The Labor Earnings Distribution During and After World War II

Chris Vickers

Auburn University
czvickers@gmail.com

Nicolas L. Ziebarth

Auburn University and NBER
nicolas.ziebarth@me.com

March 28, 2024

Abstract

We study changes in the income distribution during and after World War II. Drawing on information collected by the National War Labor Board (NWLB) during WWII as well as the 1940 and 1950 Population Censuses, we calculate the hypothetical effects of the NWLB's "bracket" policy. We find that the brackets would have reduced the p90-p10 gap between 1939 and 1945, the year the policy was lifted, by 34 log points. Regarding the between components of inequality, we find that the brackets would have had much stronger compressive effects on differences between states versus between occupations. Because of sorting by race and education into occupations, the brackets cannot explain much of the narrowing of the educational skill premium nor the racial gap between 1940 and 1950. We conclude that the NWLB is not a "cure-all" explanation of the myriad dimensions of the Great Compression.

Keywords: Wage controls, National War Labor Board, income inequality, WWII.
JEL Codes: N42, J36, D31.

1 Introduction

There is widespread agreement that the distribution of earnings changed dramatically during the 1940s and, particularly, during World War II. Piketty and Saez (2003) using tax records document that the share of income going to the top 10% of earners fell from 44% in 1940 to 32% in 1945.[1]

[1] Geloso et al. (2022), who based on a critique of the Piketty-Saez results suggest that the largest inequality declines happened during the Great Depression, still find sharp inequality declines during the war in the top 10% income share.

The headline finding of Goldin and Margo (1992) is that over the decade spanning the war, the log ratio of the 90th and 10th percentiles of labor earnings fell by 35 log points. Kopczuk et al. (2010) using data from the Social Security Administration document find that the sharpest decline in the Gini coefficient during this decade happened between 1942 and 1944.

There is much less agreement about the drivers, dimensions, and timing of these inequality changes during the 1940s. The problem in studying inequality during this period is one of data limitations. Probably, the most comprehensive data originally used by Kopczuk et al. comes from a 0.1% random sample of (confidential) Social Security Administration (SSA) records covering most private sector workers except farm and domestic workers. The problem with this source is the rather limited demographic information available, which only includes birth state, year of birth, sex, and race. Other sources such as from the National Industrial Conference Board that were used by Goldin and Margo only contain information on a select set of occupations and have even less demographic information.[2] The federal government was collecting data on earnings during this period. For example, the Bureau of Labor Statistics, in particular, was engaged in extensive data collection in support of the National War Labor Board (NWLB), an agency tasked with controlling wages during this period.[3]

To control wages, the NWLB, in the end, followed what was known as the bracket policy, which specified by occupation, region, and industry (in some cases), a value (the "bracket") that acted as a soft maximum wage. People making more than the bracket were not required to take a pay cut down to the level of the bracket, but they were forbidden to receive any further raises. Those earning initially less were allowed but not required to receive raises to the level of the bracket. The brackets were chosen to reflect the earnings distribution for a given occupation-region cell. In this way, we can use the brackets themselves to infer the earnings distribution in 1943, the year in which the brackets we have collected were set. To correctly recover the earnings distribution from the brackets, it is critical to know the exact way in which the brackets were set as a function of the earnings distribution. Based on narrative evidence, there were multiple methods used. One method was to set the bracket equal to 90% of the mean. The other was a bit more hazy in that brackets were set equal to the "first substantial cluster" of earnings. Adding to the complexity, no particular method was required by statute with the NWLB retaining full discretion over how the brackets were set. Unfortunately, there is no documentation of which method was used for any given bracket.

To determine what method was used in practice, we draw on a special sample collected by the BLS from the NWLB's Region IV in the South that includes information on hourly earnings by

[2]It should be noted that the estimate of the educational skill premium using these occupations does not fall during WWII (nor during the Great Depression). Table 9 in the NBER Working Paper version of Goldin and Margo (1992) reports inequality changes for a set of industries with most showing declines over this decade but by no means all.

[3]Douty (1984) notes that leading up to the war, the BLS had been in charge of collecting data to support the implementation of the Fair Labor Standards Act of 1938.

occupation just before the brackets were put into place. With these data, we can compare the actual brackets to the value of the brackets predicted by the 90% mean rule. We do find a strong positive log-linear relationship between earnings and the bracket though the elasticity is less than 1 meaning there were deviations from the 90% rule. In general, the brackets were set a little higher than predicted for occupations with relatively low earnings and set lower than predicted for occupations with higher earnings. On the balance, the results suggest that the 90% mean rule is a reasonable approximation of how the brackets were set in practice.

Rather than follow a strict application of the 90% mean rule, we apply the estimated relationship between the actual and predicted brackets for this single region to the whole country to impute earnings in 1943. There are two ways in which this imputation procedure could misestimate the overall level of inequality. First, the method only allows us to impute (mean) earnings by occupation-region meaning we will have to ignore the within-NWLB cell inequality component. Second, we are assuming that the residual variation in the actual bracket not explained by the predicted bracket is not correlated with any non-linear function of mean earnings.

The brackets were in place until the end of the war when the NWLB was dissolved in 1945. Our second set of calculations constructs what we call the *hypothetical* earnings distribution in 1945. In this hypothetical, we assume that by the end of the war, all those initially earning less than the bracket received raises to that level and those earning more received no further raises. We consider this hypothetical as an upper bound on the (causal) effects of the brackets for several reasons. First, if not everyone initially earning less than the bracket ended up earning an amount equal to the bracket, then the effects on inequality would be smaller. Second, if people earning above the bracket were able to receive raises (in their same occupation) by evading the brackets, then again our hypothetical would be overestimating the effects on inequality. Third, it might have been the case that inequality would have changed exactly as in the hypothetical even without the brackets. If this were true, then the hypothetical tells us nothing about the causal effects, but it does tell us about the *actual* distribution of earnings in 1945.

We compare the imputed 1943 and hypothetical 1945 labor earnings distributions to the actual distributions in 1939 and 1949 calculated using the 100% 1940 and 1950 Censuses of Population, respectively.[4] We find that the hypothetical effect of the brackets was to drastically reduce the *within* (occupation-geography) components of inequality. This qualitative result is not surprising on its own given how the brackets were set and the hypothetical we consider. What is interesting is the magnitude of the average increase in the p10-p90 log ratio between 1939 and 1945, which is 34 log points and represents about 75% of the total decline in this ratio between 1930 and 1940. On the other hand, the average within inequality change between 1939 and 1949 is only 5 log points.[5] This means there was a substantial amount of undoing of the hypothetical effects of the brackets.[6]

[4]Recall that the earnings variable in the Censues refers the year before the census was taken.

