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ABSTRACT

Using data from the 1940-1980 Decennial Census and the 1988-1992 March Current Population Surveys, this paper examines the impact of industrial change on male wage inequality over a period of five decades (1940-1990). Alternative measures of skill such as the wage percentile, education and occupation indicate that wage inequality between more and less skilled male workers fell substantially during the 1940s and increased most dramatically during the 1980s. Examination of industrial change over this longer time period shows that the demand for the most highly educated and skilled male workers relative to the least skilled male workers increased no faster during the 1970s and the 1980s than during the earlier decades. In contrast, the demand for men in the middle skill categories (such as those in basic manufacturing) expanded during the 1940s and the 1950s and contracted severely during the 1970s and 1980s. This suggests that the growth of jobs in the middle skill categories may be closely related to overall wage inequality. Cross sectional regressions based on state level data also show some empirical support for the hypothesis that a decline in demand for medium skilled groups increases overall wage inequality.

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I. Introduction

A substantial literature now documents the rise in wage inequality in the U.S. over the 1980s. In various work, researchers have shown that wage differentials between college and high school graduates, between young and experienced workers, as well as wage inequality within groups have all expanded during the 1980s.[1] While there is still debate over the ultimate sources of these changes, most researchers seem to agree that recent changes in the wage structure reflect a significant rise in demand for skilled workers in the U.S. economy.

While much of the increase in skill requirements may have occurred within sectors (via skill-biased technological change, etc.) a significant amount may also be due to changes in the industrial structure of the U.S. economy. For example, to the extent that the manufacturing sector more intensively employs less educated males, the decline of the manufacturing sector will reduce the demand for less skilled workers and reduce the relative wages of less skilled workers.[2] In this paper, I evaluate these demand side explanations based on industrial change by extending the time period of observation back to 1940 and by looking at cross sectional differences across states in relative wages and industrial change.

The additional time series observations are important in that the changes in both

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[1]For background, see among others Blackburn, Bloom and Freeman [1990], Bound and Johnson [1989], Juhn, Murphy, and Pierce [1993], Katz and Revenga [1989], Murphy and Welch [1991,1992] and Levy and Murnane [1992].

[2] Whether these demand side factors are really the cause of recent changes in relative wages remains an open question since to this point the measured changes in demand for skill fall short of the measured increases in the relative supply of skill (see Katz and Murphy [1992]). Researchers have generally relied on the fact that these measured increases in the demand for skill go in the right direction (i.e. demand for skill increases as the relative price of skill increases) and the belief that they may be indicative of larger underlying changes in the structure of labor demand.

relative wages and industrial structure in the earlier decades are quite different from those in later decades. Looking at the long term changes in wage structure, wage inequality fell substantially during the 1940s, increased at an accelerating pace over the next three decades and finally, increased most dramatically during the 1980s. With regards to industrial change, sectors such as "low tech" manufacturing have been losing employment share since the 1940s while the professional and business service sector has been expanding more or less at a steady pace throughout the fifty year period, 1940 to 1990. This implies that the recently observed increase in the demand for skill is not a relatively new phenomenon but is a continuation of a trend dating back to at least 1940. Moreover, there is little evidence that demand for skill (where skill is measured either by education or position in the weekly wage distribution) increased at a significantly faster pace during the recent decades than during the earlier decades.

The one factor that does clearly distinguish the later from the earlier decades is the contraction of industries and occupations which predominantly employ moderately skilled male workers. There has been a significant decline in demand for male workers in the recent period and in particular, there has been a large decline in demand for male workers in the moderately skilled categories defined both in terms of wages and education level. The aggregate evidence suggests that the relative demand for moderately skilled workers may be closely related to overall wage inequality since the decades in which the demand for moderately skilled workers declined the most (least) are those in which wage inequality increased the most (least). A reasonably robust relationship can also be found in the cross section as well when measures of wage inequality (such as the 80-20 log wage differential) are regressed on a measure of relative demand for moderately skilled men using state level data.

While it is easy to see why a decline in demand for the middle skill groups would

expand inequality at the upper end of the wage distribution, it is not immediately clear why it would also lead to rising inequality between the middle and the bottom groups in the wage distribution as we have observed in the data. In a simple skill framework where workers of any particular skill category are equally good substitutes for workers in all other skill categories, a decline in demand for moderately skilled workers will reduce their wages relative to both highly skilled and less skilled workers but the relative wage between the highest and the least skilled workers will remain unchanged. The evidence presented in this paper suggests that such a simple skill model could not fully account for wage inequality changes over the past five decades. A skill based framework which appears to be more consistent with the data is one in which the moderately skilled workers are better substitutes for workers in the lower than the higher skill categories such that a decline in demand for the middle also reduces the wages of the least skilled relative to the high skilled group. What is more, the cross price effects between the demand for the middle and the wages of the least skilled have to be sufficiently large so that the least skilled lose relative to the medium skilled group as well.

The paper is organized as follows. Section II describes the Census and the March CPS data used in the analysis while Section III highlights the major changes in wage structure over the 1940 to 1990 period. Section IV examines the aggregate time series evidence on industrial change. Section IV begins by broadly describing the changes in employment distribution across industries and occupations. Demand and supply changes for workers of different skill category are then presented. Section V reports the cross-sectional regression results based on state level data from the Census and the March CPS. Section VI outlines a simple two-skill model which generates the type of cross effects between low, middle, and high skill groups broadly consistent with the times series and cross sectional data. Section VII provides a summary of the results.

II. The Data

The data used in this paper are from the 1940-1980 Decennial Census (1/100 sample) and the 1988-1992 March Current Population Surveys. For describing the wage changes, the sample was restricted to men with relatively strong labor force attachment. The wage sample includes men with 1 to 40 years of potential labor market experience who worked full-time, who were not self-employed, who worked a minimum of 40 weeks, and who earned at least one half the federal minimum wage on a weekly basis. The wage measure used is the log weekly wage calculated as the logarithm of annual earnings last year divided by weeks worked last year.

I measure industrial change by shifts in employment across different industry and occupation categories. While I am mainly interested in describing wage changes for men, for the purposes of describing changes in industrial structure, it is necessary to consider a larger sample including both men and women. To measure industrial change and its impact on demand for different types of labor, I therefore use a sample of men and women with 1 to 40 years of potential labor market experience who worked during the survey week and have reported industry and occupation of the current job. The quantity of labor supplied to each industry and occupation is the sum of workers in each group (where a group is defined by gender, education, and experience) weighted by the group-specific fixed wage. Therefore, for the purposes of measuring industrial change, the quantity of labor can be viewed as being measured in efficiency units rather than as counts of workers.

Throughout the paper I only consider the non-agricultural sector in the analysis. Any worker who reports to be working in the agricultural sector is excluded from the sample. Since a large fraction of workers in agriculture is self-employed and since self-

employed workers are deleted from the wage sample for comparability reasons, the only workers in the agricultural sector who remain in the sample are low wage farm workers. Given the choice of restricting the analysis to only the non-agricultural sector or including the agricultural sector with a largely unrepresentative population, I excluded the agricultural sector from the analysis. Exclusion of the agricultural sector will have only a minor impact on the results in decades other than the 1940s. During the 1940s there was a large shift in employment from the agricultural to the non-agricultural sectors. The decline in agricultural employment during the 1940s will appear as an increase in supply of workers in the non-agricultural sector. To the extent that the agricultural sector employs lower than average skilled workers, we will see a larger increase in supply of low skilled workers in the non-agricultural sector than would be seen for the economy as a whole during the 1940s.[3] The analysis throughout the paper will therefore refer to changes in wages as well as measured supply and demand for workers in the non-agricultural sector.

