

Competition in the Promised Land: Black Migration and Racial Wage Convergence in the North, 1940–1970

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Four million blacks left the South from 1940 to 1970, doubling the northern black workforce. I exploit variation in migrant flows within skill groups over time to estimate the elasticity of substitution by race. I then use this estimate to calculate counterfactual rates of wage growth. I find that black wages in the North would have been around 7 percent higher in 1970 if not for the migrant influx, while white wages would have remained unchanged. On net, migration was an avenue for black economic advancement, but the migration created both winners and losers.

The economic position of African Americans improved dramatically during the Second World War and the subsequent decades, both absolutely and relative to whites. In 1940 the average black worker earned only 43 percent as much as the average white worker; by 1970 the black-white earnings ratio rose to 64 percent.¹ This relative growth in black wages can be attributed both to a rise in the supply of skills offered by an increasingly well-educated black workforce and to a rise in the demand for black labor as discrimination in the labor market abated. Interregional migration also played a role. From 1940 to 1970 four million blacks moved from the low-wage South to the higher-wage North. James Smith and Finis Welch estimate that migration accounts for around 20 percent of black-white wage convergence during this period.²

Scholarship on the Great Black Migration has focused almost exclusively on the wage gains realized by migrants themselves.³ However,

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¹ Author's calculations for men who meet the sample inclusion criteria described in the data section.

² Smith and Welch, "Black Economic Progress." See also Maloney, "Wage Compression"; and Margo, "Explaining."

³ Economic historians have also explored how the southern economy adjusted to the loss of black agricultural labor. Margo, "Segregated Schools," argues that the threat of black mobility prompted white planters to improve the quality of black schools in the South. Grove and Heinicke, "Better Opportunities," assess—and reject—the hypothesis that the invention and

a migration this large likely had ramifications for the receiving economy as well. In particular, competition from migrant arrivals may have reduced the wages of existing northern workers. While black migration only increased the northern labor force by 4.5 percent, the number of black workers in the North more than doubled. If the average black and white worker were perfect substitutes, black migration would have been a drop in a very large bucket, and may have had a negligible effect on the average northern wage. If instead black migrants were closer substitutes to existing black workers, the negative wage effects of black migration would be concentrated among the small group of northern blacks.

In this article, I calculate what the pace of black and white wage growth in the North would have been from 1940 and 1970 in the absence of southern migration. The key parameter in this counterfactual exercise is the elasticity of substitution by race. Following George Borjas and Gianmarco Ottaviano and Giovanni Peri, I start with a production function in which an aggregate labor input is subdivided into skill groups by education and experience level.⁴ Workers are assumed to be perfect substitutes with others of the same race and skill group, but to be imperfect substitutes with those of a different race or skill level. The elasticity of substitution by race can be recovered by estimating the relationship between changes in the black-white wage gap and changes in the ratio of black to white labor supply within a skill group over time. Southern migration generates shocks to the racial composition of northern skill groups that can be used to identify this parameter.

I find that white wages fall as either black or white labor flows into a skill group, but that black wages are only sensitive to black labor supply. The implied elasticity of substitution between similarly skilled black and white men ranges from 8.3 to 11.1 and is estimated with enough precision to reject perfect substitution. This finding is robust to using an instrumental variables procedure to address the concern that southerners chose to move North when wages in their race-by-skill cell were high. By this metric, blacks and whites were more substitutable in the postwar North than foreign- and native-born workers within similarly defined skill groups are today (elasticity = 5.6).⁵ However, we

diffusion of the mechanical cotton picker was a response to black out-migration. In *The Southern Diaspora*, Gregory offers a comprehensive historical account of how black and white migration from the South transformed the nation along religious, political, and economic lines.

⁴ Borjas, "Labor Demand Curve"; and Ottaviano and Peri, "Rethinking." Borjas was, in turn, building on Welch, "Effects," who developed a similar framework to explore the effect of changes in the age distribution on the labor market. See also Card and Lemieux, "Can Falling Supply."

⁵ Ottaviano and Peri, "Rethinking."

must use caution when comparing across time periods because, as I show below, substitutability in the labor market, both across education groups and across experience levels, also appears to have been higher in the past.

The low elasticity of substitution between black and white workers in the same skill group could be driven by either direct discrimination in job assignment or differences in unobserved skill.⁶ The average black student likely attended schools of lower quality than the average white student, particularly in the *de jure* segregated South. Southern black schools offered fewer resources per pupil and shorter school terms.⁷ To disentangle direct discrimination from unobserved skill, I reestimate the model with skill groups defined by likely days, rather than years, of completed schooling and I find that school quality can explain around two-thirds of the imperfect substitutability by race with the broader skill cells.

Using the estimated elasticity of substitution by race within skill groups, I calculate what the black-white wage gap would have been in the North under a no-migration scenario. The actual wage gap between blacks and whites in the North declined by 15 log points from 1940 to 1970. I predict that, without southern migration, the wage gap would have declined by an additional five to seven points (30 to 50 percent). Incorporating the effect of new arrivals on existing black workers modifies the prevailing view of the Great Black Migration. Smith and Welch estimate that the average black migrant experienced a 30 percent increase in annual earnings by moving northward.⁸ This figure translates into a gain of \$1,972 per migrant per year in \$2,000, or an aggregate gain of \$7.88 billion for the four million migrants who made the journey. The three million blacks already in the North in 1940 started with higher average annual earnings of \$10,509 in \$2,000. A 7 to 10 percent decline in wages due to labor market competition translates into an aggregate loss of \$2.21 to \$3.15 billion for this group. While this exercise does not capture all of the gains and losses from migration—for example, it does not take into account possible wage gains in the South with a falling labor supply—we can conclude that the migration had clear winners and losers.

⁶ Statistical discrimination may provide a third explanation for the lack of interchangeability between black and white workers. The arrival of lower-skilled black workers from the South could reduce wage offers for northern-born blacks if employers infer a worker's ability from the average skill level in his race-by-education group.

⁷ Margo, *Race*; and Card and Krueger, "School Quality."

⁸ Smith and Welch, "Black Economic Progress." The return to migration may not have been as high in real terms given the cost of living differences between the two regions.

TABLE 1
REGIONAL DIFFERENCES IN BLACK-WHITE WAGE CONVERGENCE, 1940–1970

Region	1940	1940–1950	1950–1960	1960–1970
Northeast	0.466	–0.119	0.038	–0.047
Midwest	0.436	–0.162	0.045	–0.069
West	0.428	–0.137	0.034	–0.042
South	0.689	–0.110	0.024	–0.089
National	0.685	–0.187	0.017	–0.097

Notes: The first column presents the log wage gap between black and white men in 1940. Subsequent columns show changes in this gap over the following three decades. Wages are reported for men aged 18–64 who are not living in group quarters, in the armed forces, or in the farm sector. In addition, men must not be enrolled in school, be self-employed, or work part-time. All states in the southern census region are assigned to the South, with the exception of Delaware, the District of Columbia, and Maryland. The Northeast contains the New England and Mid-Atlantic Census divisions (as well as Delaware, DC, and Maryland). The Midwest encompasses the East and West North Central Census divisions and the West includes the Mountain and Pacific divisions.

Source: Ruggles et al., *Integrated Public Use Microdata Series*.

