney, "Degrees of Inequality" and "African Americans in the 20th Century"; Fite, "The Agricultural Trap in the South," p. 46, suggests that there were insufficient non-farm occupations to absorb the surplus of southern farm labor hours that resulted from emancipation. Moreover, blacks faced more rigid hiring opportunities because the available factory jobs that were available were restricted to whites, p. 46.

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