III. Changes in Wage Structure: 1940-1990

In this section, I document changes in the wage structure for men over a period of five decades from 1940 to 1990. Over this long time period there was substantial wage convergence between black and white workers. I leave that issue to be addressed in other studies and only focus here on wage changes among white males. I use three alternative measures of skill, the wage percentile, education and occupation to describe relative wage changes between skilled and less skilled workers. Panel A of Table 1

[3]On the other hand, we will see a smaller decline in the demand for low skilled workers in the non-agricultural sector than would be seen for the economy as a whole.

begins by presenting decade changes in log weekly wages of men by wage percentile category. Changes in the overall average log wage and in relative wages are shown in the bottom rows.

Table 1 illustrates the contrast in wage growth over the earlier decades, the 1940s, 1950s and the 1960s and the later decades, the 1970s and the 1980s. The first three decades were periods of strong wage growth for American male workers. Average wages increased 19.4, 29.7 and 24.1 percent over the 1940s, the 1950s and the 1960s respectively. Over the 1970s, however, wage growth slowed to a mere 5 percent. This contrast is actually somewhat understated in that if we were to choose 1973 as a benchmark rather than 1969 average wages would actually fall over the 1970s. In the 1980s there is clearly a decline in real wages for men with average wage falling by 7.8 percent over the decade.

In terms of relative wages, the most remarkable contrast is between the 1940s, a decade in which there was a large reduction in wage inequality, and the 1980s, a decade in which there was an expansion in inequality of almost equal magnitude. Table 1 shows that real wages of men in the bottom percentiles increased most rapidly from 1939 to 1949, rising by 26.4 percent for the 1-10 percentile group and by 31.5 percent for the 11-20 percentile group. Surprisingly, the 1940s was a period of slow wage growth for highly skilled workers as evidenced by the 9.1 percent and 7.0 percent wage increases in the top two wage categories. As noted by Goldin and Margo [1992], this translates into a dramatic fall in wage inequality over this period. The wage differential between workers in the 81-90 and the 11-20 percentile categories (hereafter referred to as the 80-20 differential) fell by 22.3 percentage points over the 1940s. Since the 1940s, however, there have been progressively larger increases in wage inequality over the next four decades. For example, the 80-20 differential rises slightly by 2.2 percentage points over

the 1950s, by 9.2 and 10.4 percentage points over the 1960s and the 1970s, and by 18.1 points over the 1980s. As a result the level of wage inequality is actually higher in 1989 than it was in 1939. For example, the 80-20 log wage differential among white men in the non-agricultural sector was .996 in 1939 and falls to .773 in 1949. By 1989, the 80-20 differential had increased to 1.172.

Panel B of Table 2 describes changes in wages by an alternative skill measure, education. For the purposes of isolating educational wage differences (net of experience effects), wages were first regressed on a fixed experience profile over all the years and then predicted at a fixed level of experience. Before presenting these results it may be useful to note that given the span of the data and the rise in the fraction graduating from college over this fifty year period, one would suspect that there are substantial changes in composition within these educational categories. For example, it may be difficult to compare the typical worker with 8-11 years of schooling in 1939 (when 46.6 percent of all male white workers fell into this category) to the worker in the same schooling category in 1989 (when only 9.0 percent fell into this category). These types of compositional changes within groups may be one reason why summarizing the data by wage percentile category would be preferable to summarizing the data by education. Despite these reservations, Panel B of Table 1 reports the decade changes in wages by educational category. By and large, changes in wages by education group tell a similar story of shrinking wage inequality over the 1940s and rising inequality in the 1980s. The most notable difference from the previous table is what happens over the 1970s. Wages of college graduates fell during 1970s while overall wage inequality increased. For example, the college-high school wage ratio fell 7.2 percent over the 1970s even as the overall 80-20 wage differential increased approximately 10 percent over the decade. This suggests that there was a large increase in within-group inequality over the 1970s and unlike other

decades the changes in within and between group inequality had opposite signs. It is more than likely that this contrast was driven by the large increase in the supply of college graduates over the 1970s.

Panel C of Table 1 presents wage changes by a final skill definition, occupation.[4] As with the previous panels, the 1940s again stands out as a period of shrinking inequality with the low skilled occupations such as laborers gaining on the high skilled occupations such as professionals and managers. In contrast, the 1980s was a period of dramatic increases in inequality with the low skilled occupations suffering large wage losses. Mirroring the changes shown in panel B, professionals and managers lost ground relative to other occupations during the 1970s. This confirms the view that at this aggregated level, wage changes by occupation look very similar to changes by education group shown in the previous panel.

To summarize, overall wage inequality (as measured by the wage differential between the 80th percentile and the 20th percentile worker) fell sharply during the 1940s and increased most dramatically during the 1980s. Other measures of skill, such as education and occupation, tell a similar story of contracting skill differentials during the 1940s and rising skill differentials during the 1980s. The one exception is the 1970s in which both educational and occupational wage differentials fell while overall wage inequality increased. These observations may be reconciled, however, by the fact that the 1970s was a period in which large baby boom cohorts entered college in record numbers. This extraordinary increase in supply most likely depressed the educational wage premium during the 1970s.

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[4]Since the occupational distribution shows smaller changes across the decades, occupation as a skill measure may be less subject to composition bias. In addition, compared to educational changes, occupational changes are more likely to reflect true skill changes rather than a simple re-labeling of workers.

IV. Industrial Change and the Demand for Skill

Having documented the major changes in the wage structure in the previous section, this section examines industrial change and its impact on the demand for workers of different skill category. Many authors have attributed the recent changes in wage structure to the changing industrial structure of the U.S. economy. In particular, many have noted the decline of traditional blue-collar manufacturing jobs and the rise of service sector jobs. Some authors (most notably Bluestone and Harrison [1989]) have argued that deindustrialization and the shift in composition of jobs from the so-called high-wage manufacturing jobs to low-wage service sector jobs were major contributing factors to the recent rise in wage inequality. Others (see, for example, Blackburn, Bloom and Freeman [1989], Juhn, Murphy and Pierce [1989], Karoly and Klerman [1992]) have found that such compositional changes account for at most 15 to 20 percent of the rise in the male wage inequality since the 1970s and emphasize the effects of such changes on the relative demand for skilled and less skilled workers.

Following the theme of deindustrialization, other authors have examined cross-sectional regional data to estimate the relationship between manufacturing employment and wage inequality (see, for example, Bound and Holzer [1991], Karoly and Klerman [1992], Borjas and Ramey [1992]). Manufacturing employment is typically found to be significantly and negatively related to measures of wage inequality such as the college high school wage premium, although the magnitude of such estimates are generally found to be small. In this paper, I focus on the impact of industrial change on wage inequality within the supply and demand for skill framework used extensively in Katz and Murphy [1992]. Within this framework, the decline of the manufacturing sector reduces the demand for skill groups employed intensively in the manufacturing sector. To the extent

that the manufacturing sector more intensively employs less or moderately skilled workers, the decline in demand then reduces the wages of these groups relative to skilled labor in all sectors. Tables 2 and 3 begin this analysis by describing the shifts in employment across industries and occupations. The impact of these changes on the demand for labor of different skill category are then measured and reported in Table 4.