WAGE CONVERGENCE AND INTERREGIONAL MIGRATION,
1940–1970

Black-White Wage Convergence by Region

African Americans experienced two major episodes of wage convergence in the twentieth century, one during the 1940s and the other during the late 1960s and early 1970s. Table 1 presents decadal changes in the black-white wage gap, both nationally and by region. In every region, the sharpest decline in the black-white wage gap occurred in the 1940s, with blacks experiencing the largest relative gains in the Midwest and the West. Both of these regions exhibited strong labor demand during World War II, particularly in defense-related industry, where black wages may have been further buoyed by President Roosevelt’s executive order forbidding discrimination on the basis of race in firms holding government contracts.⁹

Black wages diverged slightly from white wages in the 1950s, a decade of slow growth following the war. Convergence returned in the 1960s, particularly in the South. John J. Donohue and James Heckman argue that, given the uniformity of black wage growth by age group, it is unlikely that black educational attainment can explain this round of

⁹ Collins, “Race.”

convergence. Instead, they suggest that strong convergence in the South is most consistent with an increase in the demand for black labor following a series of federal interventions in the southern labor market.¹⁰ Since 1975 black wage growth has kept pace with—or even fallen below—that of white wages.¹¹

Southern Migration to the North

The growth of industrial production during World War II attracted southern migrants to northern cities. Table 2 demonstrates that the black share of the northern workforce increased from 3.9 to 5.3 percent (36 percent) over the 1940s, with 80 percent of this increase due to new migrant arrivals. The relative size of this flow is akin to the high rate of immigration to the United States in the 1990s, when the foreign-born share of the population increased from 7.4 to 10.3 percent (39 percent). The war also ushered in a large flow of white southern migrants, which is apparent in the third column of Table 2.¹² The pace of southern migration slowed in the 1950s, and then reversed in the 1960s.

In-migration generated a 102 percent increase in the black labor supply in the average skill cell.¹³ The extent of this migration-induced increase in black labor supply varied by education level. In 1940, 9.6 percent of northern workers with an elementary education (0–5 years of schooling) were black southerners. The black migrant share of the labor force in this group doubled by 1960. In contrast, while only 1.5 percent of men with 8–10 years of school were black migrants in 1940, the black migrant share of this group tripled over the next 20 years. The counterfactual exercise at the heart of this article calculates alternative wage levels for black and white workers under different assumptions about the percentage change in black labor supply. In general, lower education groups had a larger black presence in 1940, but experienced smaller migration flows in percentage terms over the next 20 to 30 years.

¹⁰ Donohue and Heckman, “Continuous versus Episodic Change.” See also Heckman and Payner, “Determining.”

¹¹ Bound and Freeman, “What Went Wrong?”; Grogger, “Does School Quality?”; Chandra, “Convergence”; and Neal, “Black-White Skill Convergence.”

¹² Gregory, *Southern Diaspora*.

¹³ Due to an earlier wave of black migration, 62 percent of the northern black labor force was already composed of southern-born men in 1940. Despite a large migrant flow over the next thirty years, the migrant share of the black labor force remained relatively constant. The first wave of black migration corresponded to the growth in industrial employment during the First World War and the introduction of immigration quotas in 1924, which slowed migration from Europe. See Collins, “When the Tide.”

TABLE 2
SOUTHERN MIGRANT SHARE OF THE NORTHERN LABOR FORCE, 1940–1970

	Total Labor Force		Black Workers	
	Share Black	Share Black, Southern Born	Share White, Southern Born	Share Southern Born
<i>All North</i>				
1940	0.039	0.024	0.039	0.623
1950	0.053	0.035	0.053	0.650
1960	0.059	0.037	0.062	0.624
1970	0.066	0.033	0.061	0.499
<i>0–5 yrs. of school</i>				
1940	0.125	0.092	0.042	0.745
1950	0.201	0.160	0.079	0.796
1960	0.230	0.195	0.143	0.849
1970	0.176	0.106	0.129	0.601
<i>8–10 yrs. of school</i>				
1940	0.030	0.015	0.037	0.486
1950	0.053	0.030	0.052	0.570
1960	0.072	0.041	0.061	0.561
1970	0.105	0.052	0.065	0.493

Notes: Regional definitions are described in the notes to Table 1. Means reported for men aged 18–64 who are not living in group quarters, in the armed forces, or in the farm sector.

Source: Ruggles et al., *Integrated Public Use Microdata Series*.

Evidence of Labor Market Segmentation by Race

In the mid-twentieth century, blacks and whites in the northern workforce possessed very different skill levels. Figure 1 presents the distribution of educational attainment for three groups of men working in the North in 1950: whites, southern-born blacks, and northern-born blacks.¹⁴ While northern-born blacks were better educated than their southern-born counterparts, both groups lagged behind whites in the North. For example, 19 percent of young southern-born blacks had

¹⁴ In the main results, the category “white” includes both whites born in the North and foreign-born whites residing in the North. I also provide separate estimates of the elasticity of substitution between black and white workers by white nativity status.

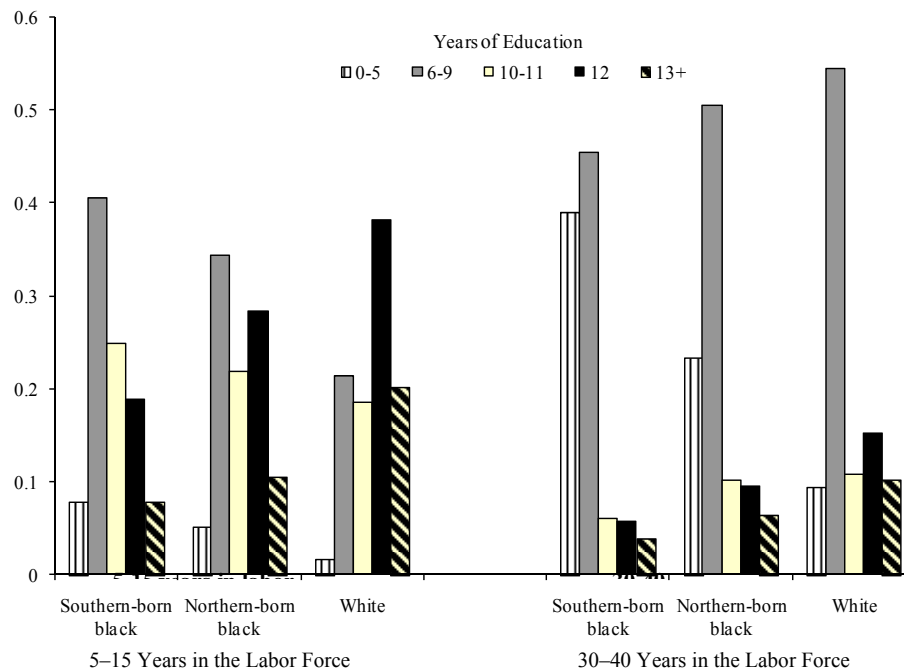


FIGURE 1
EDUCATIONAL ATTAINMENT OF MEN IN THE NORTHERN LABOR FORCE
BY RACE AND BIRTH PLACE, 1950

Notes: The sample includes all men working in the North in 1950 between the ages of 18–64 who are not living in group quarters, in the armed forces, or in the farm sector. Education categories loosely correspond to school levels: elementary (0–5 years); middle school (6–9 years); high school attendees (9–11 years); high school graduates (12 years); and men with at least some college (13 years or more).