[5]As we discuss later, IPUMS has estimated that up to 30% of the earnings observations from the 100% 1950 Population Census sample are incorrect. This makes us hesitant to put much confidence in this number.

[6]It could also be that earnings after the war ended changed in a way to undo declines in inequality that happened

At the state level, there is only a minor correlation between the hypothetical inequality change between 1939 and 1945 and the overall change from 1939 to 1949. At the occupation level, the correlation is actually *negative* with the occupations with the biggest inequality declines during the war experiencing the smallest declines over the whole period of the 1940s. Whether this means that the brackets never actually had the hypothetical effects or their effects simply disappeared rapidly after the NWLB was rolled up at the end of the war is a difficult question to answer.

The decline in overall inequality that happened during the Great Compression was due to both declines in within inequality as well as numerous dimensions of between inequality. Since the brackets were set relative to the mean by occupation and region, one might imagine that the brackets should have had no or limited effects on between group inequality. This is the case for occupations for which there is no correlation between average earnings in 1939 and the growth in hypothetical earnings between 1939 and 1945. Since there is racial and educational sorting into occupations, the hypothetical effects of the brackets on the racial gap as well as the educational skill premium are also small. Now it is possible for the brackets to affect the between group differences depending on the within-occupation (or region) earnings distribution and, in particular, the fraction of individuals earning less than the bracket initially. If it so happens that states with lower average earnings tend to have larger fractions of people earning below the bracket, then the brackets will reduce between state inequality, and this is what happened. The hypothetical effect of the brackets would have been to close 1/6 of the 1939 earnings gap between states by 1945. One reason for this is that the actual geographic unit at which the brackets varied tended to be coarser than the occupational grouping. For example, all stenographers located in Texas, Oklahoma, and Louisiana were subject to the same bracket. This would have generated substantial spatial convergence pulling up the average earnings of stenographers in low-paying Oklahoma relative to the other states.

We view this work as complementary to our earlier work on the effects of the NWLB on inequality (Vickers and Ziebarth, 2022).[7] There are two major differences with our other work. First, that work was focused on the long-run effects of the brackets on the income distribution decades after the end of the war. In this paper, we are examining the nearly contemporaneous effects of the brackets as well as using the brackets as a reflection of the existing income distribution. Second, the other paper focused on isolating plausibly exogenous variation in the brackets while here we provide no identification strategy and instead focus on the systematic (non-random) component of the brackets. As we mentioned earlier, we are ambivalent about whether we are actually recovering the causal effect of the brackets. Even if we are not, our exercise is interesting for, at least, two reasons. First, in our view, it does provide an upper bound on what the effects of the brackets could be. Second, if the hypothetical changes we calculate had happened even without the

during the war independent of the brackets.

[7]The third chapter of the dissertation by Rose (2009) also studies the effects of the NWLB on inequality.

brackets, then we would simply reinterpret our estimates as estimates of what actually happened.[8]

Our work contributes to the literature on the consequences of WWII on economic inequality. One strand of this literature has examined the effects of the war on gender inequality. Extending the earlier work of Goldin (1991), Acemoglu et al. (2004) use state-level variation in mobilization rates to examine the effect of the war on women's wages in 1950. Using a similar identification strategy, Jaworski (2014) studies the war's broader demographic ramifications for women. Shatnawi and Fishback (2018) find a persistent effect on demand for female workers in manufacturing even after the war ends. Other work has examined the effects of the war on racial discrimination and inequality. Collins (2001) studies the effect of non-discrimination policies in hiring by the federal government. Aizer et al. (2020) examine the effects of military spending contracts while Ferrara (2020) examines variation in the demand for Black labor.

Our work also contributes to the debate on the causes of the changes in inequality during the 20th century. There are two broad categories of explanations: (1) supply and demand for different types of labor (Juhn et al., 1993; Katz and Murphy, 1992; Bound and Johnson, 1992) and (2) institutions including the minimum wage (DiNardo et al., 1996; Lee, 1999) and unions (Card et al., 2004; Western and Rosenfeld, 2011; Farber et al., 2021). On the supply and demand side, Autor et al. (2008) argue that a combination of a rise in skill-biased technical change and a deceleration in the growth rate of the relative supply of highly educated workers can explain changes in the (education) skill premium over the 20th century. Goldin and Katz (2009) argue that the "race" between education and technological change has been a defining feature of the American labor market for 150 years. On the institutional side, for example, Lee (1999) argues that the minimum wage played an important role in "masking" increases in latent earnings inequality.

2 The NWLB's Bracket Setting Process

We refer the reader to our other work (Vickers and Ziebarth, 2022) for a longer discussion pm the historical background of the NWLB. We focus here on the NWLB bracket-setting process again drawing on our earlier work. The bracket policy was supposed to replace what had been an *ad hoc* system of adjudicating wage disputes with a more formal and uniform process. In April 1943, Franklin Delano Roosevelt signed Executive Order 9328, known as the "hold the line" order which authorized the NWLB to establish "by occupational groups and labor market areas, the wage-rate brackets embracing all those various rates found to be sound and tested going rates," and that "except in rare and unusual cases [. . .], the minimum of the going rates within the brackets" would be the end point of any wage adjustments. (Hourly) wages above the maximum within the bracket "could not be changed on the basis of gross inter-plant inequities." In practice, the minimum and

[8]The problematic case is if the brackets were negatively correlated with counterfactual trends in inequality absent the brackets. In this case, our ranking of which places or occupations experienced the greatest declines in inequality would be completely reversed.

the maximum were often very close to one another and, in many cases, only a maximum was set. Because of this, we treat the policy as summarized by a single number that specified a "soft" maximum wage. That is, wages below the bracket could but were not required to rise to that level while wages above the bracket were frozen in place.[9]

Given the tangled history of the NWLB, it is not altogether surprising that the process by which the value of the bracket was determined was not totally straightforward or simple. Part of the problem was that the executive order did not specify what the method should be. Record (1944, p. 576) claimed that "[t]he bracket [. . . wa]s usually set, not at the midpoint or weighted average of rates being paid for a particular job in a particular locality, but 10 percent below the weighted average, or at the first significant cluster of going rates." Even accepting this characterization, several questions spring to mind. For example, under what circumstances which of these two options was to be used was left unclear? One memo from the NWLB's Region X, which covered California and cited by Rose (2009), stated that "In an analysis of 160 brackets set, the California regional board found 97 had been set by the cluster method and 17 by the ten percent method; in 4 cases, the cluster method and the 10% method generated identical results. This leaves 50 of 160 brackets which were set with some other criteria in mind." The NWLB found that administrators in Region III (in Philadelphia) used the cluster method, though "not exclusively" (United States Department of Labor, 1949, p. 1176, volume 2).[10] This still leaves the question of what constituted a "significant cluster" of wages.

