

# Were Black Workers Harmed by Industrial Segregation? The Case of Pennsylvania, 1916-1950

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## I. Industrial Segregation

The income differential that has existed between black and white workers over the course of the past century has been well-documented. This differential may have been caused by factors on the supply-side or demand-side of the employment contract. Some of the theoretically possible demand-side causes of the black-white income differential are blacks and whites being paid differently when performing a given job, differences in employment opportunities by occupation, and/or differences in employment opportunities by industry. The relative contributions of the possible causes of the differential remain under close scrutiny. This paper explores the degree to which black workers were crowded into specific industries and the effect that this industrial segregation had on the economic welfare of black labor.

It is argued that industrial segregation was the result of a path dependent process where the initial employment opportunities of black Americans adversely impacted their future employment opportunities. Unlike other theories of discrimination, it is argued that

this inefficient path dependent equilibrium was able to persist unchecked by competitive market forces. The actual impact of industrial segregation on black labor, especially in the North, is largely an empirical question. Margo (1990) and Wright (1986) found evidence that this segregation existed in the South and that it took a negative toll on the incomes of black workers. Whatley (1990) found evidence that statistical discrimination existed during World War I in northern industry, and hypothesized that it may have led to industrial segregation. In this paper a newly developed data set is used to study the patterns of industrial segregation in Pennsylvania and how they influenced the incomes of black, whites, and foreign born workers. This annual panel presents a unique opportunity to explore how black workers were integrated into northern industries during the Great Migration of World War I when many northern employers were having their first experiences with black labor. The inter-war period for which the data set spans presents an opportunity to explore how the segregation changed through time as the nation experience significant business cycle activity and institutional change. The significant changes in the nature and extent of unionization between 1916 and 1950 on black industrial segregation are also explored.

Dual labor market theories provide a theoretical basis for the potential harm caused by industrial segregation. Dual labor market theory suggests the presence of two distinct labor markets, one where wages are low and returns to schooling and experience do not exist, and one in which wages are high and returns to schooling and experience do exist. Studies testing the dual labor market theory have argued that jobs in the high wage primary sector are often rationed in such a way that minority workers are segregated into the low wage secondary market and thus prevented from obtaining employment in the

primary sector (Dickens and Lang 1985 and 1988). Relevant to the framing of policy is the fact that the dual labor market theory is consistent with two significantly different notions of discrimination-industrial segregation and occupational segregation. The secondary market in which minority workers were segregated into may consist of secondary occupations, secondary industries, or both. Some scholars have suggested that industrial segregation has had a significantly negative impact on black workers ( Margo 1990, Whatley 1990, and Wright 1986). The fact that occupational segregation and industrial segregation imply different policy measures suggests the importance of assessing the true nature of segregation. By assessing the degree to which industrial segregation existed and its impact on black labor, this paper maps out much of the complicated contours of employment segregation.

Complimentary to this research is the literature on inter-industry wage differentials. This literature has found evidence that industries can be divided into two major groups consistent with a primary sector and a secondary sector. “At one end of the spectrum are industries which pay high wages, have substantial market power, tend to be made up of large firms with large establishments, have a higher union density, and have high capital-to-labor ratios and employ fewer women. At the other end are those with the opposite characteristics” (Dickens and Katz 1987). The inter-industry wage differentials explain a significant portion of the variance in log wages across workers and can lead to differentials between observationally similar workers (Dickens and Katz 1987 and Gibbons and Katz 1992). If black workers were systematically segregated into secondary low wage industries, this could have had a significant negative impact on their economic welfare.

The case of Pennsylvania from 1916 to 1950 is an ideal setting for exploring industrial segregation. In Pennsylvania during World War I, the Great Migration brought large numbers of black workers into its urban centers. From 1910 to 1920, 69,816 blacks migrated to Pennsylvania, a 72 percent increase in the Pennsylvania black population (U.S. Dept of Commerce 1935). During this period many northern employers, especially in manufacturing industries, were having their first experiences with black labor (Whately 1990). Between 1920 and 1930 black immigration increased Pennsylvania's black population by another 59 percent. In 1930 Pennsylvania had the largest black population of any of the northern states. By analyzing industrial segregation during the inter-war period, this study is able to explore the degree to which the distribution of black workers across industries differed from that of whites initially, and how the segregation changed through time.

Scholars studying dual labor market theory and those who focus on industrial segregation have emphasized that the segregation divided the market in such a way that black and white workers were no longer competing for the same jobs. Historically, craft unions were notorious for their racially exclusive policies. This paper presents evidence that unionization was a significant force leading to industrial segregation. However, competitive market forces between competing unions led to the extension of union coverage to many largely black industries during the late 1930s and early 1940s. The impact of this segregation was mitigated to some degree by market forces. Further, the extent to which the distribution of black workers differed from that of white workers decreased with time.

The research presented in this paper also illustrates another way in which market forces significantly affected the shape of industrial segregation. During the Great Migration of World War I, and during other periods of economic growth, it was the fast growing industries that primarily hired black labor. During periods of recession these same industries were also most likely to significantly reduce the size of their work force. The fact that black labor disproportionately found employment in cyclical industries not only helps explain their distribution across industry, but also helps explain why black workers suffered disproportionately high rates of unemployment during economic downturns. Differences in how black and white workers were distributed across industry in 1929 explain about 50 percent of the racial differential in the employment downturn of the Great Depression.

By learning how black workers were distributed across industry relative to white and foreign workers, and by exploring the characteristics of the industries that primarily employed black workers, it is possible to learn much of the possible impact that industrial segregation had on black workers. The results of this study imply that industrial segregation in Pennsylvania manufacturing, construction, and mining industries did not negatively impact black workers in terms of wages. The industries in which black workers were employed by did not have disproportionately low wages, they did not have a low capital-to-labor ratio, and were not disproportionately dangerous. The results of individual worker log wage regressions actually imply that black worker's wages would be lower than what they were if black workers were distributed across industries like white workers, all else held constant. However, there is some evidence that black workers were more likely to be found in industries with greater cyclical swings in

employment, which would subject them to greater possibilities of experiencing layoffs and unemployment. If the industrial distribution of black labor actually helped them in terms of wages earned, this leaves a large portion of the black-white income differential to be explained by occupational segregation and differences in human capital.

## **II. The Theory and Literature of Industrial Segregation**

Dickens and Lang (1985) found evidence of a dual labor market consisting of a primary and secondary sector. In the primary market returns to schooling and experience were in accord with that predicted by neo-classical human capital theory. In the secondary sector returns to schooling and experience did not exist. Dickens and Lang argued that the jobs in the primary sector were often rationed in such a way that minority workers were consigned to employment in the secondary sector when they would rather find employment in the primary sector. In their study Dickens and Lang used the “job” as the unit of analysis. For this reason their study did not differentiate the degree to which the rationing was consistent with occupational segregation and the degree to which it was consistent with industrial segregation. Though the establishment of the fact that the segregation of black labor into a secondary sector is significant for policy, before specific policy measures can be confidently pursued more must be learned about the specific nature of this segregation.

Studies conducted by Margo (1990) and Wright (1986) found evidence that both occupational segregation and industrial segregation existed in the postbellum South. Margo found that much of the segregation could be explained by a racial differential in the quality and quantity of schooling in the South. However, after differences in the quality and quantity of southern schooling by race was accounted for, he found an

unexplained difference in the way in which black and white workers were distributed across industries and occupations.