Source: Ruggles et al., *Integrated Public Use Microdata Series*.

graduated from high school, compared to 28 percent of northern-born blacks and 39 percent of whites. Among older workers, only 5 percent of southern-born blacks had graduated from high school, compared to 10 percent of northern-born blacks and 16 percent of whites.

Even among men with the same years of schooling and job experience, black workers often found themselves limited to a proscribed set of occupations and tasks. Case studies document that blacks were prevented from working at some firms, holding certain occupations—including skilled crafts, retail, and clerical work—and ascending to supervisory positions.¹⁵

¹⁵ See, for example, Bodnar, Simon, and Weber, *Lives*; Trotter, *Black Milwaukee*; Gottlieb, *Making*; Grossman, *Land*; and Broussard, *Black San Francisco*.

Overtly discriminatory hiring practices were banned in many northern states in the 1940s and 1950s.¹⁶ Before that time, some firms simply refused to hire black workers. For example, for many years Ford Motor Company was the only automobile manufacturer in Detroit willing to hire black employees. As a result, in the early 1940s Ford employed 50 percent of black Detroiters and only 14 percent of local whites.¹⁷

Even within “integrated” firms, blacks faced limited job opportunities. In manufacturing, blacks were often restricted to the hottest, dirtiest, or most dangerous parts of the factory. At the United States Steel Corporation in Pittsburgh, for example, “black men could advance no higher than first helper in the open hearth department.”¹⁸ Joe William Trotter describes a similar process in Milwaukee, whereby tanneries employed blacks only in “the beam house, where dry hides were placed into pits filled with lime to remove hair,” and packinghouses “relegated Afro-Americans to the worst occupations . . . [in which they] unloaded trucks, slaughtered animals, transported intestines, and generally cleaned the plant.”¹⁹

Case studies of particular industries emphasize that race-based job assignments cannot be satisfactorily explained by skill differentials alone.²⁰ Many factory positions required only a few weeks of on-the-job training. As one of Peter Gottlieb’s interview subjects in Pittsburgh, Wesley M., attests: “I worked in that mill and I have learned those white boy[. . .] jobs. [They] would put them on my job, [and I would] learn them their jobs, but still I couldn’t get the [better] job.”²¹ Blacks were barred from crafts and trade work not for lack of ability, but because all-white or segregated unions limited their access to apprenticeships.²² Similarly, blacks were bypassed for promotion because many white workers refused to report to a black boss.²³ Even in West Virginia’s relatively equitable coal mining industry, in which blacks had access to high-skilled machine-cutting jobs, black workers rarely attained a supervisory position.²⁴

Census records provide supporting evidence of occupational segregation by race.²⁵ As one illustration, Figure 2 depicts the fifteen

¹⁶ Collins, “Political Economy.”

¹⁷ Maloney and Whatley, “Making.”

¹⁸ Gottlieb, *Making*, pp. 98–99.

¹⁹ Trotter, *Black Milwaukee*, p. 53.

²⁰ Wright, *Old South*.

²¹ Gottlieb, *Making*, p. 100.

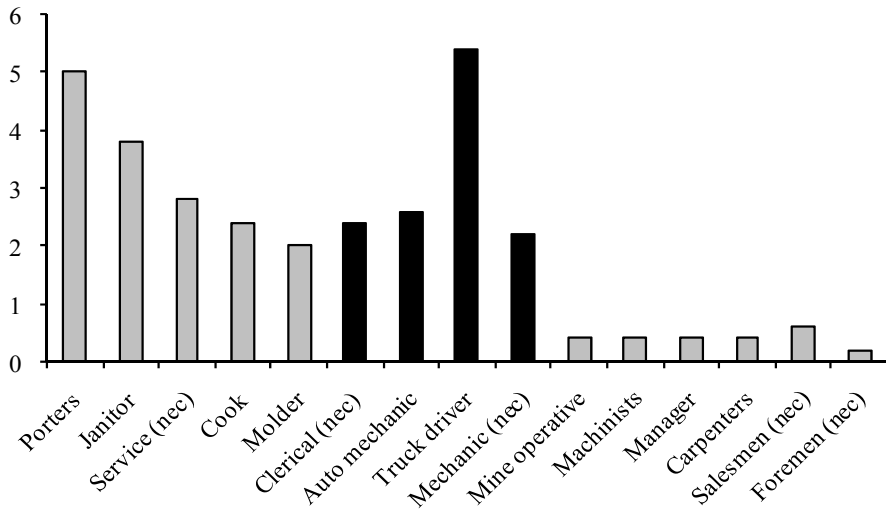
²² Foner, *Organized Labor*.

²³ Sundstrom, “Color Line.”

²⁴ Fishback, “Segregation.”

²⁵ Margo, *Race*; and Sundstrom, “Color Line.”

A. Black Men



B. White Men

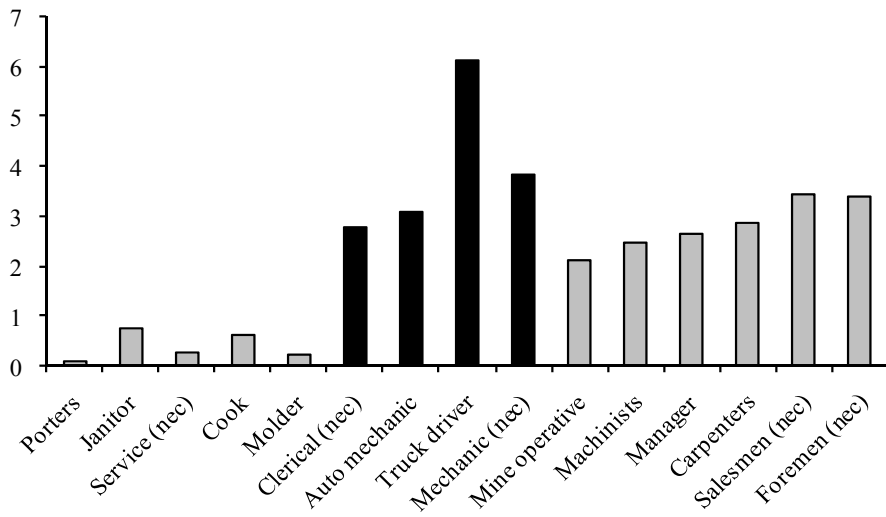


FIGURE 2
COMMON OCCUPATIONS FOR NORTHERN-BORN MEN WITH EXACTLY EIGHT
YEARS OF EDUCATION BY RACE, 1950

FIGURE 2 — continued

Notes: Graphs report the ten most common occupations held by either black or white men. These 15 categories employ 31 percent of blacks and 34.8 percent of whites. Occupations that employ at least 2 percent of men of both race are shaded. I omit two commonly held occupation categories—“laborer and operatives, not elsewhere classified”; 26.1 percent of blacks and 10.8 percent of whites are classified as “laborers, nec” and 15.8 percent of blacks and 17.8 percent of whites are classified as “operatives, nec.”

Source: Ruggles et al., *Integrated Public Use Microdata Series*.

most commonly held occupations among northern-born men with exactly an eighth grade education in 1950. Only three jobs—truck drivers, mechanics, and clerical workers—employ a sizeable share of men of both races. Black men are most likely to work in the stereotypical positions of janitor, cook, porter, and service worker, while white men hold three union posts (mine operatives, carpenters, and machinists), two supervisory positions (foremen and managers), and one position that requires interaction with the public (salesman).