As important as the setting of the level of the bracket was the assignment of workers into geographic, occupational, and industry groups to which the brackets applied. In general, demographic characteristics like sex or race were not supposed to be taken into account when applying the brackets. Two people working in the same job in the same plant, no matter whether they were male or female, white or black, were subject to the same bracket.[11] In order to develop the bracket system, the Bureau of Labor Statistics (BLS) first conducted a large-scale survey of employers "to provide information on prevailing rates in key occupations in leading industries in all important labor market areas" (United States Department of Labor, 1949, p. 797, volume 1). To carry out this survey, occupations were defined based on the 1939 *Dictionary of Occupational Titles* and sometimes subdivided into grades. This classification was then carried over to the setting of the brackets.

While the NWLB at its peak had authority over nearly 80% of all private employment, the

[9] In our other work (Vickers and Ziebarth, 2022), we provide some simulations to clarify the potential effects of such a policy.

[10] Interestingly, the analysis also found "wide difference in individual occupations between the bracket rates set by the 10 percent method and the actual rates set", but these differences "largely balance themselves" (United States Department of Labor, 1949, p. 1177, volume 2) meaning brackets were not systematically higher or lower under one or the other method.

[11] Now in practice, we have seen cases for which different brackets were listed for men and women. For example, beginning male assembly line workers in Michigan in the wooden aircraft industry had a bracket of \$0.80 while females had one of \$0.70. We have not seen examples of race-specific brackets.

number of occupations explicitly assigned a bracket was a small fraction of all occupations. As United States Department of Labor (1949) stated, "wage rate brackets were established for [only] key occupations in an industry in a labor market area." This was on purpose since, in the NWLB's view, the wage structure within plants was based on a set of "key" jobs, which were the only ones that NWLB needed to control in order to control the entire distribution of wages. The NWLB's theory of wage determination, to use an academic example, was that to fix the earnings of all tenure-track and non-tenure-track faculty, all you needed to do was fix wages for full professors. "In selecting the key occupations the intention was to select job classifications which reflected the entire spread of wages common to the industry and which represented the peg points on the basis of which rates for other related occupations were normally set" (United States Department of Labor, 1949, p. 231, volume 1). In the view of the Region XII director, this policy of only setting brackets for key jobs increased the ability of the NWLB to stabilize the wage structure: "This limiting of brackets to key jobs was not only an economy of time, but it resulted in preserving intra-plant relationships more accurately than would have been the case if brackets had been set for practically all jobs" (United States Department of Labor, 1949, p. 98, volume 3).

Another benefit of setting brackets only for key occupations was that the NWLB felt that these occupations could be "clearly and precisely defined." The precision of the occupational categories minimized one potential way of evading the brackets by simply reclassifying people into higher-bracket occupations while keeping their actual duties unchanged. The NWLB was aware of this potential problem and issued specific instructions capping the amount of reclassification allowed: "Reclassifications and job re-evaluations [are] not to exceed an average increase for all employees in the plant or plants covered by the order or authorization of 1 cent per hour or 1%" (United States Department of Labor, 1949, p. 193, volume 1).

As for occupations, not all industries were explicitly assigned brackets. We have not been able to locate any discussion as to why certain industries were not listed in the brackets. At the same time, there is no evidence to suggest the unlisted industries were not subject to the NWLB. The closest "precedent" we have found for how unlisted industries would have been treated comes from a discussion of "isolated plants." These isolated plants were ones located outside well-defined labor market areas. As the termination report of the NWLB (United States Department of Labor, 1949, p. 689, volume 2) stated,

> A second approach involves the comparison of jobs in the subject plant with bracket rates for similar jobs in other industries in the same labor market area. In most instances, specific comparison may be possible only with reference to common labor and maintenance job classifications. Bracket comparisons involving these jobs, however, may provide an adequate basis for processing the case. In the use of this method, great caution must be exercised. Attention should be given to any marked historical differentials that have existed between wages in the subject plant and wages for comparable

> work in plants in other industries in the labor market area. For example, a comparison involving job classifications in the fertilizer industry and in the basic steel industry that failed to recognize the long standing differences in rates between these industries would not be valid in terms of wage stabilization.

While there are several caveats here, we interpret this to broadly mean that the brackets for listed industries were applied to non-listed industries. This does not answer the question of why the fertilizer and steel industries were compared to one another as in the example provided. Why not the steel and cement industries on account of their similar heavy capital and energy needs? Because we are uncertain how to identify these comparison industries, we focus on "the case of occupations common to a number of industries, for example, clerical positions, [for which] cross-industry brackets rates were sometimes established. Thus, one rate was usually set for typists in all industries in one area" (United States Department of Labor, 1949). This allows us to sidestep the issue of unlisted industries at the cost of looking at a more limited set of occupations.

As for geography, there was an initial division of the country into 12 regions. Each of these regions was then divided into so-called zones, which was the geographic level at which the bracket varied. The general approach to setting up zones was based on the underlying spatial dispersion of wages within an industry: "In certain industries the wage structure was such that uniform rates were established for an area covering a number of contiguous localities or even an entire region" (United States Department of Labor, 1949, p. 231, volume 1). In fact, the NWLB used something like the modern concept of a "labor market area" (United States Department of Labor, 1949):

> [Such an] area encompassed by a particular bracket rate was normally a single locality but no hard and fast rules were applied with regard to geographical coverage. In determining the appropriate geographical area for a bracket determination, consideration was given to the labor market areas established by the Bureau of Labor Statistics and the War Manpower Commission. In general, the geographical coverage of a set of brackets represented an economic unit within which there was competition for labor. In certain industries the wage structure was such that uniform rates were established for an area covering a number of contiguous localities or even an entire region.

Because of this more economic rather than political or geographic definition of a zone, regions differed in how zones were defined. For example in Region IV, county borders were used as boundaries, while in Region I, borders were sometimes defined at the level of a town. In other cases, the records do not specify precisely the boundaries of the zones. In Region V covering Kentucky, Ohio, and West Virginia, brackets were only assigned to areas such as "Louisville" without reference to what area is exactly covered by the bracket. These zones could potentially vary by industry and occupation.