Table 2 presents industry employment shares (measured in efficiency units) in the non-agricultural sector for the period 1940 to 1990. The table shows that the U.S. economy has indeed been moving towards a service economy. From an all time peak employment share of 32.3 percent in 1960, manufacturing's employment share fell to 21.1 percent by 1990. However, the decline in manufacturing and the growth of services were not the only notable changes which occurred over this long time horizon. Table 2 also shows that employment has been shifting steadily towards more skill-intensive sectors over the entire period. For example, "low tech" manufacturing which includes such traditionally low skilled industries as textiles and apparel has steadily lost employment share from 12.5 percent in 1940 to less than 5 percent in 1990.[5] Moreover these declines are at least as large during the 1940s (2.5 percentage points) as during the 1980s (1.4 percentage points). Likewise, industries such as retail and other services which employ a large fraction of the less skilled work force lost employment share over the 1940s and the 1950s. In contrast, skill-intensive industries which tend to employ college graduates have steadily been gaining employment share since 1940. Most notably, professional services and FIRE (finance, insurance and real estate) has gained approximately 150 percent in employment share over the full period with the fraction of

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[5]"Low tech" manufacturing includes lumber, furniture, stone, clay, glass, food, textile, apparel and leather. "Basic" manufacturing includes metal, machinery, auto and other transportation equipment, tobacco, paper, printing and rubber. "High tech" manufacturing includes such industries as aircraft, photographic equipment, chemicals and petroleum.

workers employed in that sector rising from 9.4 percent in 1940 to 23.6 percent in 1990.

To summarize, the employment shares of the most and the least skill intensive industries have followed a long run secular trend. If one were to look for patterns that distinguished the decades, it might lie in industries such as basic manufacturing. The employment share of basic manufacturing first rises from 13 percent in 1940 to 17.9 percent in 1960 before declining again to 12.5 percent in 1990. There is a particularly sharp increase in employment share over the 1940s, a decade in which less skilled workers recorded large wage gains on the average worker.

Table 3 presents employment shares across occupation categories for the period 1940 to 1990. As in the previous table, Table 3 shows that demand for skilled labor has been rising since at least 1940. The employment share of highly skilled occupations such as professionals increased from 11.1 percent in 1940 to 23.5 percent in 1990. Low skilled occupations in general declined over the entire period. For example, the share of laborers fell from 7.8 percent in 1940 to 3.1 percent in 1990 with the largest declines coming during the 1940s and the 1950s. Again, if one were to look for factors which distinguished the 1940s and the 1950s from the more recent period, it is in the medium skilled occupations such as crafts and operatives. The employment shares of both crafts and operatives increased during the 1940s but declined during the 1960s and the 1970s and declined most severely during the 1980s.

While examination of industry and occupation employment shares gives some preliminary indications of generally rising demand for skilled labor since 1940 it is difficult to assess the total impact of industrial and occupational changes on various skill groups from Tables 2 and 3. Table 4 quantifies this impact by constructing demand indices for various skill groups. Using the method first introduced by Freeman [1975] and used extensively in Katz and Murphy [1992], the change in demand for a particular

skill group is constructed as the weighted average of changes in employment shares by sector (defined by industry and occupation), where the weights are the group's initial employment distribution across sectors. It follows therefore that skill groups largely employed in expanding sectors (i.e. industry by occupation cells) will experience rising demand while those groups in contracting sectors will experience a fall in demand.

Panel A of Table 4 describes demand changes by skill groups defined by wage percentile category while Panel B describes demand changes by educational category. The changes in the overall demand for men are shown at the bottom of Table 4. As suggested earlier by Tables 2 and 3, Table 4 demonstrates that the increase in demand for skill observed over the recent period is not a relatively new phenomenon but is a continuation of a trend dating back to at least 1940. For example, according to Panel A of Table 4, the demand for workers in the bottom skill category (1-10 percentiles) fell as much as 12 percent during the 1940s while the demand for workers in the highest skill category (91-100 percentiles) increased 10 percent. In addition, there is little evidence that the relative demand for skill increased faster during the more recent period (when wage inequality increased) than during the earlier decades (when wage inequality actually fell or remained relatively constant). According to Panel A, the demand for the highest skilled workers increased approximately 13 percent faster than the demand for the least skilled workers during the 1970s and the 1980s but actually increased 22 percent faster during the 1940s. The relative demand changes by educational category shown in Panel B tell a slightly different story in that the 1940s (along with the 1970s) was indeed a decade of the slowest growth in the relative demand for skill. However, when education is used to proxy for skill, the demand for the most skilled (those with 16 or more years of schooling) grew as much as 29 percent faster than the demand for the least skilled (those with less than 8 years of schooling) during the 1950s, a period during

which wage inequality grew only a modest amount. Table 4 suggests that a simple relative demand for skill hypothesis which contrasts the demand for the most and the least skilled groups cannot fully account for the pattern of wage inequality we observe over the past five decades.

The one factor that does clearly distinguish the later from the earlier decades is the decline in demand for moderately skilled male workers. As shown in the bottom row of Table 4, there was a significant decline in demand for male relative to female workers. During the 1940s, the relative demand for men increased approximately 2 percent. During the 1980s, the relative demand for men declined as much as 4 percent. The decline in demand for male workers appears to have grown more severe over the past four decades particularly in the middle skill categories. For example, the demand for male workers in the middle wage category (41-60 percentiles) grew 3 percent during the 1940s, declined at a faster pace with each decade and fell 7 percent during the 1980s. Likewise, the demand for high school graduate men increased 2 percent during the 1940s and fell 8 percent during the 1980s.[6]

The worsening position of the middle skill groups is perhaps most clearly illustrated in Figure 1. Each panel in Figure 1 shows decade changes in relative demand by skill group defined as wage percentiles. Lines are drawn through the 20th and the 80th percentiles to highlight the changes in relative demand for the middle. During the 1940s, there was an increase in demand for all male workers except for those in the very bottom skill categories. During the 1950s, there is close to a linear relationship between

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[6]The demand changes reported in Table 4 are over or understated to the extent that changes in sectoral composition reflect at least partially a response to the observed wage changes rather than actual shifts in labor demand. Table 1 in the appendix makes adjustments for these price changes by adding the percentage price changes for labor in an industry/occupation cell to its percentage change in share. This corresponds to the case where the occupation and industry demands have unit own price elasticities and zero cross price elasticities. The price-adjusted demand changes show a smoother trend at the very top and the very bottom of the skill distribution while demand for workers in the middle show even greater variation across the decades.

skill (wage percentiles) and changes in demand with the highest skill groups experiencing the largest increases in demand and the lowest skill groups experiencing the largest declines. Beginning with the 1960s, the demand for middle skill groups have declined faster with each decade and have increasingly resembled the demand changes in the bottom skill categories. By the 1980s, there was growth in demand only at the very top of the wage distribution and workers in the middle fared no better (and actually have done slightly worse) than workers at the very bottom of the distribution. Figure 1 tells a clear story of progressively larger declines in demand for workers in the middle of the skill distribution. Since overall wage inequality (i.e. the 80-20 log wage differential) grew at a faster pace with each decade, declining demand for the middle appears to be one reasonable candidate explanation for the inequality changes observed over the past five decades. The relationship between these variables is further explored using cross-sectional state data in Section V.

The analysis so far has focused on changes in demand growth as the driving force behind the observed changes in inequality. An alternative reason would be that differential supply growth across decades lies behind the observed contrasts in inequality growth. For example, Katz and Murphy [1992] report that changes in demand measured by employment shifts between sectors fall short of the measured changes in supply so that we would predict an actual decrease in wage inequality. One potential explanation for the dramatic contrast between the 1940s and the 1980s may be that the 1940s was a decade of extraordinarily rapid educational attainment and skill upgrading in the economy. This hypothesis, however, does not appear to be correct as can be seen from Table 5.