Wright (1986) found evidence of a dual labor market in the South that made black and white workers non-competing actors in the market. This division was along industry lines and had a significant negative impact on southern blacks over time. He found that the industrial segregation in the South eventually led to wage differentials between black and white workers. The southern textile mills employed mostly whites while the tobacco industry employed many blacks; yet the unskilled workers in both industries were paid virtually the same wage. According to Wright, neither a difference in the geographical distribution of the two groups, nor differentials in education levels that existed, could explain the industrial segregation in the South. The hiring practices of the southern industries followed trends that were set by antebellum employment practices. Slaves were often employed in the tobacco and steel industries, while white mill villages formed around the textile industry before the war. After emancipation, blacks were not hired in virtually all-white industries, but were trapped doing the jobs they did before the war. Wright argued that at first this industrial segregation was not very pernicious, but over time it led to vertical segregation and eventually led to wage differentials between whites and blacks employed doing the same jobs. A close analogy, as pointed out by Wright, is the path-dependent outcome of the wide spread use of the QWERTY keyboard. In both cases, it is argued that the initial choices impacted future decisions in such a way that an inefficient equilibrium resulted. Also in both cases, market forces did not prevent the inefficient path-dependent equilibrium from occurring (Wright 1986).

The literature focusing on the existence of inter-industry wage differentials has illustrated the degree to which the employment experience of individuals can differ significantly across industries. Inter-industry wage differentials exist after controlling for individual worker characteristics such as education, experience, occupation, sex, race, age and other factors common in wage regressions. All occupations in a relatively “high wage industry” draw higher wages than similar occupations in other industries. This implies that if a given worker performing a given task in a “high wage industry” were to seek employment in a “low wage industry”, performing the same task, the worker would take a wage cut (Krueger and Summers 1988). After factoring in fringe benefits the inter-industry wage spread is increased. The inter-industry differentials even exist within the union or non-union sector (Dickens and Katz 1987). The causes of the differentials are still a subject of controversy among economists.

Using data from the Current Population Survey from 1983 Dickens and Katz (1987) found that industry fixed effects explain about 7 to 30 percent of the wage variation for nonunion employees and 10 to 29 percent of the wage variation for unionized workers. The authors did this by running three log wage regressions for both the unionized sector and the nonunion sector. Two of the regressions contained covariates<sup>1</sup> common in log wage regressions, one with industry fixed effects and one without. Due to a certain degree of collinearity between the covariates and the industry fixed effects, the difference between the  $R^2$ s for the two regressions gives a lower bound on the variance in log wages explained by the industry effects. The  $R^2$  from a regression

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<sup>1</sup> “The covariates are education (years of schooling) and its square; experience (age minus education minus 6) and its square; 50 state and 11 occupation dummy variables; dummy variables for marital status, race, sex, part-time work and whether or not the individual lives in an SMSA; and interaction terms for both experience and experience squared with all the other variables except the state and occupation dummies



of log wages on just the industry fixed effects gives an upper bound. If the fixed effects and the covariates were orthogonal to each other, a perfect decomposition of the variance in log wages explained by the industry fixed effects could be obtained. Following the pattern set by Dickens and Katz log wage regressions using data on Pennsylvania workers from the 1940 Individual Public Use Microdata Series (IPUMS) with 120 industry effects were run<sup>2</sup> (Ruggles 1997). The wage regressions attributed between 4 and 18 percent of the variance in log wages across Pennsylvania workers to the industry effects. Log wage regressions focusing on 60 manufacturing, mining, and construction industries, yielded that between 6 and 15 percent of the variance in log wages can be explained by the industry effects. One would expect the regressions ran by Dickens and Katz (1987) to yield more precise estimates due to a larger sample, better covariates, and about 100 more industry fixed effects.

Higgs (1977, 1989 and Margo 1995) and others have shown, analyzing contract and firm specific data, that blacks and whites employed doing a given job in a given firm were generally paid the same wage. However, if blacks were systematically segregated into low wage industries, wage differentials between otherwise comparable workers would emerge, even if we accept the premise that intra-firm black-white wage differentials did not exist. Since as much as 15 to 30 percent of the variance in log wages between workers can be explained by industry fixed effects, if industrial segregation existed, it could have had a significant impact on black worker's economic welfare. Collins (2001) found that black workers who had been employed by World War II

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and education squared. Industry refers to 3-digit 1980 Census of Population code industry dummies (Dickens and Katz 1987).

defense industries and were still employed by these industries in 1950, earned about a 14 percent premium over observationally similar black workers not employed in these high-wage defense industries.

Whatley (1990) found evidence of statistical discrimination where employers judged the individual black worker by the perceived productivity of the average black worker, and made hiring decisions accordingly. It is common in the historical literature to find anecdotal evidence of employers making decisions on how to utilize minority workers based on ethnic stereotypes. In Pennsylvania in the late 1800s the trade journals of the steel industry published recommendations of how to employ black labor after some firms experimented with black strike breakers (Dickerson 1986). Stanford Jacoby characterized the racial stereotypes that guided employers in their hiring decisions as follows: “The Irish and Germans were considered good skilled workers, while the Poles and ‘Hunkies’ were thought to be suited for heavy labor. Jews were said to be dexterous, Rumanians dishonest, Slovaks stupid, and Italians ‘so susceptible to the opposite sex that they could not be satisfactorily employed” (Jacoby 1985).

Whatley (1990) found evidence that employers that experimented by hiring black workers learned more about their productivity, and were subsequently much more likely to hire black workers in the future than firms which had not hired black workers.

Whatley characterized this result as a necessary but not sufficient condition for the existence of long-run path dependent industrial segregation that would negatively impact black labor. The employers that had hired black workers did so because they thought them to have a comparative advantage in hot and heavy work. This provided black

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<sup>2</sup> The covariates for the log wage regressions with the 1940 IPUMS data were: 9 education dummies; age and its square; 8 occupation dummies; and dummies for race, sex, and marital status. The regressions only

workers with an opportunity to prove themselves as good workers in hot and heavy work, but limited the probability that the black workers would prove themselves just as capable at alternative jobs. An employer that successfully employed black workers in hot heavy work and never attempted to employ black workers in skilled occupations may have felt that his priors had been ratified by experience. Thus the initial statistical discrimination could have led to occupational or industrial segregation. If industrial segregation was the result this type of path dependent process, empirically, one would expect to observe black industrial employment being highly correlated with industries containing a high proportion of labor intensive and relatively dangerous occupations.

Another possible demand-side source of industrial segregation was unionization. In many cases craft unions stood to benefit significantly from excluding black labor from among their ranks. By controlling a craft the union could limit the potential competition from black labor, decreasing the elasticity of demand for union labor services and thus making unions more successful. On the other hand employers often saw the employment of black workers as a weapon that could be wielded against racial exclusive unions (Murray 1942). In Pennsylvania during the strikes of 1919 many steel companies used blacks as strike breakers replacing unionized whites. For many of the firms, union strength was weakened significantly enough by the employment of black labor that union strength did not recover again until the Congress of Industrial Organization campaigns of the late 1930s (Dickerson 1986). If racially exclusive unions were a source of industrial segregation one would expect to find black employment negatively associated with industry union density.

Tight labor markets during the World War I Great Migration and World War II provided opportunities for black workers to progress economically. Many employers faced with the costs of labor shortages found it in their interests to integrate their work forces for the first time. Though usually associated with minority progress, tight labor markets might have also been a source of segregation. During the Great Migration and other times of economic boom it was the fast growing industries fueled by the boom that hired the majority of new black laborers. Industries benefiting less from the boom would have to displace white workers in order to hire blacks at the rate of a growing industry. If this were a source of the black-white industry distribution differential one would expect to find black employment associated with disproportionately cyclical industries.