3 Data

3.1 Brackets

We collect primary source records of the brackets set by the NWLB at the occupation-industry-geography level.[12] These records specify the minimum and the maximum of the bracket though we only use the maximum as our measure of the policy. Unfortunately, to the best of our knowledge, some brackets from particular regions have not survived. For example, we have not been able to locate the brackets from Region VI, headquartered in Chicago. As an example, Figure 1 maps the distribution of brackets for stenographers. The map makes clear the areas of the country we do not have information for. It also shows the differences across regions in the geographic variation of the brackets.

3.2 Earnings

The earnings data comes from two sources. The first is 100% samples of the federal Population Census taken in 1940 and 1950. Our key dependent variable is total wage and salary income, which we will also refer to as labor earnings or income.[13] The Census also asks about a person's occupation and weeks worked. These employment-related variables all refer to the year before the Census was taken, e.g., 1939 for the 1940 Census of Population. On the other hand, the hours worked per week variable refers to the reference week in the year the Census was taken. This introduces a timing discrepancy when attempting to measure hourly earnings. Now it is not a problem if a person changed occupations since the reference year since we assign the bracket based on the occupation from the reference year. It is a problem if a person moved since the reference year. In this case, we would potentially assign the incorrect bracket based on the person's current location rather than his location when he was earning the reported income.

It should be noted that the 100% 1950 Census data file is a preliminary release from IPUMS. For a variety of reasons, IPUMS "estimate[s] the current total and wage income values exactly match the intent of the form roughly 70-75% of the time. The magnitude of the differences ranges widely. Wages are underestimated twice as frequently as they are overestimated [...] Researchers should be cautious when using these variables and should screen for outliers." Following IPUMS' advice, we provide robustness checks trimming the tails of the labor earnings distribution though it is not obvious to what extent this problem would affect our preferred measures of inequality based on differences in percentiles.

The other source of earnings data comes from surveys done by the BLS contemporaneously with the setting of the brackets. The data collected were used as an input into the bracket-setting

[12] These records are located all across the country at the regional branches of the National Archives as well as in the College Park annex of the main National Archives.

[13] In 1950, this question and other income-related questions were asked only of sample-line persons, which were every fifth person on the census form representing 20% of the population.

process and, for this reason, should provide a clear sense of what policymakers at the NWLB would have known at the time. Exactly how the BLS did these surveys is not exactly clear. For example, we do not know how they chose which employers to survey. We use a sample of these surveys collected in the middle of 1943 covering a few hundred office occupations in the South. These records are quite detailed. Besides the occupational summaries we use, this source also includes at the establishment-occupation level, tabulations of the average and range of pay, often recording whether this is for male or female workers, unionization status, or establishment size. Right now, we only use the data for men and average the wages for occupations in the manufacturing and non-manufacturing establishments as well as in the cases, when an occupation has different grades within a city.

3.3 Sample Construction

In constructing our working sample, we apply the sample restrictions imposed by Goldin and Margo (1992). This includes only keeping men, ages 18-65, who worked at least 40 weeks last year (the year the labor earnings variable refers to), and "earn[ed], on average, more than one-half the minimum wage [in that year] on a full-time basis." In the 1940 Census with a minimum wage of \$0.30 / hour, this works out to requiring individuals to have average weekly earnings greater than \$6. This sample restriction allows us to more easily compare our results to Goldin and Margo as well as sidestep some issues such as the effects of changes in female labor force participation during the war.

The rest of our sample restrictions are due to the limitations of the bracket data. We already mentioned that the archival records of the brackets for some regions are missing and the issues of occupations, industries, and regions not explicitly listed in the records. The other issue we mentioned is that the occupational classification used by the NWLB does not line up exactly with that in the Census. Because of these differences in classification, we focus on two particular groups of occupations: white-collar and clerical jobs as well as jobs in the metal trades industries. These groups of occupations have several useful features. The first is that occupations are listed in the bracket records in the same way as in Census data allowing for straightforward linking. Second, the group of white-collar occupations was a cross-industry classification, meaning we do not need to worry about differences in the brackets by industry. This is not the case for the metal trades occupations. However, it seems likely that the level of a bracket for the occupation in that industry was informative about how that occupation would be handled in other industries, so we have chosen to take these brackets as applying across industries in a given region. Finally, it was fairly common for these occupations to be explicitly mentioned in the bracket records. For the 10 white collar occupations, five (bookkeepers; messengers and office boys; office machine operators; stenographers, typists, and secretaries; and clerical and kindred workers (n.e.c.)) have a bracket mentioned in the NWLB records for at least 1600 counties. Other occupations such as draftsmen

were recorded in relatively few brackets.

This is a clearly non-random selection of occupations so it is reasonable to wonder to what extent the matched occupations look like the unmatched ones. Fig. 2 compares the distribution of average log earnings by occupation and county for the matched and unmatched sample in 1939 and 1949. In both years, the matched distribution is shifted to the left of the unmatched distribution. We think this is plausible given the set of occupations and areas that we are able to match. With this narrower set of occupations and areas, it is also not surprising that the matched distribution is less dispersed than the unmatched one. Overall though, the distributions are not dramatically different from one another.

4 Imputed Earnings in 1943

To impute the earnings distribution in 1943, we use the values of the brackets by occupation-county. To be clear, at best, this process will allow us to recover the earnings distribution at the occupation-region level. The obvious question is why we think that the distribution of the brackets actually reflects the distribution of earnings. We have already provided narrative evidence that the brackets were not simply picked at random. At the same time, this evidence also highlighted that the bracket-setting process was not strictly deterministic or straightforward. So our first exercise is to provide some quantitative evidence on the link between the brackets and earnings.

Using the BLS sample, which contains earnings that NWLB policymakers would have used to set the brackets, we calculate the predicted value of the bracket as 90% of the average wage in a given occupation and NWLB zone. Recall that this 90% of the mean rule was one possible way in which the bracket was determined. We compare the predicted to the actual value of the bracket. Importantly, differences between the actual and predicted values cannot be due to, for example, noise introduced by occupational matching. The occupational categories in the BLS data are exactly the same as the categories in the brackets data.[14] Another potential source of discrepancies is the time lag between when these data were collected in the middle of 1943 and when the brackets were actually set at the end of 1943. Now if wages had risen uniformly across occupations during this interim period, then we would expect the predicted values to underestimate the actual brackets, but this should not bias the estimate of the elasticity between the two. The problem would be if wages did not increase uniformly. Given that this period is only a few months, we do not think this is a big potential problem.