Table 5 presents decade changes in the relative supply of workers by skill category (here again defined as wage percentiles). Education is the main force behind the

changes observed in Table 5, however, in that the relative supply of each percentile group is predicted by multiplying the group's initial distribution over education categories with the decade change in educational distribution. Table 5 shows that the 1970s was indeed the decade of fastest growth in the relative supply of educated workers to the economy with the supply of workers in the 81-90 and 91-100 percentile groups expanding by 13 and 26 percents respectively. On the other hand, the 1940s appear to be the decade of the slowest growth in the relative supply of skilled workers with the top percentile groups increasing 4 and 9 percents respectively. Since education and all other skill-based wage differentials fell sharply during the 1940s, Table 5 suggests that the relative supply of skilled workers could not have been the major contributing factor to the relative wage changes observed over the 1940s.[7]

The aggregate evidence described in this section suggests that relative demand for workers in the middle of the skill distribution may be closely linked with overall wage inequality. This hypothesis, along with other factors such as average wage growth and the percent of employment in manufacturing are explored in the next section using cross sectional state level data from the Census and the March CPS.

V. Regression Results From State-Level Data

In this section I examine regional variation in relative wages and industrial change. Previous work (for example, Juhn, Murphy and Topel [1991], Karoly and Klerman [1991, 1992], Topel [1992]) has indicated that substantial variation exists across

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[7]To the extent that workers in the agricultural sector were less educated than average, a decline in agriculture will increase the supply of less skilled workers to the non-agricultural sector. This will tend to understate the increase in relative supply of skill in the 1940s. However, one would suspect most of this bias to be apparent in the lower percentile categories. Even accounting for this bias, it would be difficult to summarize the 1940s as the decade of fastest supply growth.

regions in terms of wages and employment. Cross regional data, therefore, is a useful source of information for testing the various demand-side explanations suggested by the aggregate data in Section IV.

The aggregate evidence presented in Section IV suggests that a decline in the relative demand for the middle increases overall wage inequality. I test that hypothesis in this section by running cross sectional regressions on state level data from the 1940-1980 Census and the 1988-1992 March Current Population Surveys. I regress the change in the 80-20 log wage differential on the change in relative demand for moderately skilled workers. The relative demand variable is defined as the demand for male workers in the 21-80 percentile categories relative to all (male and female) workers. As with the aggregate demand indices reported in Table 4, the change in demand for a particular skill group is constructed as the average of changes in employment shares across industries and occupations weighted by the group's initial employment distribution across industries and occupations. The one extra complication is that these demand indices now have be calculated for each state. While industrial change at the aggregate level may be interpreted as largely exogenous, it is difficult to make the same argument in the cross sectional context. For example, low skilled industries may locate in a particular state because the price of low skilled labor falls in that state. Thus, in cross sectional data, it is more than likely that relative wage changes across states drive industrial change as well as the other way around. I take account of this endogeneity problem by using predicted industry and occupation employment shares by state (based on aggregate employment changes by industry and occupation and state employment shares) instead of the actual state employment shares.

As with the aggregate data presented in previous sections, I only focus on relative wage changes among men but include both men and women for the purposes of

calculating changes in industrial and occupational structure. For purposes of consistency, I include observations from 48 states excluding Alaska and Hawaii. All variables in the regression are specified as (decade) changes thereby controlling for state-specific fixed effects. In addition, I include year dummies to control for economy-wide time effects. Each observation in the regression is weighted by the total number of workers in the state over the entire period.

Column (1) in Table 6 presents the results from regressing the change in the 80-20 log wage differential (for men) on the change in relative demand for middle skill groups. In addition to year dummies, the regression controls for average wage growth and the relative supply of workers in different education categories. The coefficient on the relative demand variable (at -1.133) is fairly large and significant. A 10 percent increase in relative demand for the middle is predicted to reduce the 80-20 log wage differential by roughly 11 percentage points. The 80-20 log weekly wage differential was .887 in 1969 and 1.172 in 1989. This translates into an elasticity measure somewhere between .9 and 1.2.

How much of the large contrast in wage inequality between the 1940s and the 1980s can be accounted for by differential growth in the relative demand for the middle? According to the aggregate demand indices reported in Panel A of Table 4, demand for workers in the middle (wage percentiles 21-80) grew approximately 2.5 percent during the 1940s and fell approximately 6 percent during the 1980s, resulting in a differential of about 8.5 percentage points between the decades. This suggests that the severe decline in relative demand for moderately skilled workers in the 1980s relative to the 1940s can account for approximately 9 and 10 percentage points (.085 x 1.1) of the total 40 point differential in inequality growth that exists between these decades based on the cross sectional estimates from Table 6. That the relative demand variable cannot account for

a large fraction of the contrasts in wage inequality across the decades (despite the large coefficient reported in Table 6) is perhaps not too surprising given the fact that demand for skill measured by employment shifts between sectors have always fallen short of the measured increases in the relative supply of skill.

Column (2) in Table 6 presents the results of an alternative specification where the relative demand variable is interacted with year dummies to give estimates of the relationship by decade. The relative demand for the middle variable appears to be strongly and negatively related to wage inequality during the 1940s and the 1960s and the point estimates are negative for four of the five decades. The two variables show a positive (albeit insignificant) relationship during the 1950s. As reported at the bottom of Table 6, F-tests which test for equal coefficients across all the decades are rejected at the 4 percent level and the test that the coefficient is equal to zero in all the years is strongly rejected. While the relationship is not resoundingly stable, the regression results reported in Table 6 provide some empirical support for the hypothesis that a declining demand for the middle increases wage inequality.

While the relative demand variable works reasonably well in accounting for relative wage changes across the decades, there may simpler and more direct explanations which we have thus far overlooked. An alternative explanation considered in these regressions is average wage growth. Economists have argued for many years that productivity increases and rapid gains in the average real wage have disproportionately large benefits for workers at the bottom end of the skill distribution. The results reported in Table 6 indeed show that average wage growth is consistently and negatively related to increases in wage inequality. A 10 percent increase in average wages reduces the 80-20 log wage differential by 4.1 percentage points according to the cross sectional estimates in the table. Since average wages increase 19 percent during

the 1940s and actually fall 8 percent during the 1980s, the decline in average wages can account for approximately 11 percentage points (.27 x .41) of the 40 point differential in inequality growth between the 1940s and the 1980s. While average wage growth is somewhat successful in explaining the 1940s and 1980s contrast, it is less successful at explaining the differences in inequality changes between the 1940s and the 1950s or between the 1940s and the 1960s. The 80-20 log wage differential fell 22 percent during the 1940s when average wages grew 19 percent but actually increased during the 1950s and the 1960s when average wages grew at a faster pace (by 30 and 24 percents).

Another possible explanation is that the relative demand for the middle variable is largely capturing the effect of manufacturing employment. A number of studies using cross sectional data (Bound and Holzer [1991], Borjas and Ramey [1992], and Karoly and Klerman [1992]) have reported a negative and significant relationship between wage inequality and employment in the manufacturing (particularly durable) sector. By and large, these studies have focused on the recent decades, the 1970s and the 1980s, during which wage inequality increased and the manufacturing sector declined. The addition of cross sectional data from the 1940s and the 1950s will prove useful here in checking the robustness of these results in different decades. Columns (3) and (4) report results from regressing the change in the 80-20 log wage differential on the fraction employed in the basic and high tech manufacturing sectors. Column (3) reports the results from a regression over all the years while column (4) reports the coefficients for the different decades. According to column (3) of Table 6, a 10 percentage point increase in the fraction employed in manufacturing reduces the 80-20 differential by 3.6 percentage points. While significant, this coefficient is small and can account for only a trivial portion of the difference in inequality growth between the 1940s and the 1980s. In addition, when different coefficients are estimated for each decade as in column (4), the

relationship is weak for most of the decades with the exception of the 1960s. Results reported in Table 6 indicate that a variable which captures only the compositional shifts in employment between manufacturing and service sectors is less systematically related to overall wage inequality than a skill-based measure which captures the rise and fall of medium skilled jobs more generally.