### **III. The Data**

Since this study uses a 35 year annual panel it is able to assess the degree to which any northern industrial segregation existed in the long run and how it changed through time. It also employs data on substantially more industrial classifications than have been used in previous studies. The primary source of data for this paper is a newly compiled data set obtained from the “Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania” for the years 1916 to 1950. The data includes the number of white, black, and foreign wage earners, the number of salaried workers, the total wages paid, and the total salaries paid for at least 315 industry classifications. The wage and salary information is broken down by sex. The data set also includes information on the number of minors employed, capital invested, value of manufacture, and the number of establishments for each of the industry classifications. The annual data for these industrial classifications have been matched up

over time so that an unbalanced panel has been formed. Also employed is an annual industry level panel of national union densities obtained from the data of Wolman (1936) and Troy (1965). The 1940 Individual Public Use Microdata Series (IPUMS) was also used for individual wage regressions (Ruggles 1997).

#### **IV. The Extent of Segregation**

Margo (1990) found evidence that both supply-side and demand-side factors led to a distribution of workers across industries which differed by race. Since both demand-side and supply-side factors can contribute to a black-white distribution differential, racial differences in how black and white workers were distributed across industry is only a necessary condition for the existence of demand-side induced industrial segregation. This section identifies the degree to which industrial distributions differed by race, and the degree to which any initially existing industrial segregation led to a long-run relatively unchanging trend like that found to exist in the South by Wright (1986). One measure of the degree to which industrial segregation existed is a Duncan Dissimilarity Index, which is:

$$DDI = (\sum |b\_share_i - w\_share_i| / 2) \times 100$$

where  $b\_share_i$  is industry  $i$ 's share of the employed black labor force and  $w\_share_i$  is industry  $i$ 's share of the employed white labor force. If there was complete integration, the segregation index would equal 0, and complete segregation would yield a value of 100 (Margo 1990). One problem with this index as pointed out by Margo is that, given a particular level of segregation, as the number of industries are increased, the index takes on larger values implying a greater degree of segregation.

The table below contains the Duncan Dissimilarity index for black and foreign workers. The number of industry categories that were reported in the data set changed with time so the numbers of industry categories were also given. From 1922 to 1930 the index was relatively constant, fluctuating between 48 and 51.7. After 1930 the general trend appears to be that the degree of segregation was decreasing. This result is relatively robust given the fact that the index was decreasing even though the number of industry categories was increasing.

**Table 1.**

Year	Duncan Dissimilarity Index		% of Industries Which Hired No Black Workers	Number of Industries
	Black	Foreign		
1916	51.7	39.1	19.3%	326
1917	51.1	41.9	17.2%	331
1918	49.4	39.6	16.3%	331
1919	48.4	41.7	14.6%	335
1920	48.9	41.4	13.2%	341
1921	47.0	45.2	16.9%	338
1922	48.0	43.6	15.4%	305
1923	49.0	43.4	14.7%	306
1924	51.7	45.0	14.8%	304
1925	49.6	44.1	14.9%	303
1926	50.0	44.9	14.0%	301
1927	50.4	46.2	14.8%	318
1928	50.5	45.9	14.4%	312
1929	49.9	45.4	13.1%	312
1930	50.4	47.0	13.4%	313
1931	49.3	48.3	15.3%	313
1932	49.4	48.3	16.3%	313
1933	50.3	48.9	16.6%	314
1934	48.3	47.4	17.8%	315
1935	48.6	48.9	17.6%	318
1936	47.9	47.0	17.1%	316
1937	47.3	47.7	16.8%	315
1938	47.2	49.5	16.8%	316
1939	46.1	48.0	16.5%	315
1940	43.2	52.5	16.1%	317
1941	43.4	54.1	14.8%	318
1942	40.0	48.5	12.8%	313
1943	41.1	44.9	10.9%	312
1944	40.2	44.3	9.6%	311
1945	36.7	44.6	10.3%	311
1946	37.8	44.9	9.9%	313
1947	38.3	44.6	8.7%	311
1948	38.4	43.5	9.0%	311
1949	36.3	41.8	8.6%	313
1950	36.1	38.1	8.9%	313
<b>Mean</b>	46.1	45.4		
<b>Varian</b>	25.4	12.2		

The data are from the "Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania" for the years 1916 to 1950.

Table 1 also contains the percent of industries that hired no black workers. In 1916 the percent hiring no blacks was relatively high, at 19.3. After 1916 this percent decreased to 13.2 in 1920 but then increased to 16.9 percent during the recession in 1921. After the recession in the early 1920s, the percent of industries hiring no blacks decreased

to 13.1 in 1929. During the Great Depression this percent jumped up to 17.1 percent and stayed relatively high until the war time boom of the 1940s lowered the percentage to 8.7. So the general trend was that the percent of industries hiring no blacks decreased over time and was somewhat cyclical.

**Table 2**  
**Black, White, and Foreign Workers as a Percent of Total Wage Earners<sup>2</sup>**

<i>Year</i>	<i>WHITE</i>	<i>BLACK</i>	<i>FOR</i>
<b>1916</b>	62.47	2.02	35.51
<b>1920</b>	67.87	3.94	27.81
<b>1925</b>	70.35	4.08	25.57
<b>1930</b>	76.40	3.33	20.27
<b>1935</b>	83.36	2.73	13.91
<b>1940</b>	90.84	2.76	6.41
<b>1944</b>	91.87	6.36	1.77
<b>1945</b>	92.81	5.74	1.45
<b>1950</b>	93.86	5.28	0.86

The mean number of wage earners employed by the industries that hired no blacks was between 83 and 96 percent less than the mean number of employed wage earners of all industries. The size of the industries hiring no blacks tended to increase during economic downturns. In table 2 we see that black wage earners ranged from 2.0 percent to 6.4 percent of total wage earners employed. The fact that the industries hiring no black workers were relatively small, that black workers were a small percent of the working population, and the fact that blacks were concentrated primarily in urban areas, makes it conceivable that the percent of industries not hiring blacks would have resulted even if the hiring of workers was purely random<sup>3</sup>. However, a significant difference in

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<sup>3</sup> To actually calculate the probability that this outcome occurred randomly requires labor force data that is not available.



how blacks were distributed across industries does seem to have existed and this segregation decreased with time.

Table 3 shows how blacks were distributed across 11 aggregate industry categories and how the distribution changed across time. The metals, mining, and textile industries appear to have been the largest industries. If workers had been integrated equitably across these aggregate industry categories the same proportion of black, white, and foreign workers would have been found in each industry. In 1916 there appears to have been a considerable difference in how they were distributed across industries. However, in 1950 the distributions appear to be much more equitable.