Figure 3 plots the relationship between the (log) actual and (log) predicted bracket. There is a clear positive relationship between the two though the estimated elasticity of 0.80[15] is clearly less

[14] One slight issue is the BLS data reports wages for both manufacturing and non-manufacturing industries, which we aggregate into one average.

[15] This estimate is based on a regression with no constant included. If we include a constant, then the elasticity is 0.52.

than the "theoretical" value of 1. More intriguing is the fact that it appears the NWLB was most likely to deviate from the 90% rule for lower-paying occupations in the direction of higher brackets. In other words, the relationship between the predicted and actual bracket is concave. This pattern is potentially consistent with wages growing faster for lower-paying jobs in the months between when the BLS survey was taken and the brackets were set.

In the end, what matters for being able to recover the wage distribution from the bracket distribution is the existence of a stable relationship between the two. On this point, the data clearly support such a relationship with the bracket alone explaining about 90% of the variation in earnings. Therefore, we use the fitted linear relationship between earnings and brackets from this sample to imputed earnings based on the brackets for all other occupations and regions not in this sample. Under this imputation approach, the distribution of earnings is a simple affine transformation of the distribution of the brackets. We experiment with other imputation methods such as including a quadratic term to predict the bracket.

The issue is still the source of the residuals. If these residuals are due to a misspecified model and are, in fact, correlated with a non-linear function of income, then the imputation method will be biased though exactly how is not obvious. On the other hand, if the residuals are truly orthogonal to non-linear functions of income, then our method of recovering the earnings distribution from the brackets distribution filtering out the residuals is valid. The residuals would be orthogonal to other functions of income if the NWLB made "honest" mistakes when attempting to apply the 90% rule. For example, it could be that the wage data they were using was subject to greater measurement error than the data we have access to. This was, in effect, the argument we make in our other paper (Vickers and Ziebarth, 2022) that uses the residual variation to estimate the long-run causal effects of the brackets on the income distribution. In this way, we see no contradiction between the methodology employed here and the one used in our other paper.[16]

Even if we could precisely explain the brackets using some (non-linear) function of the predicted bracket, we still need to assume that the estimated relationship for the South applies to other NWLB regions for this method of recovering the earnings distribution to be valid. Obviously, this assumption is untestable since testing it would require earnings information for the rest of the country, which is what we are trying to impute in the first place. The best we can do is examine whether *in the South* the relationship varied by geography. Figure 4 shows the distributions of the ratio of the actual to predicted bracket across occupations by city. The distributions for Birmingham and Atlanta look quite similar as do Mobile and Huntsville, cities with major military production. Miami is different with systematically higher brackets relative to predicted. This hints at the possibility of systematic deviations as a function of local characteristics. At the same time, in our other work (Vickers and Ziebarth, 2022), we did not find much evidence for a

[16]That said, we need a stronger assumption in the other paper. Not only do the residuals have to be orthogonal to other functions of income, they also need to be orthogonal to other predictors of future changes in inequality. For example, it would be a problem for our other paper if the brackets were correlated with military spending and, for whatever reason, military spending predicted changes in inequality.

connection between the brackets and levels of military spending in a region. We want to emphasize that a correlation between the brackets and these local characteristics is only a problem if those characteristics are a stand-in for some non-linear function of income.

5 Hypothetical Earnings in 1945

Our second set of exercises is to construct a hypothetical distribution of earnings in 1945 taking into account the potential effects of the brackets. Recall that the brackets did not require anything to immediately happen to earnings. They simply limited any further wage increases for those earning more than the bracket. Our hypothetical assumes that, in fact, by the end of the war, all those initially earning less than the bracket were earning whatever the bracket specified and nothing had changed for those initially earning more than the bracket. In other words, we assume that, by the end of the war in 1945, the brackets were binding for everyone.

We want to be clear that these exercises do not need to be interpreted causally. That is, we make no assumption about what would have happened absent the bracket policy. If the brackets were correlated with not just the level of wages but also trends in wages absent the bracket, then some of the changes we attribute to the brackets would have happened on their own. Since the brackets were set as a function of the level of wages, the question is whether wage growth between 1940 and 1943 was correlated with the level of wages in 1940, i.e., was inequality falling or rising during the first years of the war. If it was falling, then our hypotheticals will overstate the impact of the brackets since some of the compression would have already happened before the brackets were even put into place. In this way, we think these hypotheticals provide an upper bound for the effects of the brackets (assuming the brackets do reduce inequality). The second reason we view this hypothetical as an upper bound on the effects of the bracket is our assumption of "maximum compliance." Not only do individuals earning less than the bracket end up constrained by the end of the war, but we also assume that those earning initially more than the bracket were not able to obtain a raise through legal or illegal means. Any lack of compliance would mute the effects of the brackets on inequality. Even if the brackets did not cause these hypothetical inequality changes but instead the changes would have happened anyway, we think these calculations are still interesting and informative. In this case, what we interpret as hypothetical changes would have been the *actual* changes. While the changes would not identify the role played by the NWLB in the Great Compression, the changes would allow us to identify when certain dimensions of inequality changed between 1930 and 1940.

Concretely, in this calculation, for each individual from the 1940 Population Census, we calculate an estimate of total hours worked as reported weeks worked last year times 40 hours per week. We do not use reported hours per week since it refers to a different year than the earnings and weeks worked variables. We have experimented with using the reported hours worked. We then calculate hourly earnings by dividing total labor earnings by this total hours worked variable. Next

we adjust for the growth in production worker compensation between January 1940 and January 1943 by multiplying by 1.53. To this adjusted hourly earnings variable, we apply the brackets by raising those earning less up to the level of the bracket. Finally, we multiply by the total hours worked estimate from 1939 to arrive at a hypothetical total level of earnings in 1945 at the end of the war.

We focus on changes in the (log) differences in percentiles as our preferred inequality measures. We put the lower percentile first and the higher percentile second so that an increase in this difference represents a *decline* in inequality. Let p_0 and q_0 be the lower and upper percentiles of the inequality measure before the bracket in 1939 and p_1 and q_1 after the bracket is imposed in 1943. There are three cases for the value of the bracket $\bar{w}$ to consider: (1) $\bar{w} < p_0$; (2) $p_0 \leq \bar{w} < q_0$; and (3) $\bar{w} \geq q_0$. In the first case, there will be no change in inequality: $(p_1 - q_1) - (p_0 - q_0) = 0$. In the second case, $p_1 = F^{-1}(\bar{w})$ where F is the CDF of earnings conditional on occupation and NWLB region before the bracket and $q_1 = q_0$. Hence, $(p_1 - q_1) - (p_0 - q_0) = F^{-1}(\bar{w}) - p_0$. This could be positive or negative. Finally, for the third case, there will be no inequality post bracket so $(p_1 - q_1) - (p_0 - q_0) = (q_0 - p_0) > 0$.