To check for robustness of the results across data sets, the cross-state regressions are rerun using fixed effects rather than first differences and the March Current Population Survey data for the years 1967 to 1991. These results are reported in Table 7. The advantage of the CPS data is that we have single year observations. The disadvantage is that only 19 aggregated state groupings can be consistently followed through all the years. Column (1) reports the coefficient on the relative demand for medium skilled workers while column (2) reports the coefficient on the fraction employed in manufacturing. By and large, the results from the CPS data reported in Table 7 confirm the earlier results using Census data. The coefficient on the relative demand variable is even larger (at -1.62) using the CPS data while the coefficient on the manufacturing variable remains the same.

As a way of summarizing the results and also to give a clearer picture of the underlying data, Figure 2 provides scatter plots of the relationships between wage inequality and the explanatory variables considered in this section. The top panels use Census data and graph annual rates of change over the earlier period 1940-1970. The bottom panels present data from the March CPS and graph annual rates of change during the later period 1970-1990. The horizontal and vertical lines represent the weighted means of the variables. As shown in the bottom panels, both changes in relative demand for the middle and manufacturing employment appear to be systematically and negatively related to changes in wage inequality during the 1970s and

the 1980s. Looking at the individual observations, there appears to be reasonable correspondence between the two graphs as to which states lie to the right or the left of the mean. However, as shown in the top panels, during the earlier decades, the manufacturing variable appears to be only weakly related to overall inequality changes while the relative demand variable is strongly and negatively related to inequality changes. In addition, there appears to be very little correspondence as to which states lie to the left or the right of the mean. One possibility is that the manufacturing variable works well in the 1970s and the 1980s precisely because it largely represents the medium skilled sectors during this later period. These results suggest that deindustrialization and the decline of the manufacturing sector may have been important during the recent decades, not because of factors that are specific to the manufacturing sector per se, but because the manufacturing sector is where most of the moderately skilled male workers were located during this later period.

VI. A Framework for Understanding Relative Demand for the Middle and Wage Inequality

The aggregate evidence presented in Section IV suggested that the relative demand for moderately skilled workers exhibited the greatest variation across the decades. Moreover, this variation appears to be closely related to overall wage inequality in that the decades in which the relative demand for the middle declined the most (least) were those in which wage inequality expanded the most (least). The cross state regressions presented in Section V provided further support for the link between demand changes for the middle skill groups and changes in overall wage inequality. While it is easy to see why a decline in demand for the middle skill groups would expand

inequality at the upper end of the wage distribution, it is not immediately clear why it would also lead to rising inequality between the middle and the bottom groups in the wage distribution. If the moderately skilled workers are equally good substitutes for workers in the higher and the lower skill categories, a decline in demand for moderately skilled workers will reduce their wages relative to other skill groups but the relative wage between the highly skilled and the least skilled will remain unchanged. If the moderately skilled workers are better substitutes for workers in the lower than the higher skill categories, however, a decline in demand for the middle will also reduce the wages of the least skilled relative to the highly skilled group. Under what circumstances will the wages of the least skilled fall relative to both the medium and the highly skilled groups? In this section, I discuss a simple two-skill model in which a decline in relative demand for the middle increases wage inequality both at the top and the bottom ends of the wage distribution.

Consider the following model where there are two types of skills, S_1 and S_2. For convenience, let us think of three types of workers distinguished by the wages they receive, low, medium and high. Workers in the low wage category possess 1 unit of S_1 and 0 units of S_2, or $S_L = (1,0)$. Alternatively, workers in the high wage category possess 0 units of S_1 and 1 unit of S_2 so that $S_H = (0,1)$. We can specify workers in the middle category as owning a combination of both skills, $S_M = (\alpha S_1, \beta S_2)$. Since they possess both types of skills, $\alpha > 0$ and $\beta > 0$. For simplicity, let us assume that the market wage paid for a unit of S_1 is W_1 so that $W_L = W_1$. The market wage paid for a unit of S_2 is W_2 so that $W_H = W_2$. It follows then that wages of the middle group, W_M, equals $\alpha W_1 + \beta W_2$.

First, it is important to point out that with two skills, all relative wages, top vs. bottom (W_H/W_L), top vs. middle (W_H/W_M), middle vs. bottom (W_M/W_L), move in the

same direction. Thus, if the relative wage between the top and the middle group rises, it follows that the relative wage between the middle and the bottom group also rises. This follows from the fact that with two skills, relative wages ultimately depend on the supply and demand of the underlying skills S_1 and S_2 and on the ratio of skill prices, W_2/W_1. The one important feature of this model is that there are potentially large cross effects between wages and underlying demand and supply conditions of different groups. For example, an increase or decrease in the supply of workers in the middle can potentially have larger impacts on the wages of the two extreme groups than on the wage of the middle group by shifting the relative supplies of S_1 and S_2.

Under what circumstances will a decline in demand for the middle group raise relative wages in both the top and bottom ends of the wage distribution? This will depend on the relative substitutability of workers in the middle category with those in the top and bottom categories. In our present framework, if $\alpha > \beta$ (so that workers in the middle are better substitutes for workers in the bottom than the top skill categories), a decline in demand in the middle will increase the supply of S_1 relative to S_2 and thereby drive down W_1 relative to W_2 (with initial supply conditions). The relative wage between the high and low skilled workers, W_H/W_L, equals W_2/W_1 and will increase as W_1 falls relative to W_2. The relative wage between high and medium workers, W_H/W_M, equals $W_2/(\alpha W_1 + \beta W_2) = 1/(\alpha W_1/W_2 + \beta)$. This ratio also rises as W_1 falls relative to W_2. Finally, the relative wage between medium and low skilled workers, W_M/W_L, equals $(\alpha W_1 + \beta W_2)/W_1 = \alpha + \beta W_2/W_1$. This ratio will also increase as W_1 falls relative to W_2.

The above describes one simple framework in which a decline in demand in the middle wage sector increases wage inequality at both the top and bottom ends of the wage distribution. My purpose here was to present one example of a model which has

the two important features necessary to be consistent with the data. One necessary feature is that there are large cross effects between the wages and the demands for different groups. The other is that workers in the middle wage sector more closely resemble (or alternatively, are better substitutes for) workers in the low wage than the high wage sector. Whether such a model or an alternative framework can ultimately explain the data presented here remains a question for future research.

VII. Summary

Many researchers have attributed the recent rise in wage inequality to a rise in demand for skill brought about by the changing industrial mix of the U.S. economy. This paper evaluates these demand side explanations by extending the time series evidence back to the 1940s and by looking at cross sectional evidence.