A FRAMEWORK FOR ESTIMATING THE EFFECT OF BLACK MIGRATION ON NORTHERN WAGES

Theoretical Framework

The historical record provides suggestive evidence that similarly skilled blacks and whites were not perfect substitutes in the northern labor market. The migration of black southerners may therefore have represented a larger competitive shock to existing black workers than to their white counterparts. This section uses a simple production function to demonstrate the conditions under which black in-migration from the South would have slowed relative black wage growth in the North. The rest of the article will use this framework, along with estimated elasticity parameters, to calculate the effect of migration on the wages of existing black workers.

The analysis is based on a Cobb-Douglas production function in which capital (K) and labor (L) are combined to produce output

$$Y = A L^\alpha K^{1-\alpha} \tag{1}$$

Following Borjas and Ottaviano and Peri, I model labor as a composite of education groups (e), experience levels within education groups (x), and two racial groups (black and white) within each education-experience cell (r).²⁶ Each nested function exhibits constant elasticity of substitution (CES). The construction of the labor composite is detailed in the Theory Appendix.

²⁶ Borjas, “Labor Demand Curve”; and Ottaviano and Peri, “Rethinking.”

This production function embeds a set of assumptions about the role of race in the northern labor market. First, as with any neoclassical production function, it is assumed that workers are paid the value of their marginal product. In this model, black workers may be paid less than whites with the same level of education and experience only because of discrimination in job assignment, not because of unequal pay for the performance of identical tasks. This assumption appears to be consistent with the historical evidence; available payroll data show that black and white men employed in the same job at the same firm were usually paid the same wage.²⁷ Of more concern is the assumption that the wages of workers in one skill group can only be affected by the labor supply in another group if the elasticity of substitution between these groups is high. In the presence of statistical discrimination, the arrival of low-skilled blacks from the South could harm the job prospects of all black workers, including those of high skill, if employers use a single category to form expectations about black workers.²⁸ Concerned that rural migrants would reflect poorly on existing black workers, northern black newspapers published cartoons and editorials admonishing migrants to arrive punctually at work and to dress appropriately.²⁹ In the presence of such widespread statistical discrimination, the wage effects estimated here would be a lower bound.

In a competitive equilibrium, we can recover the wages of men with education level e , experience x , and race r by differentiating equation 1 with respect to L_{exr} ³⁰

$$\begin{aligned} \ln w_{exr} = & \ln(A^{1/\alpha} \kappa^{(1-\alpha)/\alpha}) + 1/\delta \ln(L) + \ln\theta_e - (1/\delta - 1/\eta) \ln(L_e) \\ & + \ln\theta_{ex} - (1/\eta - 1/\sigma) \ln(L_{ex}) + \ln\theta_{exr} - 1/\sigma \ln(L_{exr}) \end{aligned} \quad (2)$$

Wages depend positively on the own education-, experience-, and race-specific productivity terms (θ) and negatively on own-group labor supply. The extent to which labor supply in adjacent groups reduces own-group wages is determined by the elasticities of substitution by education (δ), experience (η), and race (σ).

Equation 2 allows us to analyze the effect of black migration on the wages of white and black workers in the North.³¹ Let's start with the

²⁷ Higgs, "Firm-Specific Evidence"; and Foote, Wright, and Whatley, "Arbitrating."

²⁸ Lieberson, *Piece of the Pie*.

²⁹ Grossman, *Land of Hope*.

³⁰ Following Ottaviano and Peri, "Rethinking," I first express output as a function of the capital-output ratio ($\kappa = K/Y$); this substitution will become useful later on.

³¹ Hamermesh, "Labor Demand," provides a general expression for the effect of an increase in the supply of factor b on the wages of factor a : $d \log w_a / d \log L_b = s_b (Y_{ab} Y / Y_a Y_b)$, where s_b is the share of income earned by factor b and Y_x denotes the partial derivative of output with respect to a factor x .

case of white workers in the education-experience group $e-x$. A portion of the black migration flows directly into this skill group. Black migration into group $e-x$ has the following effect on the wages of white workers in this cell

$$\frac{\Delta w_{exw}}{w_{exw}} = [1/\delta + (1/\eta - 1/\delta)(1/s_e) + (1/\sigma - 1/\eta)(1/s_{ex})] \cdot s_{exb} \cdot \Delta L_{exb}/L_{exb} \quad (3)$$

where s_{exr} refers to the share of income earned by men in education-experience-race group $e-x-r$. Other migrants have the same amount of education but different experience levels, while still others are in different education groups. These arrivals further influence the wages of white works in $e-x$

$$\Delta w_{exw}/w_{exw} = [1/\delta + (1/\eta - 1/\delta)(1/s_e)] \cdot s_{exb} \cdot \Delta L_{exb}/L_{exb} \quad (4)$$

$$\Delta w_{exw}/w_{exw} = 1/\delta \cdot s_{exb} \cdot \Delta L_{exb}/L_{exb} \quad (5)$$

Adding equations 3–5 across all skill groups contributing to the migration flow indicates the total effect of the migration on the wage of white workers in group $e-x$

$$\frac{\Delta w_{exw}}{w_{exw}} = 1/\delta \sum_i \sum_j (s_{ijb} \Delta L_{ijb}/L_{ijb}) + (1/\eta - 1/\delta)(1/s_e) \sum_j (s_{ejb} \Delta L_{ejb}/L_{ejb}) + (1/\sigma - 1/\eta)(1/s_{ex}) (s_{exb} \Delta L_{exb}/L_{exb}) \quad (6)$$

Equation 6 demonstrates that white wages will fall with migrant entry into the group's own education level and education-experience cell (terms 2 and 3). As a counterweight, wages will rise with an increase in labor supply into skill cells that are complements in production (term 1). For the time being, I will maintain the assumption that capital completely adjusts with the new labor supply, in which case we can ignore the impact of this inflow on K or the capital-labor ratio. I will relax this assumption below.

The effect of black migration on the wages of black workers in skill group $e-x$ is nearly identical to equation 6, but contains an additional term capturing the potentially imperfect elasticity of substitution between men of different races in the same skill group

$$\Delta w_{exb}/w_{exb} = \Delta w_{exw}/w_{exw} - 1/\sigma (\Delta L_{exb}/L_{exb}) \quad (7)$$

In the case of perfect substitution, σ is equal to ∞ and black migration will have an equal effect on black and white wages in the same skill

group. If σ is less than ∞ , the arrival of new black workers will have a larger negative effect on existing black workers.

Equations 6 and 7 demonstrate the effect of an increase in black labor supply on the wages of white and black men in a specific skill cell ($e-x$). The effect on *average* black and white wages will be a weighted sum of these cell-specific effects. Black migration will have a larger effect on average black wages if: (1) the skill distributions of whites and blacks are sufficiently different, or (2) the elasticity of substitution by race (σ) is low, augmenting the effect of black migration on black wages *within* each skill cell.