These calculations show what happens in this hypothetical to inequality *within* a particular occupation-region cell. There is no simple formula for the effects of the brackets on between-group inequality. These effects will depend on the fraction of the population within a particular group that has earnings below the bracket. Nevertheless, it is straightforward to calculate these between-group inequality changes at, say, the occupation level by aggregating up the occupation-county level changes. One question when calculating these changes is what weights to use. We use the employment distribution in 1940. This has the feature of isolating the effects of the brackets themselves on inequality versus the effects due to changes in the distribution of employment across occupations and counties. In any case, we do not know what the distribution of employment was in 1945. For changes between 1940 and 1950, we can take into account the effects on inequality of changes in the weights by using the 1950 employment distribution.

In our mind, there are clear benefits in terms of interpretability to the inequality measures we focus on. The drawback is that it is not so simple to decompose changes in the inequality of the unconditional distribution into the changes in between and within inequality. If we had used the Theil index as our inequality measure, then it would be easy to calculate overall inequality from the conditional inequality measures since the Theil index can be decomposed. That is, the overall Theil index T is $T = \sum_{g=1}^{G} s_g T_g + \hat{T}$ where s_g is the fraction of group g, T_g the within group Theil index, and $\hat{T}$ the between group Theil index, i.e., the Theil index of the group means.[17] In the future, we plan to calculate a decomposition of the Theil measure of inequality.

As one final small point, the NWLB, along with the brackets, also set a minimum wage of \$0.55

[17]Similarly, if we had instead focused on the variance as the measure of inequality, then it would be straightforward to decompose the changes in the unconditional variance into changes in the between and within components. The problem with using the variance as our measure of inequality is that there is no simple expression for the effects of the bracket on the within variances.

per hour. To get a sense of the potential relative magnitudes of the effects of the minimum wage versus the brackets, we construct two hypothetical distributions of hourly earnings:

1. Hourly earnings below the bracket are raised to the value of the bracket, and all others are unchanged.

2. Hourly earnings below the minimum wage (55 cents) are raised to the minimum, and all others are unchanged.

Although it would seem odd to have a bracket set below the level of the minimum wage, the minimum wage and brackets were not set at the same time. The minimum wage was put in place *after* the brackets; because of this, in some cases, the minimum wage was higher than the level of the bracket.

6 Results

6.1 Overall Changes in Earnings Inequality

Our first set of results in Figure 5 compares the hourly labor earnings distributions at the occupation-county level for white-collar and metal trades occupations in 1939, 1943 (imputed), 1945 (hypothetical), and 1949. Concretely, for 1939 and 1949, we simply report $w^t_{O,C} = \frac{1}{N_{O,C}} \sum_{i \in O,C} w^t_i$ where w^t_i is an individual's (log) hourly earnings and $N^t_{O,C}$ is the number of individuals in occupation O and county C in Census t. For 1943, we report $w^{1943}_{O,C} = \widehat{\beta} \bar{w}_{O,C}$ where $\widehat{\beta}$ is the estimated relationship between earnings and the brackets from the BLS data. Finally, for 1945, we report $w^{1945}_{O,C} = \frac{1}{N^{1939}_{O,C}} \sum_{i \in O,C} \max\{\bar{w}_{O,C}, g + w^{1939}_i\}$ where $g = 0.42$ is the (log) growth rate in compensation for production workers between 1939 and 1943.

We seem to be missing the right tail of the distribution for 1943. This, in part, is a reflection of the concave relationship between the actual and predicted brackets with higher-earning occupations not necessarily enjoying a proportionally higher bracket. The flip side is that lower-earning occupations enjoyed relatively higher brackets than predicted based on the simple 90% of the mean rule. The figure here makes clear what deviations from the 90% rule meant for the earnings distribution. We are missing the left tail of the 1945 earnings distribution since, before applying the brackets, we multiplied an individual's 1939 hourly earnings by a common factor. So if the brackets were not binding at all, the distribution in 1945, on a log scale, would simply be the 1939 distribution shifted to the right. The fact that this is not the case shows that the brackets were binding for a fraction of the occupation-county cells. Given how the brackets worked then, it is not surprising that the effects on the hypothetical distribution are to push up the left tail relative to the distribution in 1939 while holding fixed the right tail. The consequence is a much more compressed distribution of earnings. The (actual) distribution in 1949 shows continued growth in earnings on average, but also the reappearance of the left tail of the distribution

meaning the brackets did not completely freeze the gaps in earnings in place. Note that the differences between the pre-1949 distributions and 1949 are not due to changes in the distribution of employment over time (at least directly). That is, the fact that the distribution in 1949 is to the right of the other distributions cannot be simply explained by people shifting into higher-paying manufacturing jobs, for example. We are instead focusing on the occupational-level distribution (equally weighting each occupation) meaning shifts in the earnings distribution have to come from changes in earnings within an occupation.

Figure 6 shows the distribution of within occupation-county changes in inequality between the distribution in 1939 and the hypothetical one in 1945 as measured by the log change in the p10-p90 ratio. Recall that by putting the smaller percentile in the numerator, a positive value for this difference represents a *decrease* in inequality. Changes in the overall distribution of earnings (Fig. 5) are driven by changes in the within and between components of inequality. The figure here focuses on the within component. This is the most plausible dimension along which the brackets would have affected overall inequality. The between component of inequality would only be affected by the brackets if the brackets were not set in a uniform way across occupations or the within distribution of (log) earnings by occupation differed not just in terms of the mean but also dispersion. Note that in reality, the between component could also change if there is a differential earnings growth at the bottom of the earnings distribution. Our hypothetical simply assumes that everyone initially earning less than the bracket reaches that level, which might not be true in general and the fraction who do not reach that level might differ by occupation simply due to differences in the changes in the latent earnings distribution.