The evidence presented in this paper suggests that the decline in demand for middle skilled groups may have been a major contributing factor to the recent rise in wage inequality. This paper is certainly not the first to suggest that a contracting middle wage sector is an important part of the story. Previous studies and even the popular press have proposed that the replacement of assembly line-type jobs with both low and high paying service sector jobs has been the major contributing force to the rise in inequality. Still others have emphasized the disappearance of manufacturing jobs paying substantial rents to low skilled labor. There are several points on which what I propose here is consistent with or distinct from these previously proposed explanations. First, while the number of service sector jobs did actually increase slightly during the 1980s, the resulting composition effects are very small and do not account for the large reductions in wages at the low end. This suggests that any explanation based on

compositional changes alone without cross price effects between the middle and the bottom wage categories would fall far short of accounting for the rise in wage inequality. Second, it is possible to interpret the decline in the middle wage sectors as the disappearance of rent paying jobs. However, regardless of whether one interprets wage differences between medium and low wage workers as reflecting rents or skill differences, again the mere change in the composition of jobs from rent-paying to non-rent jobs could not explain the data.[8] Rather, under any story the key feature must be that the decline in demand for the middle increased competition for jobs in the low wage sector and further reduced the wages of low wage jobs rather increased their number. The final point is that based on the cross state regressions, it appears that the story is not specific to changes in manufacturing. The manufacturing employment variable appears less robust (and has far less explanatory power) than the relative demand for moderately skilled workers. While the decline in the manufacturing sector is clearly an important part of the story in the recent period, the evidence presented here suggests that it has been important not because of factors unique to the manufacturing sector per se but because the manufacturing sector is largely where moderately skilled male workers were located in the recent period.

I have discussed here only one class of explanations based on demand for skill and industrial change. It may be unreasonable to expect a single explanation to account for all the changes in wage structure over a span of five decades. An alternative that I have not explored here is that inequality at the top end may be better explained by changes in relative demand for skill whereas inequality at the bottom may be better

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[8]As with the skill based framework, the rent story has difficulty explaining why workers in the medium wage sector actually gain on workers in the low wage sector. In order for wages in the rent-paying sector to increase relative to wages in the non-rent sector, the size of these rents would have to be implausibly large and remain constant despite large negative demand shocks to the rent-payinag sector.

accounted for by institutional change. For example, as discussed in Goldin and Margo [1992], the 1940s may have been unique in that the National War Labor Board actively sought to compress the wage structure. However, as Goldin and Margo themselves point out, this leaves open the question why compression continued throughout the 1940s long after the dismantling of controls. While I have not addressed the role of unions, a long range study examining the impact of labor unions on the wage structure since the 1940s will be a valuable addition in the future.

Finally, the question remains as to what extent technological change within sectors has contributed to the rise in inequality. Of course, inequality changes may be entirely consistent with a simple relative demand for skill hypothesis if we could somehow measure within sector increases in demand for skill. In this paper I have implicitly assumed that these within sector increases follow the same time pattern as the measured increases in demand for skill. However, it may be the case that within sector increase in demand for skill was relatively constant during the 1940s and accelerated rapidly during the 1980s. Measuring such changes with data and testing their importance are additional exercises which remain to be undertaken in the future.

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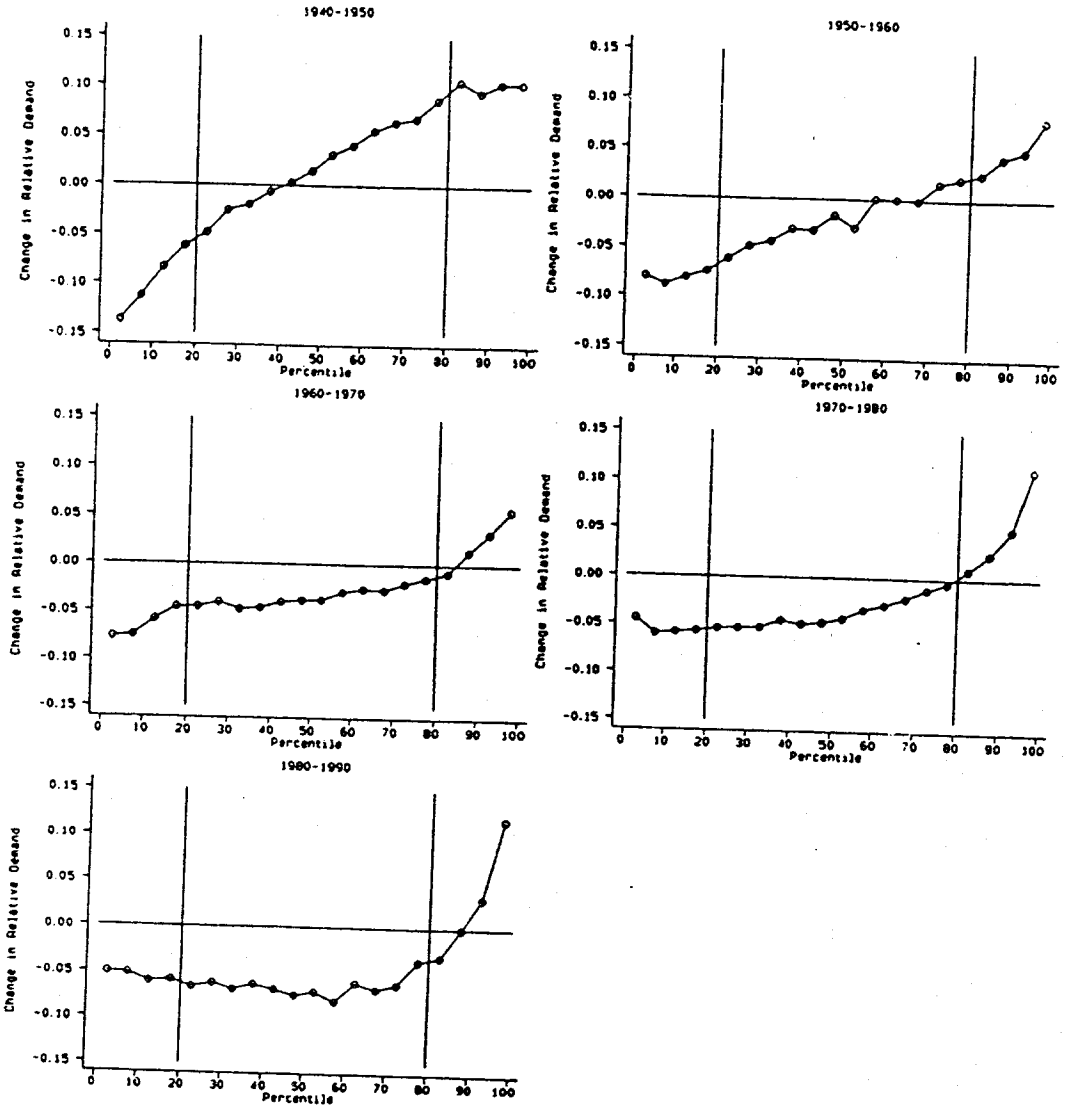