Estimating Equation

Obtaining an unbiased estimate of the elasticity of substitution by race (σ) is central to understanding the effect of black migration on relative black wage growth in the North. A simple expression for σ can be found by taking the ratio of black to white wages in a skill group $e-x$ from equation 2

$$\ln(w_{exb}/w_{exw}) = -1/\sigma \ln(L_{exb}/L_{exw}) + \ln(\theta_{exb}/\theta_{exw}) \quad (8)$$

The black-white wage gap in skill group $e-x$ is a function of the ratio of black to white labor supply in that group and the ratio of the race-specific productivity terms. If blacks and whites are perfect substitutes ($\sigma = \infty$), the wage ratio will be invariant to relative supply. A positive coefficient on the relative supply term implies that black and white workers in the same skill are not used interchangeably in production ($\sigma \neq \infty$).

I estimate a version of equation 8 by pooling data from four census years (1940–1970)

$$\ln(w_{exbt}/w_{exwt}) = \beta \ln(L_{exbt}/L_{exwt}) + e + x + \tau + (e \cdot x) + (e \cdot \tau) + (x \cdot \tau) + \varepsilon_{exbt}/\varepsilon_{exwt} \quad (9)$$

The regression contains fixed effects for education levels (e), work experience (x), and census year (τ), and all two-way interactions. The interactions ($e \cdot \tau$) and ($x \cdot \tau$) allow the returns to schooling and experience to change over time, and the interaction ($e \cdot x$) allows experience profiles to differ by education. The implied elasticity of substitution (σ) is equal to $-1/\beta$. β is identified from changes in relative black-white labor supply within a skill group over time. These changes can occur with differential rates of either educational attainment or in-migration. In the empirical analysis, I will focus on changes driven by migration.

DATA AND DEFINITIONS

I construct a skill group-level data set from census samples compiled by the Integrated Public Use Microdata Series (IPUMS). The northern economy is partitioned into 40 skill cells in each year based on five education categories and eight experience intervals.³² I define five levels of educational attainment: elementary school (0–5 years of schooling), middle school (6–9 years of schooling), high school attendees (10–11 years of schooling), high school graduates (12 years of schooling), and men with at least some college (13 or more years of schooling). I consider alternative divisions as a robustness exercise below.

Because the census does not collect information on work experience, I assign each individual a predicted level of work experience based on his age and years of completed schooling. I allow men to begin accruing labor market experience in the year after they leave school, but constrain the earliest age of labor market entry to be 13. Work experience is thus defined as $[\text{age} - \max\{\text{education} + 6, 12\}]$. I consider individuals who, by this measure, have one to forty years of work experience and divide this group into five-year intervals (1 to 5 years, 6 to 10 years, *et cetera*).³³

The dependent variable in the estimating equation is the ratio of annual earnings for blacks and whites in a skill cell.³⁴ The earnings ratio is calculated only for northern-born men who are not enrolled in school, self-employed, or working part-time (fewer than 40 hours per week).³⁵ Including southern migrants in the earnings measure would lead to composition bias. Migrants contribute more toward average earnings in cells with higher in-migration rates. Because southern black migrants earned more than their northern-born counterparts, even upon first

³² I allocate all men between the ages of 18 and 64 who are employed in the northern labor force into a skill cell, with the exception of men who reside in group quarters, are in the armed forces, or work in the farm sector.

³³ Men with 0–5 years of education accrue 1–5 years of experience between the ages of 13 and 18. Because entry into the sample begins at age 18, the lowest experience cell is unobserved for men in this education group. The remaining sample contains 156 skill cells (4 years · 5 education groups · 8 experience levels – 4 cells).

³⁴ While I refer to non-blacks as “whites” throughout the article, this group contains a small number of Asians and Native Americans.

³⁵ Excluding part-time workers and the self-employed is necessary to ensure comparability across census years. In 1940 the census did not collect information on self-employment income. In addition, in that year workers reported the number of weeks worked full-time, whereas in all subsequent years respondents reported any week in which they had worked for pay. Finally, I exclude full-time workers who report making less than one-half of the prevailing federal minimum wage and replace top-coded incomes with 1.4 times the top-code. See Goldin and Margo, “Great Compression”; and Margo, “Explaining,” for further discussion of these restrictions.

arrival in the North, including migrants in the earnings ratio would bias against finding negative wage effects of migration.³⁶

The key right-hand side variable in the estimating equation is the black-white labor supply ratio in a skill cell. Temporal variation in this ratio is driven by changes in skill levels across birth cohorts due either to migration from the South or to changes in the distribution of education among the northern-born.³⁷ Men are more likely to stay in school if they perceive high returns to doing so. As a result, educational upgrading across cohorts may be positively correlated with the race-specific productivity terms in equation 8. To avoid this source of bias, most of the article focuses on variation induced by migration flows. I discuss concerns with this source of variation in the next section. Southern migrants include all men who were born in a southern state and reside in the North.³⁸ For brevity, I often refer to a change in the number of black southerners in a skill cell as a “flow” of new black migrants, though this change could, in principle, be due to reverse migration to the South. Summary statistics for annual earnings and labor supply by skill group are presented in Appendix Table 1.

ESTIMATING THE ELASTICITY OF SUBSTITUTION BY RACE WITHIN SKILL GROUPS

Baseline Results: Skill Groups Defined by Education and Experience Level

Table 3 investigates the relationship between changes in the black-white wage gap and in the ratio of black to white migrant labor supply within skill cells. Every cell in the table reports the main coefficient from a different specification of equation 9 where the logarithm of black and white earnings (or their ratio) are regressed on the logarithm of black and white migrant labor supply. As the first row demonstrates, black wages fall both in absolute terms and relative to white wages in skill cells that experience a migration-induced increase in relative black

³⁶ Masters, “Black Migrants”; Long and Heltman, “Migration and Income Differences”; Margo, *Race and Schooling*; and Vigdor, “Pursuit.”

³⁷ For example, (most of the) men with 1–5 years of labor market experience in 1940 belong to the 1915–1920 birth cohort, while men in this experience group in 1950 belong to the 1925–1930 birth cohort.

³⁸ I cannot observe the interregional migration activity of the foreign-born. Implicitly, I assume here that the foreign-born do not relocate from South to North once they enter the country. The foreign-born are included with northern-born natives in calculating the dependent variables. I drop individuals whose birthplace is not reported (0.1 percent of the sample).

TABLE 3
RELATIVE BLACK LABOR SUPPLY AND THE BLACK-WHITE WAGE GAP IN THE
NORTH, 1940–1970

RHS: Migrant Labor Supply	Dependent Variable: Wages			RHS: Total Labor Supply
	ln(black/white)	ln(black)	ln(white)	ln(black/white)
Panel A: OLS				
1. ln(black/white)	-0.120 (0.048)	-0.137 (0.049)	-0.017 (0.017)	-0.186 (0.089)
2. ln(black)	-0.124 (0.052)	-0.146 (0.051)	-0.022 (0.014)	-0.178 (0.087)
ln(white)	0.083 (0.057)	0.052 (0.060)	-0.031 (0.019)	0.120 (0.071)
Panel B: IV				
1. ln(black/white)	-0.090 (0.068)	-0.119 (0.069)	-0.029 (0.021)	-0.097 (0.085)
2. ln(black)	-0.088 (0.069)	-0.114 (0.068)	-0.027 (0.017)	-0.105 (0.085)
ln(white)	0.061 (0.101)	0.058 (0.105)	-0.002 (0.029)	0.061 (0.085)

Notes: $N = 156$. In Panel A, each cell contains a coefficient from a separate OLS regression of the logarithm of black or white wages (or their ratio) on the logarithms of black and white migrant labor supply (or their ratio) by skill group over time. Standard errors are presented in parentheses and are clustered by skill group. The labor supply count includes southern-born men working in the North between the ages of 18–64 who are not living in group quarters, in the armed forces, or in the farm sector. Annual earnings are calculated for northern-born men who, in addition to the sample restrictions above, are not enrolled in school, self-employed, or working part-time. Skill groups are defined by five education categories and eight experience intervals. Observations are weighted by the number of northern-born men used to calculate mean annual earnings. Panel B presents coefficients from IV regressions. The instrument for black (white) migrant flow is the national stock of southern-born men by race in the skill group living either in the North or the South. First-stage results are reported in Table 4. In the final column, the black-white wage ratio is regressed on the total black-white ratio of labor supply. In Panel A, the migrant labor supply ratio is used as an instrument for total labor supply ratio. The first-stage coefficient is 0.645 (s.e. = 0.110). In Panel B, the ratio of the national stocks of southern-born men by race is used as an instrument for the total labor supply ratio.