Our first finding is that for 25% of occupation-county cells, the hypothetical effect of the bracket on the p10-p90 measure of inequality is no effect at all. This happens when the brackets end up not being binding to a significant degree, which would happen for one of two reasons. It could be because wages grew faster than the growth in earnings for production workers overall that we used to adjust 1939 earnings. It could also be because, for whatever reason, the NWLB chose to set a bracket very low in the earnings distribution. By low, we mean lower than the 10th percentile of earnings. In that case, even if everyone earning less than the 10th percentile enjoys a raise to the level of the bracket, it will not increase the 10th percentile of the hypothetical earnings distribution or have any effect on this measure of inequality. Remember that, in a certain sense, setting a lower value for the bracket is a more intrusive policy since it freezes a larger fraction of earnings in place even if it has smaller effects on inequality. This points to a third way in which the brackets could appear to be not binding, which is that, even if the *average* earnings growth was the same across occupations and counties, wages at the bottom of the distribution before the brackets might have grown faster than at the top.

Figure 7 plots the distribution of the log difference between the 10th percentile of hourly earnings and the bracket for those cases where the brackets had no hypothetical effect on the p10-p90 measure of inequality. That is, it shows how much faster hourly earnings at the 10th percentile

would have had to grow over and above the average growth rate between 1939 and 1943 to just reach the level of the bracket. Clearly, for a sizable fraction, the bottom of the earnings distribution only had to grow slightly faster than the average to explain the null effect on inequality. These are plausibly false null cases. At the same time, there are also many cases (say, with growth rate differences greater than 10 log points) for which it is not plausible that the explanation for the null effect is simply faster wage growth at the bottom. Instead, these are plausibly true null cases for which the NWLB, for whatever reason, set the bracket much lower than the 90% rule would have specified. To be sure, this does still not mean that we are capturing the causal effects of the bracket since these cases might have also experienced no change in inequality even without the bracket being set where it was.

The second result is that the modal decline in hypothetical inequality was around 50 log points and the mean decline was 34 log points, a substantial reduction and a substantial fraction of the overall inequality decline reported by Goldin and Margo from 1939 to 1949. This does not mean that the NWLB can explain all of the compression during the 1940s and then some since this modal change is conditional on there being some change in inequality. Nevertheless, these results highlight the potentially powerful effects the brackets could have had on shaping the income distribution. To be sure, some part of the change that Goldin and Margo document could be due to shifts in the between-inequality component of earnings. As one more point of comparison, Figure 6 also shows that, on average, the inequality changes for the occupation-county cells in our sample over the decade of the 1940s are smaller than the overall changes or the changes for these broad occupational categories.[18]

One question is whether it was the brackets or the minimum wage set by the NWLB that mattered more in reducing inequality. Fig. 8 plots the hypothetical changes in inequality imposing both the brackets and the minimum wage against the hypothetical changes due to the brackets only. For convenience, we center these changes at 0. The minimum wage only matters when it ends up being higher than the bracket. In that case, wages at the bottom of the distribution are increased all the way up to the minimum wage in this hypothetical. The vast majority of the points lie along the 45-degree line meaning the minimum wage was not binding. In the cases when the minimum wage did matter, it only decreased this measure of inequality by around 10 log points, which, on its own, is a meaningful decline but doesn't really change the qualitative picture. We conclude from this that the minimum wage is not that important relative to the brackets in driving changes in inequality.

6.1.1 Within and Between Occupational Changes

Table 1 aggregates the inequality changes up to the occupation level. Besides reporting the p10-p90 inequality measure like before, we now provide a decomposition of that change into the p10-p50

[18] We are a bit nervous about how long the left tail of the 1939-1949 distribution is, and it makes us wonder about the quality of the earnings data.

and p50-p90 components. We also include the actual change in inequality. from 1939 to 1949. Recall that the end of the war also brought the end of the NWLB and its wage controls. These controls were brought back to a certain extent during the Korean War, which had only just started when the 1950 Census was taken (and the earnings questions referred to a year earlier). We already know from the work of Goldin and Margo that inequality in 1949 had not returned to its 1939 level. The question is really how much if any recovery was there in inequality following the end of the war.

There is substantial variation in the effects of the brackets on within occupation inequality. Roughly speaking, the effects are smaller for the white-collar occupations (the first 7 occupations listed in the table) relative to the metal trades occupations (the remaining occupations in the table). These effects are mainly driven by decreases in inequality at the bottom of the distribution. This is not too surprising since there is no effect on the bracket for those initially earning more than the bracket and the brackets were, in general, set low in the earnings distribution.[19]

One puzzling finding is the changes in inequality at the bottom of the earnings distribution. Still consistent with the Great Compression story, for most occupations, within inequality fell over this decade. What is strange is that this is happening despite a sharp *increase* in inequality at the bottom, the difference between the 10th and 50th percentiles. It is just that this increase is being offset by an even larger decrease in inequality at the top. This makes us wonder about the quality of the labor earnings data from the 1950 Population Census released by IPUMS.

We can compare these results to those reported in Table IV of Goldin and Margo's paper, which documents inequality changes within broad occupational categories. For example, for white-collar occupations, the p10-p90 increases by 32 log points between 1939 and 1949 while, for blue-collar occupations, increases by 22 log points. The hypothetical inequality changes we calculate are of a similar magnitude with the changes for white-collar occupations ranging between 9.6 and 36.2 log points and, for blue-collar occupations, between 10.5 and 62.1 log points. That said, in general, the hypothetical changes are larger for blue-collar occupations than white-collar ones, which is the opposite of what Goldin and Margo found.

Fig. 9 plots the hypothetical change in inequality between 1939 and 1943 and the total change over the 1940s for occupations. If the brackets were locking in the wage distribution that persists, then we would expect the points to lie along a 45-degree line. A zero slope would mean that the brackets had no enduring effect on the wage distribution, and any hypothetical effects during the war were offset by changes between 1945 and 1949. Any positive slope would suggest that the brackets had a persistent effect. If anything, the correlation between these changes is negative. This means that not only were the effects of the brackets undone after the war but were reversed by 1949.

Overall, we take these results as providing quantitative support for Sect. 2.4 of the NBER

[19] We have done similar calculations for the p25-p75 inequality measure and found similar if smaller effects. These smaller effects are not surprising given how the brackets tended to be set.