Figure 1. Change in Relative Demand by Wage Percentile

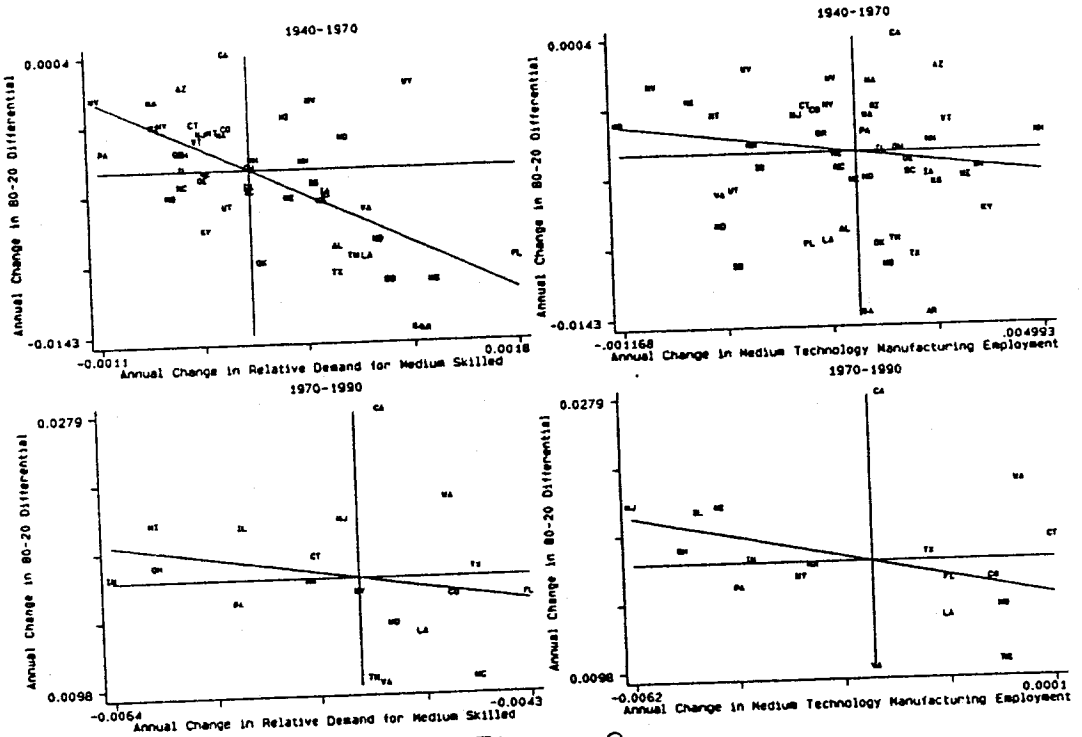
1940-1970
Annual Change in 80-20 Differential
0.0004
-0.0143
-0.0011
0.0018
Annual Change in Relative Demand for Medium Skilled
1940-1970
Annual Change in 80-20 Differential
0.0004
-0.0143
-.001168
.004993
Annual Change in Medium Technology Manufacturing Employment
1970-1990
Annual Change in 80-20 Differential
0.0279
0.0098
-0.0064
-0.0043
Annual Change in Relative Demand for Medium Skilled
1970-1990
Annual Change in 80-20 Differential
0.0279
0.0098
-0.0062
0.0001
Annual Change in Medium Technology Manufacturing Employment

Figure 2

Table 1

Change in Log Weekly Wages of White Men in Non-Agricultural Sector

A. Percentile

	Year				
	39-49	*49-59*	*59-69*	*69-79*	*79-89*
Percentile					
1-10	*.264*	*.300*	*.226*	*-.033*	*-.232*
11-20	*.315*	*.278*	*.192*	*-.015*	*-.169*
21-40	*.277*	*.292*	*.207*	*.015*	*-.116*
41-60	*.197*	*.301*	*.232*	*.073*	*-.072*
61-80	*.127*	*.302*	*.252*	*.096*	*-.024*
81-90	*.091*	*.300*	*.284*	*.089*	*.011*
91-100	*.070*	*.304*	*.324*	*.093*	*.034*
1-100	*.194*	*.297*	*.241*	*.050*	*-.078*
80-20 Diff.	*-.223*	*.022*	*.092*	*.104*	*.181*

Source: Numbers for 1939-1979 are based on the 1940-1980 Public Use Microdata Samples (PUMS). Numbers for 1989 are based on a five-year average of the 1988-1992 surveys from the March Current Population Surveys.

Notes: 1] The sample includes white males with 1-40 years of experience who worked in the non-agricultural sector, worked full time, were not self-employed, worked a minimum of 40 weeks, and earned at least one-half the legal minimum weekly wage.

2] Experience effects were taken out of the wage changes reported in panel B and panel C by first regressing wages on a fixed experience profile over all the years.

Table 1 (continued)

B. Education

	Year				
	39-49	49-59	59-69	69-79	79-89
Education					
<8	.209	.215	.178	.057	-.319
8-11	.184	.248	.183	.033	-.247
12	.159	.263	.200	.034	-.166
13-15	.141	.264	.211	-.013	-.111
16+	.072	.308	.276	-.038	-.038
College-H.S. Diff.	-.086	.045	.076	-.072	.134

C. Occupation

	Year				
	39-49	49-59	59-69	69-79	79-89
Occupation					
Professionals	.043	.304	.251	.004	-.007
Managers	.071	.303	.251	.017	-.036
Sales	.157	.286	.284	.039	-.042
Clerical	.128	.242	.224	.082	-.140
Crafts	.180	.279	.208	.082	-.136
Operatives	.223	.254	.196	.115	-.191
Transp. Oper.	.225	.249	.249	.141	-.201
Laborers	.269	.277	.221	.136	-.224
Services	.191	.230	.258	.054	-.175
Prof.-Laborers Diff.	-.226	.027	.030	-.132	.217

Table 2

Distribution of Total Employment Across Industries
(Excluding Agricultural Sector)

	Year					
Industry	*1940*	*1950*	*1960*	*1970*	*1980*	*1990*
Mining	*2.9*	*2.2*	*1.5*	*1.2*	*1.5*	*0.9*
Construction	*6.2*	*7.2*	*7.2*	*6.7*	*6.7*	*6.8*
Manufacturing:						
Low Tech.	*12.5*	*10.0*	*9.7*	*7.5*	*6.2*	*4.8*
Basic	*13.0*	*16.1*	*17.9*	*17.1*	*15.3*	*12.5*
High Tech.	*2.8*	*3.3*	*4.7*	*4.7*	*4.1*	*3.8*
Transportation & Util.	*10.0*	*9.9*	*8.4*	*7.9*	*7.9*	*7.3*
Wholesale	*3.9*	*4.7*	*4.4*	*5.0*	*5.1*	*4.8*
Retail	*18.1*	*16.6*	*14.1*	*13.0*	*12.1*	*12.5*
Professional Services & FIRE	*9.4*	*9.8*	*12.4*	*15.4*	*19.1*	*23.6*
Education & Welfare	*5.3*	*5.1*	*7.0*	*9.4*	*10.4*	*11.1*
Public Administration	*5.0*	*6.1*	*6.7*	*7.2*	*7.2*	*6.5*
Other Services	*10.9*	*7.8*	*6.1*	*4.9*	*4.4*	*5.4*

Source: Numbers for 1940-1980 are based on the Public Use Microdata Samples (PUMS). Numbers for 1990 are based on a five-year average of the 1988-1992 surveys from the March Current Population Surveys.

Notes: 1] The sample includes men and women with 1-40 years of experience who were in the non-agricultural sector, and who were not enrolled in school or the military during the survey week. Employment shares are calculated as the fraction of total wage-weighted count of workers in the non-agricultural sector.

Table 3

Distribution of Total Employment Across Occupations
(Excluding Agricultural Sector)

	Year					
	1940	1950	1960	1970	1980	1990
Occupation						
Professionals	11.1	13.1	16.7	19.9	21.1	23.5
Managers	13.1	13.0	12.6	12.8	15.5	19.5
Sales	7.5	8.2	7.8	7.4	6.7	6.8
Clerical	13.5	12.8	13.6	14.6	14.9	13.6
Crafts	15.6	18.3	17.8	16.7	15.8	13.3
Operatives	15.2	15.7	14.2	12.5	10.1	7.4
Transport Operatives	5.8	5.1	5.1	4.4	4.2	3.9
Laborers	7.8	6.0	4.4	3.5	3.1	3.1
Domestic	3.3	1.3	1.1	0.5	0.2	0.3
Services	7.3	6.6	6.7	7.6	8.3	8.9

Source: Numbers for 1940-1980 are based on the Public Use Microdata Samples (PUMS). Numbers for 1990 are based on a five-year average of the 1988-1992 surveys from the March Current Population Surveys.