Source: Ruggles et al., *Integrated Public Use Microdata Series*.

labor supply.³⁹ The coefficient in the first column implies an elasticity of substitution by race within skill group of 8.3 ($= 1/0.120$). In the next two rows, I split the labor supply ratio in two and separately enter the levels of black and white migration. The wages of northern-born black

³⁹ Sundstrom, “Geography,” finds a similar pattern across southern counties in 1940. Counties with a larger ratio of black-to-white labor supply also had larger black-white wage gaps.

men fall when black southerners in their skill cell move North, but increase slightly with white southern in-migration. On the other hand, an increase of either black or white labor supply reduces the wages of white workers to an equal degree. Interestingly, foreign-born whites appear to be much more easily substituted for black workers in their skill group than are native-born whites. We cannot reject the possibility of perfect substitutability between blacks and foreign-born whites (estimated elasticity = 16.4). In contrast, the elasticity between native-born whites and blacks is 7.9 and statistically different from zero.⁴⁰

Estimating the relationship between the black-white wage gap and the full labor-supply ratio, rather than the ratio of migrant labor supply, produces a coefficient that is only half as large and is not statistically significant (not shown). However, educational improvements across cohorts will bias the estimate upward—that is, towards zero—if men invest in education when (expected) wage offers are high. Column 4 uses migration-induced changes to instrument for all changes in labor supply. The implied elasticity of substitution is similar to the earlier results obtained from entering the migrant labor supply ratio directly. We can think of the main OLS equation as the reduced form of this two-stage least squares estimation process.

Southerners might choose to migrate when northern wages in their race-by-skill cell are high. In this case, migration flows will be correlated with unobserved race-specific productivity terms and OLS coefficients will be biased upward (see equation 8). A possible solution is to instrument for black and white migrant flows using the stock of southern-born men by race in a skill cell. The stock of southern-born men includes both men who chose to migrate North and men who chose to remain in the South.⁴¹ The validity of this instrument rests on the assumption that neither demographic patterns nor educational upgrading in the South—two factors that affect the stock of southern-born men in each skill cell—are influenced by northern wages. This assumption may be violated if southerners consider the option of migrating to the North when making their human capital decisions. However, education decisions occur early in life. While these decisions are forward looking, it is unlikely that southerners would have been able to predict race-specific wage patterns in the North 20 or 30 years into the future.

Table 4 presents a set of first stage results in which the national stock of southern-born men in a skill cell is used to predict the flow of

⁴⁰ Boustan, "Competition."

⁴¹ During this period, 16 percent of white men and 27 percent of black men in the average cell who were born in the South resided in the North.

TABLE 4
 FIRST STAGE RESULTS: PREDICTING THE FLOW OF NEW SOUTHERN MIGRANTS
 TO THE NORTH USING THE NATIONAL STOCK OF SOUTHERN-BORN MEN WITHIN
 SKILL CELLS, 1940–1970

Dependent Variable: Migrant Labor Supply in the North			
RHS: Stock of Southern-Born Men	ln(black/white)	ln(black)	ln(white)
ln(black)	1.052 (0.091)	0.950 (0.092)	-0.101 (0.080)
ln(white)	-0.857 (0.126)	0.104 (0.128)	0.961 (0.111)

Notes: $N = 156$. Each column contains a regression of the logarithm of black or white migrant labor supply in the North (or their ratio) on the logarithm of all black and white men born in the South by skill group over time. Standard errors are presented in parentheses and are clustered by skill group. Skill groups are defined by five education categories and eight experience intervals. Observations are weighted by the size of the underlying northern-born sample used to calculate mean annual earnings. The sample restrictions and sources are described in the notes to Table 3.

southern migrants to the North. The first-stage regressions include the full set of dummy variables contained in the second stage. Not surprisingly, the stock of black southerners in a cell strongly predicts the southern black migrant flow into that cell in the North and the stock of white southerners predicts the white migrant flow; neither stock is significantly associated with the migration patterns of men of the opposite race.

The second panel of Table 3 contains second stage coefficients from an IV regression that instruments for the migrant flows with the southern-born stocks. The qualitative pattern in the IV regressions is similar to OLS, but the standard errors increase. As a result, the effect of relative labor supply on black wages and the black-white wage gap is no longer significant. However, in comparing the point estimates, there is no evidence that the OLS coefficients are biased downward by endogenous relocation. If the migrant flow into a skill cell increases when race-specific productivity (wages) are high, we would expect the IV coefficients to be *larger* in absolute value than their OLS counterparts. If anything, they are a little bit smaller. It is important to keep in mind that the migration decision entails a comparison of relative wages in the source and destination regions. Periods of increasing labor demand for black workers in the North could coincide with *even larger* increases in race-specific labor demand in the South.⁴²

⁴² In the working paper version of this article (Boustan, “Competition”), I demonstrate that

Accounting for Imperfect Substitution: Discrimination versus Unobserved Skill

Thus far, the results suggest that blacks and whites with the same years of schooling and work experience were not used interchangeably in production in the postwar North. This lack of interchangeability could be due to discrimination in job assignment or to differences in unobserved skill, perhaps due to disparities in school quality. Derek A. Neal and William R. Johnson document that black men score well below white men with identical years of reported schooling on standardized tests, suggesting that years of education is not a sufficient measure of skill.⁴³ Some of this test score gap could be due to the lower quality of schools attended by the typical black student. *De jure* black schools in the South provided substantially fewer resources per pupil. As a result, black schools had higher pupil-teacher ratios and shorter-term lengths.⁴⁴ Other aspects of school quality, including the quality of teachers and peers, surely differed as well but remain unobserved.

To disentangle discrimination from differences in unobserved skill, I adjust years of schooling for differences in school quality and reestimate the elasticity of substitution within these more precisely defined skill groups. I focus on differences in the length of the school term because, while the literature is unequivocal that time spent in school earns a market return, it is mixed on the value added of small class sizes.⁴⁵ Using data on average term length by race, state of birth, and birth cohort, I convert years of completed schooling into likely days spent in the classroom.⁴⁶ I replace year-based education categories with day-based equivalents according to an 180-day school term. For example, the lowest education group translates into 900 or fewer days of likely school attendance, rather than five or fewer years of educational attainment.