**Table 3.****Distribution of Workers by Race Across Aggregate Industry Classifications**

<b>Industry</b>	<b>Race</b>	<b>1916</b>	<b>1920</b>	<b>1925</b>	<b>1930</b>	<b>1935</b>	<b>1940</b>	<b>1945</b>	<b>1950</b>
<b>Chemicals</b>	White	3.2%	2.4%	2.2%	2.4%	2.8%	2.3%	2.7%	2.7%
	Black	7.7%	7.3%	5.4%	6.8%	7.5%	5.5%	4.7%	3.5%
	Foreign	1.9%	1.4%	1.2%	1.1%	1.3%	0.6%	1.4%	1.2%
<b>Clay, Glass, and Stone</b>	White	4.8%	3.5%	4.2%	4.0%	3.9%	4.0%	3.4%	4.1%
	Black	11.2%	7.5%	7.5%	5.5%	3.9%	4.2%	1.9%	2.8%
	Foreign	4.2%	4.2%	5.1%	3.2%	3.1%	2.0%	3.4%	3.6%
<b>Food</b>	White	4.8%	5.1%	5.4%	5.9%	7.2%	6.7%	6.8%	6.9%
	Black	4.8%	5.2%	5.1%	4.9%	5.6%	5.2%	6.2%	6.2%
	Foreign	2.1%	2.1%	2.2%	2.4%	2.9%	2.1%	5.0%	6.3%
<b>Leather and Rubber</b>	White	3.2%	3.4%	2.7%	2.6%	2.9%	2.9%	2.5%	3.0%
	Black	1.0%	0.8%	1.0%	1.0%	1.3%	1.2%	1.9%	2.2%
	Foreign	1.6%	2.8%	1.2%	1.2%	1.3%	1.1%	2.1%	3.9%
<b>Lumber</b>	White	3.5%	3.0%	3.3%	2.5%	1.9%	1.9%	1.8%	2.3%
	Black	1.7%	0.8%	0.8%	0.8%	0.6%	0.7%	1.0%	1.0%
	Foreign	1.0%	0.5%	0.8%	0.5%	0.3%	0.2%	0.6%	1.5%
<b>Metals</b>	White	35.4%	34.1%	30.2%	29.0%	27.3%	35.0%	40.5%	38.2%
	Black	53.3%	50.9%	47.3%	35.4%	33.0%	38.2%	41.0%	41.4%
	Foreign	34.1%	35.4%	30.1%	29.1%	28.8%	28.8%	41.7%	43.8%
<b>Mine and Quarries</b>	White	14.0%	14.6%	17.0%	16.7%	15.2%	13.3%	11.1%	11.3%
	Black	6.7%	10.5%	14.0%	18.5%	16.6%	10.5%	4.2%	4.1%
	Foreign	42.5%	40.8%	48.5%	52.6%	51.0%	56.4%	31.4%	17.5%
<b>Paper and Printing</b>	White	4.8%	4.6%	5.2%	5.3%	5.3%	5.0%	4.4%	5.1%
	Black	3.1%	2.5%	3.3%	3.7%	3.7%	3.9%	5.1%	4.8%
	Foreign	0.9%	0.9%	0.8%	0.6%	0.6%	0.5%	0.7%	1.8%
<b>Textiles</b>	White	19.1%	19.0%	22.6%	24.4%	27.2%	22.1%	17.7%	20.8%
	Black	3.0%	3.8%	3.5%	7.6%	10.2%	11.5%	14.3%	18.6%
	Foreign	7.2%	6.4%	6.1%	6.8%	8.5%	5.4%	9.1%	15.7%
<b>Tobacco</b>	White	2.8%	3.4%	2.9%	2.4%	2.0%	1.5%	1.1%	1.0%
	Black	1.8%	2.2%	2.8%	3.0%	3.8%	3.8%	2.7%	2.6%
	Foreign	1.4%	1.5%	1.6%	0.9%	0.8%	0.9%	1.1%	0.8%
<b>Miscellaneous</b>	White	4.2%	6.8%	4.4%	4.7%	4.2%	5.2%	8.0%	4.7%
	Black	5.7%	8.4%	9.4%	12.7%	13.7%	15.4%	17.1%	12.9%
	Foreign	3.0%	4.0%	2.6%	1.6%	1.4%	2.0%	3.5%	3.9%

The data is from the "Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania" for the years 1916 to 1950.

In 1916 the differences in the industrial employment of black and white workers in the North seemed to have mirrored that of the South. In the South in 1890 52.4 percent of the steelworkers were black and in 1900 this percent was 60.3 (Wright 1986). In the

North 53 percent of the black workers employed by the eleven aggregate industry categories were employed in the metal and metal products industry. This percent for white workers was 35 percent. In the South the textile industry was “lily white” and attempts to integrate black workers into the industry were unsuccessful (Wright 1986). Similarly in the North in 1916 only 3 percent of the blacks employed in the eleven aggregate industry categories were in the textile industry while 19 percent of the whites were employed in the textile industry.

In the South, both the disproportionate amount of blacks hired in the steel industry and the fact that black workers were practically barred from any employment at all in textile mills were path dependent trends that began with how antebellum slaves were used in southern industry. This industrial segregation was rigid and unchanging (Wright 1986). In contrast, the initial black industrial distribution in the North was not rigid and unchanging. With time, the distributions became much more similar between races so that by 1950 the differences in the distributions of black and white works appeared much less pronounced. In particular, the iron and steel industry now employed 38 percent of the whites employed in the eleven aggregate industry classifications and the percent for black workers was 41. These two figures were 35 and 53 percent respectively in 1916. The change was also very pronounced for the textile industry. In 1950 the proportion of the whites employed in the eleven aggregate industry classifications employed by the textile industry was 21 percent and that of blacks was 19 percent. The two percentages in 1916 for the textile industry were 20 and 3 percent for whites and blacks respectively.

In 1916 in Pennsylvania the distribution of blacks across the 300+ industry categories differed from that of whites. The distribution of the two races also differed

substantially across the eleven aggregated industry classifications in 1916. Such inequity between distributions would be a necessary condition for the existence of the industrial segregation found in the South. However, the distribution of workers in the North across industries does not appear to have been rigid and unchanging. The differing 1916 distribution of workers by race across the aggregate industry classifications in the North, which seemed to have mirrored the industrial segregation of the South, changed considerably by 1950. By the middle of the 20<sup>th</sup> century the black and white distributions across industries had become much more similar by all measurements employed in the paper.

## **V. Industrial Segregation and Industry Characteristics**

The work of Dickens and Lang (1985) and others indicate that minority workers were often segregated into a secondary market where their economic welfare was adversely affected. Gavin Wright (1986) found that the result of a half-century of industrial segregation in Virginia was black-white wage differentials. It is important to differentiate between the portion of the earning gap that resulted from different occupational advancement, and that which resulted from industrial segregation, insofar as it is possible. The state of Pennsylvania did not collect race specific wage data or information on the occupational distribution of workers for each industry. This data limitation prevents the degree to which black and white workers received different earnings within a given industry from being ascertained. Such differences are likely to have appeared due to the different types of occupations held by black and white workers. However, by calculating the industry average wage for each industry and using the information available on how black, white, and foreign workers were distributed across

industries, it is possible to understand how industry segregation might have impacted white, black, and foreign worker incomes.

Krueger and Summers (1987), in a study focusing on inter-industry wage differentials, found industry average wages to be a robust approximation to other measures of the industry wage structure which use individual worker and occupational controls. A powerful statistic that can be used to understand the degree to which industrial segregation impacted worker earnings is the expected industry average wage for white, black, and foreign workers. For black workers this weighted average is calculated as  $\frac{\sum(b_i * awage_i)}{\sum b_i}$ , where  $b_i$  is the number of blacks employed in industry  $i$ , and  $awage_i$  is the average wage for industry  $i$ . The statistic is calculated analogously for foreign born and white workers. The difference in expected industry average wages between races is due entirely to differences in their distributions across industries. For this reason the descriptive statistic is powerful for assessing the impact that segregation had on black wages relative to white wages. In almost every year the expected industry average wage for black workers was greater than that of whites. The years in which this was not true were 1921, 1932, 1933, and 1934, which were recession years, and the years 1945 to 1950, the period right after the end of World War II. This simple measure implies that black workers were generally not segregated into relatively low wage industries.