Notes: 1] The sample includes men and women with 1-40 years of experience who were in the non-agricultural sector, and who were not enrolled in school or the military during the survey week. Employment shares are calculated as the fraction of total wage-weighted count of workers in the non-agricultural sector.

Table 4

Change in Relative Demand for Men by Wage Percentile

	Year				
Percentile	39-49	49-59	59-69	69-79	79-89
1-10	-.12	-.09	-.08	-.05	-.05
11-20	-.07	-.08	-.05	-.06	-.06
21-40	-.02	-.05	-.04	-.05	-.06
41-60	.03	-.02	-.04	-.04	-.07
61-80	.07	.01	-.02	-.02	-.05
81-90	.10	.03	.00	.02	-.01
91-100	.10	.07	.04	.08	.08

Change in Relative Demand for Men by Education

	Year				
Education	39-49	49-59	59-69	69-79	79-89
<8	-.06	-.11	-.10	-.07	-.11
8-11	.01	-.06	-.07	-.06	-.11
12	.03	-.01	-.04	-.04	-.08
13-15	.05	.04	.02	.02	.00
16+	.11	.18	.14	.10	.11
All Men	.02	-.02	-.03	-.02	-.04

Notes: 1] The change in relative demand for a particular group is calculated as the change in the national composition of employment across industries and occupations multiplied by the group's initial employment distribution across industries and occupations. Both men and women were included to calculate the national employment shares. The agricultural sector was excluded from all calculations.

Table 5

Change in Supply of Men by Percentile

	Year				
	39-49	49-59	59-69	69-79	79-89
Percentile					
1-10	-.06	-.10	-.15	-.16	-.11
11-20	-.04	-.07	-.10	-.14	-.07
21-40	-.01	-.03	-.05	-.08	-.03
41-60	-.00	-.01	-.00	-.03	.00
61-80	.01	.02	.04	.05	.03
81-90	.04	.06	.09	.13	.07
91-100	.09	.12	.17	.26	.12

Notes: 1] The change in supply reported above is predicted by multiplying the change in educational distribution across the decennial censuses with the percentile group's initial distribution across five educational categories, <8, 8-11, 12, 13-15, and 16+.

Table 6

Regression Results for Changes in 80-20 Log Wage Differentials by State
(Decade Changes using State-Level Census Data)

Variable	*(1)*	*(2)*	*(3)*	*(4)*
Demand for Med. Skilled				
All Years	*-1.133*		---	---
	(0.300)			
Year40		*-1.926 (0.577)*		
Year50		*0.672 (0.840)*		
Year60		*-1.946 (0.572)*		
Year70		*-0.343 (0.785)*		
Year80		*-0.886 (0.537)*		
% Med/High Tech. Manuf.		--- ---		
All Years			*-0.362*	
			(0.136)	
Year40				*-0.056 (0.263)*
Year50				*-0.134 (0.387)*
Year60				*-1.278 (0.286)*
Year70				*-0.301 (0.323)*
Year80				*0.084 (0.289)*
Average Wage	*-0.412*	*-0.447*	*-0.447*	*-0.448*
	(0.057)	*(0.057)*	*(0.057)*	*(0.056)*
% < 8 Years Education	*0.690*	*0.765*	*0.765*	*0.689*
	(0.157)	*(0.158)*	*(0.158)*	*(0.159)*
% 8-11 Years Education	*0.353*	*0.277*	*0.277*	*0.402*
	(0.116)	*(0.117)*	*(0.117)*	*(0.126)*
% 13-15 Years Education	*0.578*	*0.491*	*0.491*	*0.577*
	(0.255)	*(0.256)*	*(0.256)*	*(.254)*
16+ Years Education	*1.083*	*1.035*	*1.035*	*1.063*
	(0.191)	*(0.220)*	*(0.200)*	*(0.197)*
Year Dummies	*Yes*	*Yes*	*Yes*	*Yes*
R^{2*}	*.43*	*.45*	*.41*	*.45*

Demand for Med. Skill Effects Equal Across Years	*F(4,231)=2.51 P=.043*
Demand for Med. Skill Effects Equals Zero for All Years	*F(5,231)=4.93 P=.000*
% Manuf. Effects Equal Across Years	*F(4,231)=3.51 P=.008*
% Manuf. Effects Equals Zero for All Years	*F(5,231)=4.29 P=.001*

* *Not including year dummies*

Table 7

Regression Results for 80-20 Log Wage Differentials by State
(Using Aggregated State-Level CPS Data 1967-1991)

Variable	*(1)*	*(2)*
Demand for Medium Skilled	*-1.619*	---
	(0.520)	
% Med/High Tech. Manuf.	---	*-0.350*
		(0.108)
Average Wage	*-0.260*	*-0.283*
	(0.052)	*(0.051)*
% < 8 Years Education	*1.785*	*1.853*
	(0.203)	*(0.199)*
% 8-11 Years Education	*1.155*	*0.973*
	(0.214)	*(0.187)*
% 13-15 Years Education	*0.039*	*0.048*
	(0.180)	*(0.180)*
16+ Years Education	*0.859*	*0.782*
	(0.124)	*(0.125)*
Year Dummies	*Yes*	*Yes*
State Dummies	*Yes*	*Yes*
R^{2*}	*.43*	*.43*

* *Not including year and state dummies*

Appendix

Table 1

Change in Relative Demand for Men by Wage Percentile
(Adjusted for Price Changes)

	Year				
Percentile	*39-49*	*49-59*	*59-69*	*69-79*	*79-89*
1-10	*-.10*	*-.10*	*-.09*	*-.04*	*-.08*
11-20	*-.05*	*-.09*	*-.06*	*-.05*	*-.08*
21-40	*-.00*	*-.05*	*-.05*	*-.04*	*-.08*
41-60	*.04*	*-.02*	*-.04*	*-.04*	*-.09*
61-80	*.07*	*.01*	*-.03*	*-.02*	*-.07*
81-90	*.09*	*.04*	*.01*	*.01*	*-.02*
91-100	*.07*	*.08*	*.06*	*.07*	*.08*

Change in Relative Demand for Men by Education
(Adjusted for Price Changes)

	Year				
Education	*39-49*	*49-59*	*59-69*	*69-79*	*79-89*
<8	*-.04*	*-.12*	*-.12*	*-.06*	*-.15*
8-11	*.02*	*-.06*	*-.08*	*-.05*	*-.14*
12	*.02*	*-.01*	*-.04*	*-.03*	*-.11*
13-15	*.03*	*.05*	*.02*	*.02*	*-.01*
16+	*.06*	*.22*	*.17*	*.08*	*.13*
All Men	*.02*	*-.02*	*-.03*	*-.02*	*-.06*

Notes: 1] The change in relative demand for a particular group is calculated as the change in the national composition of employment across industries and occupations multiplied by the group's initial employment distribution across industries and occupations. Both men and women were included to calculate the national employment shares. The agricultural sector was excluded from all calculations. The adjusted demand changes are calculated by adding the group's percentage price change to its percentage change in share. This corresponds to the case where the occupation and industry demands have unit own price elasticities and zero cross price elasticities.