Table 5 reestimates the main results using these adjusted skill groups. The magnitude of the point estimates falls by two-thirds in this setting. The implied elasticity of substitution by race within skill cells is high ($23.8 = 1/.042$), but remains significantly different from perfect substitutability (that is, we can reject that $\beta = 0$). The qualitative

the main results are robust to partitioning the economy by occupation and experience, rather than by education, or to redefining the education groups. Results are also qualitatively similar when women are added to the labor supply counts.

⁴³ Neal and Johnson, "Role of Pre-Market Factors."

⁴⁴ Margo, *Race*.

⁴⁵ Hanushek, "Evidence"; and Krueger and Whitmore, "Effect."

⁴⁶ Card and Krueger, "School Quality."

TABLE 5
RELATIVE BLACK LABOR SUPPLY AND THE BLACK-WHITE WAGE GAP IN THE
NORTH WITH EDUCATION LEVELS ADJUSTED FOR TERM LENGTH, 1940–1970

Migrant Labor Supply	Wages		
	ln(black/white)	ln(black)	ln(white)
1. ln(black/ white)	-0.042 (0.025)	-0.031 (0.030)	0.010 (0.006)
2. ln(black)	-0.041 (0.025)	-0.028 (0.028)	0.013 (0.005)
ln(white)	0.035 (0.067)	-0.009 (0.080)	-0.049 (0.017)

Notes: $N = 156$. Each cell contains a coefficient from a separate OLS regression of the logarithm of black or white wages (or their ratio) on the logarithms of black and white migrant labor supply (or their ratio) by skill group over time. Standard errors are presented in parentheses and are clustered by skill group. The sample restrictions and sources are described in the notes to Table 3. Skill groups are defined by five education categories and eight experience intervals. Education categories are based on expected classroom days rather than years of reported schooling using data on average term length by race, state, and birth cohort (Card and Krueger, “School Quality”). Observations are weighted by the size of the underlying northern-born sample used to calculate mean annual earnings.

patterns are similar to the results using the unadjusted skill groups. As before, black wages fall with an increase in black labor supply but are unaffected by changes in white labor supply. White wages are now sensitive only to white labor supply. One interpretation of this finding is that two-thirds of the estimated imperfect substitutability by race in Table 3 is driven by differences in the quality of education attained by blacks and whites, while the remaining one third is due to discrimination in job assignment for men with otherwise identical skill.⁴⁷ With better measures of school quality, the share of the imperfect substitution that can be attributed to discrimination may fall even further.

COUNTERFACTUAL RATES OF BLACK-WHITE WAGE CONVERGENCE

The theoretical framework illustrates how an influx of black workers could affect northern wages within the context of a neoclassical production function. According to the model, black migration would

⁴⁷ Alternatively, the lower-point estimates may simply be due to measurement error. If term length is *not* closely associated with skill, this procedure would be adding noise to an otherwise reasonable assignment to skill groups.

have had a larger effect on black wages if black and white workers occupied different portions of the skill distribution or if the elasticity of substitution within skill groups by race was low. In this section, I calculate counterfactual levels of wage convergence in the North within this framework. If there had been no new black migration to the North after 1940, would the wages of northern black workers have increased at a faster rate?

Equations 6 and 7 detail how the wages of white and black workers change following a percentage change in black labor supply. The magnitude of these changes depend on the size of the labor supply shift due to black migration ($\Delta L_{exb}/L_{exb}$); income shares for black workers by skill group (s_{exb}); and three elasticity estimates (δ , η , and σ). The first two components can be calculated directly from census data. The elasticity of substitution by race within skill group (σ) was estimated in the previous section. Estimates of δ and η can be obtained by aggregating the workforce into education-experience groups or education categories alone and estimating the wage response to an increase in own-group labor supply over time. The resulting coefficients, which are based on data from 1940 to 1970, are 0.192 (s.e. = 0.044) and 0.266 (s.e. = 0.138). The elasticity of substitution implied by these coefficients is 5.20 across experience levels and 3.75 across education groups. Comparing these results with Borjas' more recent estimates of 3.47 and 1.35 suggests that there was a greater scope for substitution across skill categories in the mid-twentieth century.⁴⁸

In the counterfactual scenario, the northern black labor force is only allowed to grow through natural increase. The black migration flow into every skill group is set to zero. The percentage increase or decrease in average wages from 1940 to 1970 under this scenario (relative to their actual levels) are reported in Table 6. Wage effects are aggregated into five education categories by race. A positive sign indicates that wages would have been *higher* if not for the black migration flow.

The wage effects in the first two columns are calculated using the OLS and IV estimates of σ respectively (Table 3). In both cases, limiting southern black migration would have had large positive effects on black wages, particularly for blacks with ten or more years of education. The lowest education groups already faced a large supply of black southerners from the first, World War I-based wave of migration. The flow of new migrants from 1940 to 1970 was only large

⁴⁸ I conduct the counterfactual wage calculations using both sets of parameter estimates, and the results are almost entirely unchanged (not shown). See Borjas, "Labor Demand Curve."

TABLE 6
COUNTERFACTUAL WAGE INCREASE FOR BLACK MEN UNDER A “NO SOUTHERN
MIGRATION” SCENARIO, BY EDUCATION CATEGORY FOR 1940 THROUGH 1970

	Alternate Estimates of σ				
	OLS	IV	Perfect Substitution ($\sigma = \infty$)	Fixed Capital Stock (Using IV)	Counter Factual 1940–1950
<i>Black</i>					
0–5 years	-0.011	-0.011	-0.011	0.001	0.006
6–9 years	-0.008	-0.009	-0.012	0.005	0.015
10–11 years	0.154	0.117	0.009	0.131	0.065
12 years	0.243	0.184	0.008	0.198	0.066
13+ years	0.162	0.121	0.002	0.135	0.022
Mean	0.096	0.072	-0.002	0.085	0.036
<i>White</i>					
0–5 years	-0.011	-0.011	-0.011	0.001	-0.002
6–9 years	-0.011	-0.012	-0.012	0.002	-0.003
10–11 years	0.000	0.003	0.010	0.016	0.002
12 years	-0.001	0.001	0.008	0.015	-0.001
13+ years	-0.007	-0.006	0.002	0.008	-0.005
Mean	-0.005	-0.004	-0.000	0.010	-0.002
<i>Difference</i>	0.102	0.075	-0.002	0.075	0.038

Notes: Counterfactual wage growth calculations are based on equations 6 and 7 in the text. Estimates of δ and η are reported in the text. Changes in labor supply due to black migration ($\Delta L_{exb}/L_{exb}$) and income shares for black workers by skill group (s_{exb}) are calculated from the 1940 and 1970 IPUMS. Average wage effects are constructed by weighting the contributions of each skill group by their share of the total (race-specific) wage bill. Columns 1–4 reflect different estimates of σ . Column 1 uses the OLS estimate in Panel A of Table 3. Column 2 uses the IV estimate from Panel B of Table 3. Column 3 is calculated under the assumption of perfect substitution by race within skill groups ($\sigma = \infty$). Column 4 assumes a fixed supply of capital in the North. Column 5 presents a similar counterfactual for the 1940–1950 migration alone using the IV estimate of σ . δ , η , and σ are estimates of the elasticity of substitution by education level, experience level, and race, respectively.

enough to replace the preexisting stock (Table 2). As a result, for low-skilled workers, the dominant effect of the migration was to increase complementary factors, thus increasing wages slightly (by around 1 percent). In contrast, while there were few southern blacks among the

high school attendees and graduates in the northern labor force in 1940, the stock of southern blacks in these education groups tripled by 1970 (Table 2). On average, I calculate that, if not for the ongoing southern migration, average black wages in the North would have been 7.2 to 9.6 percent higher by 1970. The distribution of wage effects is more uniform when focusing on the migrant flow in the 1940s (column 5). Over this decade, a larger share of the new arrivals entered the lowest education groups. Therefore, forestalling migration in this period would have buoyed the wages of black elementary and middle school attendees as well.