**Table 4****Weighted Industry Average Wage<sup>2</sup>**

	White	Black	Foreign	All Workers	% Diff <sup>4</sup>
1916	701	715	746	717	2.0%
1917	865	952	968	899	10.1%
1918	1152	1233	1299	1198	7.1%
1919	1168	1319	1319	1218	13.0%
1920	1395	1575	1634	1468	12.9%
1921	1102	1081	1245	1142	-1.9%
1922	1023	1098	1066	1037	7.3%
1923	1295	1432	1526	1364	10.6%
1924	1269	1313	1459	1323	3.5%
1925	1250	1390	1334	1277	11.2%
1926	1319	1484	1494	1369	12.5%
1927	1285	1326	1409	1315	3.3%
1928	1281	1355	1403	1311	5.7%
1929	1319	1385	1445	1348	5.0%
1930	1206	1267	1302	1227	5.0%
1931	1029	1052	1097	1043	2.3%
1932	803	791	860	813	-1.6%
1933	785	774	837	793	-1.4%
1934	929	916	1007	941	-1.4%
1935	987	989	1058	997	0.2%
1936	1089	1108	1207	1105	1.8%
1937	1186	1243	1316	1203	4.8%
1938	1021	1043	1087	1029	2.1%
1939	1134	1175	1236	1145	3.6%
1940	1221	1253	1339	1229	2.6%
1941	1475	1485	1576	1479	0.7%
1942	1803	1840	1871	1806	2.1%
1943	2077	2201	2163	2087	6.0%
1944	2248	2354	2464	2258	4.7%
1945	2131	2108	2376	2133	-1.0%
1946	2076	1971	2335	2073	-5.0%
1947	2448	2328	2756	2445	-4.9%
1948	2669	2505	2994	2663	-6.2%
1949	2534	2446	2726	2531	-3.5%
1950	2733	2631	2922	2729	-3.7%

The data is from the "Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania" for the years 1916 to 1950.

Arrow (1972) presented some models of race discrimination induced by the discriminatory tastes of other employees rather than those of the black worker's employer. One prediction of the model is that white workers would demand a compensating differential to be induced to work with a black worker. The more black

<sup>4</sup> %Diff=(Black-White)/White\*100

labor employed, the higher the differentials needed to attract white labor. The results in table 4 are consistent with two different notions of black industrial employment. Black workers may have been disproportionately employed by primary industries that had other characteristics that would imply higher average wages. Also consistent with the results in table 4 is the notion that the industries did not necessarily have characteristics that would imply higher industry wages but that the white workers where blacks were employed were demanding a compensating differential. For this reason the weighted average industry characteristic for black and white workers found in table 5 were calculated for only some selected years. The weights used were once again the proportion all workers of a particular race in the data set employed by a particular industry. These weighted means show that black workers were generally disproportionately employed by industries with a high capital-to-labor ratio, a high proportion of salaried occupations, and a low proportion of female and minority workers. The weighted averages also show that black workers were generally employed by smaller industries and industries that were less unionized. These results are not consistent with the notion that black labor was segregated into secondary industries.

**Table 5.****Weighted Average Industry Characteristics for Black and White Workers**

<b>Year</b>	<b>Race</b>	<b>Wage Earners</b>	<b>Capital per Emp</b>	<b>%Sal</b>	<b>%Female</b>	<b>%minor</b>	<b>Union Index</b>
1916	<b>white</b>	67,993	6,091	8.8%	15.9%	1.5%	1.2
	<b>black</b>	32,812	5,481	8.5%	5.6%	0.5%	1.4
1920	<b>white</b>	38,037	3,715	10.2%	18.6%	1.7%	1.9
	<b>black</b>	29,848	4,376	10.7%	7.9%	0.6%	2.0
1925	<b>white</b>	38,382	4,882	10.7%	22.4%	1.6%	1.6
	<b>black</b>	29,168	6,323	10.9%	9.9%	0.4%	1.3
1930	<b>white</b>	37,394	5,501	12.1%	23.6%	0.9%	1.2
	<b>black</b>	31,577	7,469	12.4%	15.9%	0.3%	1.2
1935	<b>white</b>	30,426	5,767	10.7%	24.5%	0.4%	1.8
	<b>black</b>	28,037	7,932	11.4%	19.0%	0.2%	1.7
1940	<b>white</b>	26,611	4,974	11.4%	21.9%	0.2%	2.3
	<b>black</b>	23,697	6,078	11.5%	20.8%	0.1%	2.2
1945	<b>white</b>	27,385	3,468	13.4%	28.6%	3.0%	3.3
	<b>black</b>	22,610	3,838	13.4%	30.2%	2.9%	3.2
1950	<b>white</b>	26,188	3,530	14.4%	25.3%	0.7%	3.4
	<b>black</b>	22,479	3,846	14.5%	28.1%	0.7%	3.3

Individual log wage regressions using the 1940 IPUMS can also be used to test whether the black-white industrial distribution differential was a contributing factor to the black-white wage differential. Table 6 reports the results of a log wage regression using Pennsylvania data on manufacturing and mining industries from the 1940 IPUMS. The covariates for the regression were age, age<sup>2</sup>, a dummy variable indicating the sex of the individual, nine education dummies, eight occupation dummies, a dummy indicating the individuals race, and 59 industry dummies. The coefficients for the industry dummies are not reported. Using the sample means of the covariates for white workers and the coefficients from the log wage regression for all workers an expected log wage for white workers can be calculated. This expected log wage for white workers was 6.873. Analogous calculations for black workers yields an expected log wage of 6.669.



The white means for each industry dummy represents the proportion of white workers in each industry. So the race specific means for the industry dummies represent the distribution of that particular race across industries. It is possible to calculate what the expected log wages for white workers would be if their occupational, educational, and other characteristics did not change, but yet they were distributed across industry like black workers. This is done by using the black industry dummy means instead of those of white workers in the sample, but still using the white means for the other covariates. This yields an expected log wage for white works of 6.881. So if white workers assumed the industrial distribution of black workers, all else constant, their wages would not be expected to decrease. Similarly for black workers, if they are allowed to assume the industrial distribution of white workers, still claiming their actual means for the other covariates used in the regression, their log wage would decrease from 6.669 to 6.648. So if black workers were distributed across industry like white workers, all else held constant, their wages would not increase. This leaves a lot to be explained by occupational segregation.

**Table 6****Log Wage Regression**

Variable	Coef.	Std. Err
Age	0.052835	0.000191
Age <sup>2</sup>	-0.00052	2.24E-06
Female	-0.34538	0.00132
Education 2	0.04512	0.00285
Education 3	0.144467	0.002536
Education 4	0.214821	0.002976
Education 5	0.225003	0.002966
Education 6	0.269886	0.003353
Education 7	0.294323	0.002779
Education 8	0.469967	0.003585
Education 9	0.55427	0.003687
Occupation 2	-0.07253	0.007294
Occupation 3	0.127214	0.007229
Occupation 4	0.300301	0.007282
Occupation 5	0.799999	0.007609
Occupation 6	0.502613	0.027168
Occupation 7	1.540606	0.045778
Occupation 8	-0.08177	0.045617
Black	-0.13827	0.002695
Constant	5.504571	0.014376
Adj R <sup>2</sup>	.3768	

The dependent variable is the natural log of annual wage. The data are from the 1940 IPUMS. Coefficients for industry dummies are not reported.

The panel of data obtained from Pennsylvania state reports can be used to learn more about the characteristics of industries which hired black workers. A model of industrial segregation that predicts that black workers were systematically segregated into secondary industries implies that an industry's racial mix is endogenous to the characteristics that would identify it as a primary or secondary industry. A multinomial linear probability model for group data<sup>5</sup> can estimate how black, white, and foreign workers were associated with various industry characteristics. The estimated probabilities

<sup>5</sup> A particularly appealing specification for the model is the multinomial logit regression for grouped data or the minimum chi-square method. However, the estimated standard errors for these two models are artificially small. In this case the standard errors will reflect those of a model estimated with 40 plus million individual worker observations

yield the probability that a randomly selected employ was a black, white, or foreign worker.

The multinomial linear probability model used was estimated by running three different fixed effect regressions, one for each race. In each regression the dependent variable was the proportion of workers in industry  $i$  that was race  $j$ . The probability that a randomly selected employ in a given industry will be of race  $j$  ( $P_{ij}$ ) was estimated as

$$(1.) P_{ijt} = a_{ij} + a_{1j} \ln(\text{awage})_{it} + a_{2j} \text{kapemp}_{it} + a_{3j} \text{wagetot}_{it} + a_{4j} \text{psal}_{it} + a_{5-9j} \text{union1-4}_{it} + a_{10-44j} \text{Year}(1916-1949)_t + u_{ijt}$$

where  $j$  = black, white, or foreign worker, and  $i = 1, \dots, 420$  for each industry classification.

$\ln(\text{awage})_i$  was the natural log of the industry average wage and  $a_{ij}$  was the industry fixed effects. The other variables were capital invested per employee, total employees which were wage earners, proportion of the employees that were salaried, four union density dummies (a fifth was left out), and 34 year dummies (1950 was left out) respectively.  $\ln(\text{awage})_i$ , and  $\text{kapemp}_i$ , were adjusted to be in 1950 dollars with a CPI deflator. One possible problem with identifying this equation was that the natural log of the industry average wage was endogenous to some of the industry characteristics. The fact that changes in tariff rates would impact the industry's average wage without affecting its racial mix makes the ad valorem tariff rate a good candidate for an instrument of the  $\ln(\text{awage})_i$  that would enable equation 1) to be identified. The tariff data collected to identify equation 1.) varies both across industries and over time (U.S. Dept. of Commerce 1952). A regression of industry log average wages on industry

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rather than one employing 10589 industry level proportions made up of 40 plus million wage earners.

characteristics and tariff rates indicates that the level of tariff rates had a significant positive effect on industry wages.

In table 7 the estimates from two different specifications of this model are shown. Summing a coefficient up across the three equations yields a sum that is approximately zero except in the case of the constant which sums approximately to one as expected. The marginal effect for the  $\ln(\text{awage})_i$  was not significantly associated with the probability that a randomly selected employee was black in either of the two specifications. The coefficient for  $\ln(\text{awage})_i$  was statistically different from zero at a 95 percent level of confidence for the white equation in the first specification and was significant at a 90 percent level of confidence in the second. The magnitude of the coefficient indicates that a 10 percent increase in the industry average wage was associated with an absolute increase in the percent of workers in the industry that were white by 1.25 percentage points. The marginal effect for the proportion of an industry's workforce that was salaried was significantly different from zero at a 95 percent level of confidence for each race in both specifications. The first specification indicates that an absolute increase in the percent of an industry's workforce that was salaried by 10 percentage points was associated with an absolute decrease in the percent of the industry's workforce that was black by 1 percentage point. For the second specification this absolute decrease was less than 1 percent. These estimates enable the hypothesis that black workers were segregated into secondary low wage industries to again be rejected. They also do not appear to have been segregated into industries with a low capital-to-labor ratio. Though the coefficient for the proportion of an industry's workforce that was salaried had a statistically significant negative association with black employment, in

absolute terms the association was rather small. If statistical discrimination had led to a long-run path dependent form of industrial segregation one would suspect black workers to have been disproportionately employed by labor intensive low skilled industries.

One factor that does seem to significantly impact an industry's racial mix of wage earners was the extent of unionization. Union density negatively impacted the probability that a randomly selected employee in a given industry was black or foreign, whereas the probability that the randomly selected employee was white increased with union density. Focusing on the first specification, if an industry had a union density between 80 and 100 percent this industry would have 3 percent less blacks, 8 percent less foreign workers, and 11 percent more whites than a comparable industry with less than 20 percent of its work force unionized.

The second specification in table 7 is important because it allows for the Congress of Industrial Organizations (CIO) to have a different effect on black employment than other unionization. The CIO differed from the American Federation of Labor (AFL) due to the fact that they strove to organize on an industrial basis rather than within specific "crafts" like the AFL. The CIO started in 1935 and took a radically different stance from that of the AFL with regards to the organization of black labor. Employers saw the employment of black workers as one of the weapons at their disposal in maintaining an open shop. The generally discriminatory attitude of unions towards blacks, and the ability of employers to intimidate black workers who became more favorably disposed towards unions, had made the majority of black workers anti-union (Dickerson 1986). The fact that employers were able to use non-unionized black workers as a weapon against organization as long as they were anti-union, created an economic incentive for

industrial unions to organize black workers. In 1940, at the CIO's convention in Atlantic City, an adopted resolution recognized this economic incentive:

Whereas, Employers constantly seek to split one group of workers from another, and thus to deprive them of their full economic strength, by arousing prejudices based on race, creed, color or nationality, and one of the most frequent weapons used by employers to accomplish this end is to create false conflicts between Negro and white workers; now, therefore be it

Resolved, That the CIO hails the advance of industrial unions which have broken down the traditional barriers of outworn union policies to the unity of Negro and white workers, and hereby pledges itself to uncompromising opposition to any form of discrimination, whether political or economic, based upon race, color, creed or nationality (Murray 1942).

Well before this declaration the CIO had made provision in its constitution that forbade discrimination on the basis of "race, creed, color, or nationality" (Murray 1942).

The AFL adopted resolutions at some of its conventions condemning racial discrimination. However, attempts at establishing an anti-discrimination provision in its constitution all failed. In 1893 provision was established in the AFL constitution to have separate charters for local unions composed entirely of black workers (Murray, 1942).

These all black unions were under the control of the local white unions and were not by any means equal (Dickerson 1986).

Despite the ideological declaration of the CIO condemning discrimination, in practice, at the local level there was still a substantial amount of discrimination tolerated. There was a considerable amount of heterogeneity across industries and regions in the degree in which industrial unionization was extended to black workers. In Pittsburgh the National Negro Congress (NNC) was instrumental in assisting the Steelworkers Organization Committee (SWOC), an industrial union affiliated with the CIO, muster up the requisite black leadership to organize many of the steel mills in Western Pennsylvania. The effort of the NNC was significant enough to draw several substantial

cash contributions from the CIO. The NNC drew leadership from the National Urban League, the Pittsburgh Urban League, the black press, and from black churches, for the assistance of the SWOC. The black churches allowed their pulpits to be used for the cause of the industrial union effort. The union organizers within the SWOC executed carefully planned recruitment efforts that protected the names of black workers who joined the organization from employers until black membership was significant enough that the threat of intimidation from employers had been mitigated (Dickerson 1986).

In 1937 the SWOC began signing contracts with large steel producers in Western Pennsylvania establishing more advanced internal labor markets. These collective bargaining agreements established the eight-hour day, the forty-hour week, and a grievance procedure for workers who believed they had been unjustly discharged. If it was found that a worker was unjustly discharged he was entitled to full back pay. Workers with seniority were given preference in promotions and were given lay-off protection. All workers with more than five years seniority were given seven-days paid vacation. And perhaps most significantly, these provisions applied equally to all workers, whether black or white (Dickerson 1986). In practice how these policies were carried out remains an open question.

In some of the steel mills in Western Pennsylvania the SWOC was not as successful in organizing black labor. In these mills black leadership was often lacking or the intimidation by employers was effective. A major obstacle, which had to be overcome within all firms, was the skepticism which black labor had with respect to unionization. Many feared that their support of the SWOC would lead to closed shops

that historically were used as a tool against black workers. However, overall the SWOC was very successful in the organization of black steelworkers in Western Pennsylvania.

One would suspect that the CIO would be more positively associated with black employment because of their open constitutional declaration condemning discrimination, and their attempts to unionize black workers and other less skilled workers. The AFL separate union chapters for black labor were anything but equal. However, despite the CIO's ideological acceptance of the organization of black labor, in practice there was a substantial amount of heterogeneity across CIO affiliated unions in their treatment of black labor. This was possibly driven by heterogeneity in the firm level economic incentives to organize black labor. In table 7 there were three additional variables included in the second specification that were not included in the first. The three variables were the percent of union employees that belonged to the CIO interacted with union density dummies. The marginal effects on these coefficients indicate a significant positive impact of the CIO on black employment. The coefficients are large enough to more than negate the negative effect of craft unionism indicated by the union density dummies.