The second panel of Table 6 demonstrates that black migration had essentially no effect on white wages. Black migration simply did not represent a large enough increase in total northern labor supply to greatly influence white wages. Taken together, we can conclude that, absent migration, black workers would have experienced an additional 7 to 10 percent increase in wages relative to white workers. The foregone wage convergence in the North due to migration is large relative to actual wage growth. In 1940 northern blacks earned 45 percent less than northern whites (Table 1). Over the next thirty years, this gap declined by 15 log points. A 7 to 10 percent increase in black wages (absent migration) would have translated into an additional 5 to 7 percentage point reduction in the black-white wage gap.⁴⁹

The next two columns in Table 6 examine the impact of black migration on northern wages under two alternative sets of assumptions. Column 3 recalculates the wage effects under the assumption that black and white workers are perfect substitutes within skill groups ($\beta = 0$ or $\sigma = \infty$). While, in theory, black migration may still have had a larger effect on existing black workers due to differences in skill distributions by race, I do not find this to be the case. Instead, ending black migration would have increased the wages of high school attendees and graduates of *both* races by around 1 percent and decreased the wages of less-educated men by an equivalent amount. These two effects would have offset one another, and so black migration would have had little effect on the average wages of men of either race in this scenario.

The fourth column of Table 6 relaxes the assumption that capital adjusts perfectly to the expansion of the northern labor force. Instead, I assume that capital remains unchanged even as the labor supply increases, resulting in a reduction in the capital-labor ratio and an associated decline in wages for all skill groups. This channel can be

⁴⁹ The average black wage was 70 percent of the average white wage in 1970. If the average black wage had grown by an additional 10.2 percent, it would have been 77.1 ($= 70 \cdot 0.102$) of the average white wage.

expressed as $-(1-\alpha) \sum_i \sum_j (s_{ijb} \Delta L_{ijb} / L_{ijb})$, where α is share of income earned by the labor aggregate. For $\alpha = 0.7$, the 4.5 percent increase in the total northern labor supply due to black migration would lead to an additional 1.3 percent decline in wages for all groups. As a result, black wages fall by 8.5 percent (rather than 7.2 percent) and white wages fall by 1.0 percent (column 4). Whether one prefers the estimates in columns 2 or 4 depends on how responsive one believes capital to be.⁵⁰ However, the choice between an elastic or inelastic capital stock has no effect on the *wage convergence* results because capital adjustment would have an equal effect on both black and white wages.

CONCLUSION

Writing in the 1920s, W. E. B. Du Bois warned that the impending migration of a “great reservoir of [southern black] labor” to the North would generate competition for existing black workers in both the labor and housing markets.⁵¹ The 1940s ushered in an era of interregional migration at levels that Du Bois could have hardly foreseen, driven in part by a wartime boom in northern industry. Between 1940 and 1970 southern migrants more than doubled the black labor supply above the Mason-Dixon Line. New black arrivals reduced the wages of existing black workers in the North but had no effect on average white wages. I estimate that northern black wages would have grown by an additional 7 to 10 percent in the absence of southern migration. This finding modifies the current view of the Great Black Migration as a general avenue for black economic advancement. While migration was an important step in the alleviation of black rural poverty, it was also impediment to black wage growth in the urban North.

Beyond competition in the labor market, an influx of southern migrants may have generated other externalities for the northern black community. Prices and rents may have increased in black neighborhoods, schools may have overcrowded, and the level of parental education in the student body may have declined. On the other hand, migration may have amplified black political power in northern cities and, more speculatively, may have hastened the Civil Rights movement by recasting the “negro problem” as national—rather than simply a southern—concern.⁵² A more complete assessment of the effect of black migration on the northern economy awaits further research.

⁵⁰ Ottaviano and Peri, “Rethinking,” present evidence from the past three decades showing that capital is very responsive to immigrant arrivals.

⁵¹ Du Bois, “Hosts.”

⁵² Myrdal, *American Dilemma*.

While this article has focused on the black migration, competition between new and established migrants may have been a more general phenomenon in twentieth-century cities. As this article illustrates, the extent of competition between new and established migrants depends on the specificity (or generality) of skills held by a particular ethnic group and the presence (or absence) of discriminatory barriers. One implication of this framework—which remains to be tested—is that, ironically, first and second generation European immigrants may have benefited from the strict immigration quotas established in the 1920s.

Theory Appendix

The theoretical framework presents a Cobb-Douglas production function in which capital and a labor composite combine to produce output. This appendix describes the labor composite in more detail. I model the labor composite as a nested set of functions, each of which exhibit constant elasticity of substitution (CES). The layers of the labor composite include education groups (e), experience levels within each education group (x), and two racial groups (black and white) within each education-experience cell (r).

Total labor supply can be written as an aggregation of the contributions from each education group (L_e)

$$L = [\sum_e \theta_e L_e^{(\delta-1)/\delta}]^{\delta/(\delta-1)} \quad (\text{A1})$$

The θ_e terms are technology parameters that shift the relative productivity of education groups (normalized to sum to one). The variable $\delta > 0$ denotes the elasticity of substitution between workers with different levels of educational attainment.

In turn, the labor supply of each education group is a combination of the contributions of workers with different levels of experience

$$L_e = [\sum_x \theta_{ex} L_{ex}^{(\eta-1)/\eta}]^{\eta/(\eta-1)} \quad (\text{A2})$$

η measures the elasticity of substitution across experience levels within an education category. It is likely that workers are closer substitutes within education categories than across them; in this case, we expect $\eta > \delta$.

APPENDIX TABLE 1
SUMMARY STATISTICS FOR MEN IN THE NORTHERN LABOR FORCE, 1940–1970

	Total Labor Supply	Southern-Born Labor Supply	Wages
ln(black)	5.103 (1.127)	4.519 (1.170)	9.812 (0.424)
ln(white)	7.728 (1.174)	5.162 (1.053)	10.127 (0.419)
ln(black/white)	-2.863 (0.875)	-0.664 (0.669)	-0.319 (0.165)

Notes: Means within education-experience cells. Wages in 1999 dollars. The sample restrictions and sources are described in the notes to Table 3.

Finally, I allow black and white workers in the same skill group to be imperfect substitutes, perhaps due to discrimination in the labor market. The labor supply within an education-experience cell combines the contributions of black and white workers

$$L_{ex} = [\theta_{exw}L_{exw}^{(\sigma-1)/\sigma} + \theta_{exb}L_{exb}^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \quad (A3)$$

The θ_{exr} terms ($r = w, b$) are race-specific productivity parameters and σ is the elasticity of substitution between black and white men in the same skill cell. Appendix Table 1 gives summary statistics for annual earning and labor supply by skill group.

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