**Table 7**

**Multinomial Linear Probability Model with Fixed Effects**

	<b>Black</b>	<b>White</b>	<b>Foreign</b>	<b>Black</b>	<b>White</b>	<b>Foreign</b>
ln(awage)	-0.00099 (0.026936)	0.125272** (0.056586)	-0.11828** (0.051149)	-0.03515 (0.030299)	0.113552* (0.063135)	-0.07092 (0.056206)
Capital/emp	-2.26E-08 (2.08E-08)	-9.43E-08 (9.87E-08)	1.18E-07 (9.69E-08)	-2.56E-08 (2.16E-08)	-9.75E-08 (1.00E-07)	1.25E-07 (9.80E-08)
# wage earners	5.82E-08 (7.37E-08)	-1.41E-06** (3.90E-07)	1.33E-06** (3.74E-07)	8.88E-08 (8.31E-08)	-1.35E-06** (3.86E-07)	1.23E-06** (3.58E-07)
Salaried/emp	-0.10651** (0.017706)	0.199366** (0.032387)	-0.09445** (0.027529)	-0.09197** (0.018412)	0.201748** (0.033611)	-0.11191** (0.027899)
% female/100	0.003628 (0.002859)	-0.00411 (0.004463)	0.000497 (0.005164)	0.003052 (0.002522)	-0.00415 (0.004358)	0.001137 (0.004389)
% minor/100	-0.05119 (0.037688)	0.336623** (0.07466)	-0.27855** (0.070289)	-0.08544** (0.039547)	0.32617** (0.078721)	-0.23247** (0.072233)
Union2 20-39%	-0.00251* (0.001482)	0.013707** (0.003003)	-0.01056** (0.002673)	-0.00569** (0.001634)	0.013112** (0.003413)	-0.00673** (0.002979)
Union3 40-59%	-0.00531* (0.003096)	0.026965** (0.005874)	-0.02114** (0.005088)	-0.02296** (0.003458)	0.029999** (0.006962)	-0.00608 (0.005777)
Union4 60-79%	-0.00959** (0.003712)	0.065526** (0.006648)	-0.0555** (0.005778)	-0.02483** (0.005471)	0.0882** (0.011141)	-0.06329** (0.009699)
Union5 80-100%	-0.02987** (0.008788)	0.109788** (0.025966)	-0.08003** (0.024271)	-0.03247** (0.009388)	0.119621** (0.026744)	-0.0875** (0.024748)
Union2*% CIO/100	.	.	.	0.01042** (0.003884)	0.009137 (0.007251)	-0.01983** (0.006083)
Union3*% CIO/100	.	.	.	0.048543** (0.007226)	0.001056 (0.013406)	-0.05106** (0.011119)
Union4*% CIO/100	.	.	.	0.026963** (0.005809)	-0.03325** (0.011798)	0.006744 (0.010229)
Constant	0.097211 (0.201808)	-0.44187 (0.424822)	1.299164** (0.384237)	0.355915 (0.227085)	-0.35335 (0.474147)	0.940736** (0.42239)
R <sup>2</sup>	.6897	.6962	.6639	.6881	.7002	.6823
# of Observations	10589	10589	10589	10589	10589	10589

The dependent variables are the proportion of an industry's employment that was black, white, or foreign. The data are from the "Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania" for the years 1916 to 1950. The union data were obtained from Wolman (1936) and Troy (1965). To obtain union densities the union numbers were combined with U.S. Census industry data on the number of wage earners. The union data are national. Standard errors are in parenthesis. These standard errors were produced using a white correction procedure to correct for heteroskedasticity. \* indicates that the coefficient is significant at a 90% level of confidence, \*\* indicates significance at a 95% level of confidence. Coefficients for 34 year dummies and 420 industry fixed effects were not reported. The proportion of male wage earners, a year dummy for 1950, and union dummies for union density between 0 and 19%, were left out to prevent perfect collinearity.

Another way in which industrial segregation could negatively impact black workers was if they were concentrated into relatively more dangerous industries. Table 8 contains the expected values of industry risk premiums for foreign, black, and white workers in Pennsylvania for the years 1916, 1917, 1918, 1928, and 1929. The risk premium serves as a proxy for the relative danger associated with the industry, a higher value implying greater risk. The expected industry premium for black workers was not statistically different from that of the white workers or all wage earners at a 95 percent confidence level for the 5 years for which data was available. This complements the results in table 7 which imply that industrial segregation was not the result of black workers only being employed in hot, heavy, labor intensive, or dangerous jobs.

**Table 8**

**Expected Industry Risk Premiums**

<b>Year</b>	<b>White</b>	<b>Black</b>	<b>For</b>	<b>All Workers</b>
<b>1916</b>	0.814 (0.467)	0.943 (0.346)	1.165 (0.543)	0.952 (0.524)
<b>1917</b>	0.812 (0.458)	0.916 (0.331)	1.131 (0.536)	0.925 (0.505)
<b>1918</b>	0.815 (0.456)	0.907 (0.327)	1.141 (0.532)	0.927 (0.503)
<b>1928</b>	1.437 (0.789)	1.587 (0.771)	2.024 (0.882)	1.581 (0.848)
<b>1929</b>	1.417 (0.753)	1.571 (0.759)	1.997 (0.859)	1.552 (0.814)

The expected industry premiums are comparable across years only for 1916, 1917, and 1918. Standard errors are in parenthesis. The data are from the “Statistical Analysis of Workmen’s Compensation Insurance in Pennsylvania From January 1, 1916, to December 31, 1918” and the “Current and Weighted Experience Rating Plans for 1928 and 1929” by the Pennsylvania Compensation Rating and Inspection Bureau.

**V I. Business Cycle Activity and Industrial Segregation**

The industrial experience of black labor was largely affected by the business cycle, and industrial segregation in turn affected black’s unique experience with business cycle activity. The empirical evidence presented in this section indicates that black labor was disproportionately employed by cyclical industries. It was the fast growing industries facing tight labor markets during World War I and the other periods of economic growth that hired black labor. The industries that had hired black workers when times were good suffered disproportionately during periods of recession. The fact that the industrial distribution of black workers was relatively skewed towards employment in relatively cyclical industries explains much of the disproportionately high unemployment suffered by African Americans during the Great Depression. Perhaps the most negative feature of industrial segregation in the North with respect to black labor

was that it led, during times of recession, to the worse possible form of industrial segregation-into no industry at all!

The black experience during the 1930s was typified by high unemployment (unemployment rates of 50 percent among blacks in the North were not uncommon), high incidences of work relief, and displacement of black workers by whites. “The period from 1930 to 1940 was the only decade between 1890-1980 in which the ratio of black-to-white average earnings actually declined”(Sundstrom 1992). William A. Sundstrom (1992 and 1996) has explored the causes of the racial unemployment gap that existed during the Great Depression. He found that the disproportionately high black unemployment of the 1930s could be attributed to discrimination and to the fact that a relatively high proportion of black workers was unskilled. Unskilled workers suffered disproportionately during the depression. The fact that the black migration north took place during times of economic growth could have led to blacks being hired by fast growing industries which were feeding off the economic boom of the time, but which suffered disproportionately during the Great Depression because of their cyclical nature.

For industrial segregation to be the cause of any portion of the relatively high black shares of the cyclical employment, they would have to be distributed disproportionately across cyclical industries. In table 9 the expected or weighted average industry employment percent change for a number of expansionary and recessionary periods have been calculated. The formula for the weighted average industry employment change for black workers from 1929 to 1932 would be  $\sum(b_i^{29}/B^{29})*((N_i^{33}-N_i^{29})/N_i^{29})$  where  $b_i^{29}$  is the number of black workers in industry  $i$  in 1929,  $N_i$  is the number of total wage earners in industry  $i$ , and  $B^{29} = \sum b_i^{29}$ . The formula for that of white

workers is analogous. During periods of boom the weights for the last year during the period were used and during periods of recession the racial weights from the first year of the period were used. Differences in the weighted average industry employment change between black and white workers can be attributed entirely to differences in how black and white workers were distributed across industries. This fact makes weighted average industry employment changes a powerful tool for assessing the degree to which industrial segregation contributed to the differing experience that black and white workers had with respect to business cycle activity.

**Table 9.**

**Weighted Average Industry Employment Percent Change for Periods of Boom and**

**Bust**

	<b>White</b>	<b>Black</b>
<b>1916 to 1919</b>	72%	74%
<b>1919 to 1921</b>	-13%	-21%
<b>1921 to 1929</b>	37%	58%
<b>1929 to 1932</b>	-29%	-34%
<b>1932 to 1937</b>	20%	26%
<b>1937 to 1938</b>	-14.7%	-14.9%
<b>1938 to 1945</b>	45%	57%
<b>1945 to 1946</b>	-.4%	-4.2%
<b>1946 to 1950</b>	5%	7%

The data are from the "Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania" for the years 1916 to 1950.

The evidence presented in table 9 is consistent with the hypothesis that blacks were segregated into disproportionately cyclical industries. During economic downturns, the weighted average industry percent change in employment was more negative for black workers than for white workers and more positive during periods of economic expansion. Periods of economic growth in the North between 1916 to 1950 were periods

in which southern blacks sought work in northern industry. One would not suspect that black immigrants from the South would replace employed whites, but would be employed in industries where a shortage of workers had occurred. During World War I and World War II industries in Pennsylvania expanding due to the war effort actively recruited black workers in the South (Dickerson 1986). In table 4 the weighted average wage for black workers was greater than that of whites except during periods of recession and the period after World War II. This is consistent with the notion that industries facing tight labor markets allowed wages to be bid up before incurring the cost of recruiting and integrating black labor into their firms. These disproportionately cyclical industries which hired black labor would also be expected to have a relative decrease in wages compared to other industries during periods of recession due to their relatively large decrease in labor demand.

The fact that black workers, compared to white workers, disproportionately found employment in cyclical industries explained a substantial amount of the high black unemployment of the Great Depression. A decomposition was used to isolate the proportion of the difference between the black-white percent change in employment that could be attributed to differences in how black and white workers were distributed across industries. The total percent change in black employment during the Great Depression can be written as  $(B^{32}-B^{29})/B^{29}$ , where  $B^{29} = \sum bi^{29}$  and  $B^{32} = \sum bi^{32}$ . Once again  $bi$  is the number of blacks employed in industry  $i$  and the postscript denotes the year. There is an analogous equation for white workers.  $(B^{33}-B^{29})/B^{29}$  is equivalent to  $\sum (bi^{29}/B^{29} * (bi^{33}-bi^{29})/bi^{29})$  which is a weighted average of the percent change in black employment for all

industries. The number of interest is the difference between the black percent change in employment and that of whites:

i.)  $\Sigma(bi^{29}/B^{29}*(bi^{33}-bi^{29})/bi^{29}) - \Sigma(wi^{29}/W^{29}*(wi^{33}-wi^{29})/wi^{29})$  which is equivalent to

ii.)  $\Sigma\{(bi^{29}/B^{29} - wi^{29}/W^{29})*((bi^{33}-bi^{29})/bi^{29})\} + \Sigma\{(wi^{29}/W^{29})*[(bi^{33}-bi^{29})/bi^{29}) - ((wi^{33}-wi^{29})/wi^{29})]\}$ .

Equation (ii.) was formed by substituting  $- wi^{29}/W^{29}*(bi^{33}-bi^{29})/bi^{29}$  and  $wi^{29}/W^{29}*(bi^{33}-bi^{29})/bi^{29}$  into equation (i.) and factoring. The first summed term of equation (ii.) is the part of the difference that can be attributed to differences in how black and white workers were distributed across industries. It asks the question: What is the difference between the actual percent change in black employment and the percent change in black employment that would have existed if each industry changed their black employment the way they actually did, but yet blacks were distributed across industries like whites? The second summed term is the part of the difference that can be attributed to factors other than differences in how black and white workers were distributed across industries. It asks the question: What is the difference between the white percent change in employment if they were fired like black workers were in each industry but distributed like whites, and the actual white percent change in employment? The decomposition was also undertaken for the period between 1919 to 1921 which was another recessionary period.

**Table 11**

**Decomposition Results**

	1919 to 1921	1929 to 1932
White % Change	-13.0%	-26.7%
Black % Change	-32.9%	-45.7%
Difference	-19.9%	-19.0%
Distribution	-18.8%	-10.2%
Residual	-1.1%	-8.8%

The data are from the “Report on Productive Industries, Public Utilities and Miscellaneous Statistics of the Commonwealth of Pennsylvania” for the years 1916 to 1950. “Difference” is “black % change” – “white % change”. “Distribution” is the part of “Difference” that can be attributed to differences in how black and white workers are distributed across industry. “Residual” is the part that can be attributed to other factors.

The decomposition attributes over 50 percent of the black-white difference in the percent change in employment during the Great Depression to differences in how black and white workers were distributed across industries. During the recession from 1919 to 1921, according to the decomposition, if blacks had been distributed across industries like whites, but faced their actual percent change in employment in each industry, their percent decline in employment would have been about the same as that of white workers. During the Great Depression and other recessionary periods, industrial segregation was a substantial contributor to the disproportionately high rates of unemployment suffered by American black labor.

**VII. Conclusion**

Studies testing the dual labor market hypothesis have found evidence that minority labor was often segregated into a low wage secondary market due to the rationing of primary jobs (Dickens and Lang 1985 and 1988). It is important for anti-discrimination policy to distinguish, as far as possible, the proportion of this segregation that was occupational in nature and that which was along industry lines. In looking at the industrial sector of Pennsylvania during the late 1910s and 1920s, it is clear that there



was a significant difference in the distributions of white and black workers across industries. Such a difference is a necessary condition for the existence of demand-side industrial segregation. However, this distribution of black workers became increasingly similar to that of whites over time. This is also true of the trend during the Great Depression except that the number of industries employing no blacks increased.

The evidence from Pennsylvania from 1916 to 1950 suggests that industrial segregation was not a major factor behind the black-white income differential. It is probable that limitations on occupational advancement within industries due to discrimination and/or differences in human capital were the factors that led to the large earnings differences that existed between black and white workers. Multivariate analysis shows that the probability that a randomly selected employee in an industry was black did not decrease with an industry's average wage and an industry's capital investment. Also, blacks do not appear to have been segregated into industries that were disproportionately dangerous. This is inconsistent with the hypothesis that black workers were segregated into low-wage secondary industries. The extent of an industry's unionization negatively impacted the probability that a randomly selected employee was black. However, black employment appears to have been positively associated with the extent of industrial unionization as measured by the proportion of unionized workers affiliated with the Congress of Industrial Organizations.

One way in which blacks appear to have been negatively impacted by industrial segregation was in their experience with employment fluctuations. Blacks were employed by relatively cyclical industries. As a result, during recessions, blacks were

more likely to experience employment declines than whites. This explains part of the disproportionately high unemployment that blacks endured during the Great Depression.

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