Working Paper version of Goldin and Margo (1992). That section discusses in detail the effects of the NWLB's policies including the brackets and other actions like allowing wage increases to eliminate intraplant differentials. Goldin and Margo draw on industry-level (rather than occupation-level) surveys done by the BLS covering the pre-war (1936-1941), war (1942-1946), and post-war (1947-1952) periods. Except for 2 cases, all industries experience a decline in inequality between the pre-war and war period. While these declines are driven partly by inequality at the bottom of the distribution, they are also driven by falling inequality at the top, which is not consistent with our results. Goldin and Margo highlight this puzzle and suggest it points to the effects of broader market forces in shaping inequality during the war. They also highlight female-intensive industries including cigars, men's neckwear, as well as woolen and worsted mills as exceptions to these general inequality trends. They provide some reasons beyond the NWLB for why this might have been the case. We would simply note that the general rule was that the brackets were to apply uniformly to men and women (as well as whites and blacks) so there is no reason ex-ante to think that inequality effects should have been smaller in these industries just because they were dominated by women.

A separate question is the effect of the brackets on differences in earnings between occupations through 1945. Even if the bracket was set consistently according to the 90% rule, the brackets could have different hypothetical effects on mean earnings depending on the fraction of people earning less than the bracket. Fig. 10 plots by occupation the growth rate in hypothetical mean earnings versus mean earnings in 1939. We center both of these variables and overlay the negative 45-degree line. If the brackets eliminated differences in 1939, then the points should lie along this line. In general, a negative slope implies that the brackets compressed the differences in average earnings across states. The estimated slope is effectively 0 meaning the brackets did not compress the between occupational distribution of earnings. This null result will return when we discuss the effects of the brackets on the skill premium.

A natural next question after examining the effects of the brackets on occupational inequality is the effects of the brackets on the educational skill premium. Figure 11 shows the hypothetical effects of the brackets on the ratio of earnings for those with some college to high school graduates. We plot as a function of years of experience the educational skill premium in 1939 and 1949 for our sample of matched occupations. For one year of experience, this ratio is about 1.17 in 1939 and just over 1.04 in 1949. The premium falls as years of experience increase with an earnings premium in 1939 of about 0 for 8 years of experience. The brackets do not help explain the compression between 1939 and 1949 at all. If anything, the hypothetical education skill premium in 1945 is slightly higher than in 1939. This is particularly true for greater years of experience where the premium is practically nil. These results are consistent with the lack of occupational compression in Fig. 10 assuming a degree of educational sorting across occupations. Similar results hold for other measures of the educational skill premium such as college graduates relative to high school graduates.

We can also study how the brackets affect the racial gap in earnings. Fig. 12 shows Black earnings as a percentage of white earnings for the same set of experience bins as the educational skill premium figure (Fig. 11). First, it is interesting to note the substantial compression that happened between 1939 and 1949, before the Civil Rights era. In general, the gap decreased by around 15 percentage points, which is about 30% of the 1939 gap. Clearly though, this compression was not due to the brackets. The differences between the 1939 gap and the hypothetical 1943 gap are trivial, at best, a few percentage points for the least experienced workers. From one perspective, this result is puzzling since the brackets were supposed to apply uniformly to all races so why didn't earnings for Blacks rise faster than for whites who would have been more likely to be subject to the brackets? We think the explanation for this is again a reflection of the fact that the brackets did not affect the between-occupation earnings distribution. Like educational sorting into occupations, there was also racial sorting so it should not be surprising that the brackets did not substantially reduce the racial gap.

6.2 Within and Between Geographical Changes

The next question we address is the impact of the brackets on geographic earnings inequality. To get a sense of the variation in effects across space, Figure 13 maps out the geographic variation in these hypothetical inequality changes for electricians at the county level. This figure shows that the brackets had the most compressive effects in the South, at least, for electricians. We find similar results for other occupations. Goldin and Margo also comment on the potential impact of the brackets on inequality within Southern industries. Like women-dominated industries, they note that a large fraction of workers in the South would have been earning at or near the minimum wage, and this explains why, in contrast to the lumber industry in the rest of the country, inequality actually *rose* from the pre-war to the war periods. On the other hand, the steel industry in the Southeast experienced a decline in inequality over the same period so it is hard to draw firm conclusions on whether the South's inequality experience was an outlier.

Table 2 shows the changes in inequality within states. Variation across states will be due to geographic variation in where the brackets are set in the earnings distribution independent of occupation as well as differences across geography in the occupational mix. Even if two regions have the same average level of earnings and, hence, the same value for the bracket, that same value would have very different effects on inequality as a function of differences in the left tail of the earnings distribution across the regions. We find, broadly speaking, the biggest hypothetical declines in inequality in Southern states, which is consistent with the differences in occupational mixes between these two regions of the country.

Fig. 14 plots the hypothetical change in inequality between 1939 and 1943 and the total change over the 1940s for states. Unlike for states in Fig. 9, there is basically no relationship between the changes in these two periods. What that means is that brackets had no enduring effect on

within-state inequality changes. One should not conclude from this that the war itself or the policies that came with it had no enduring effect on inequality. We simply cannot identify that counterfactual. What our results do highlight are the dramatic effects policy would have had on the earnings distribution during the war.

Fig. 15 plots a similar graph for states instead of occupations as in Fig. 10. Relative to the case of occupations, we find that the brackets did reduce regional earnings differences to some degree though not completely. The slope of the regression line is about -1/6. We can do a similar calculation for the North-South earnings differential. Workers in the North earned about 40% than those in the South in 1939. After taking into account the hypothetical effects of the brackets, this premium is about 30%. So the brackets do potentially reduce these regional differences though the brackets do not appear to be the complete story. This compression potentially complements the effects of military spending on regional development identified by Jaworski (2017).

7 Conclusion

We studied the income distribution during the 1940s. We used the brackets set by the NWLB to uncover the earnings distribution in 1943. We then considered the hypothetical effect these brackets had on the earnings distribution through the end of the war. We found that the brackets would have substantially reduced within inequality, potentially explaining over 75% of the decline in the p90-p10 measure between 1930 and 1940. In this regard, the NWLB would appear to be a promising explanation for the Great Compression. The brackets also worked to reduce the between-state distribution of earnings, another dimension along which inequality fell during the 1940s. On the other hand, the brackets would not have reduced between occupation earnings differences as well as the education and racial gaps, all key dimensions of inequality that also fell during the 1940s. We conclude that the Great Compression cannot simply be chalked up to the NWLB. The NWLB is not a "one size fits all" explanation for the "mystery" of inequality changes during the 1940s. In our view, a complete explanation will require a theory with many different drivers to explain the different changes in inequality along different dimensions.

References

Acemoglu, Daron, David H. Autor, and David Lyle, "Women, War, and Wages: The Effect of Female Labor Supply on the Wage Structure at Midcentury," *Journal of Political Economy*, 2004, *112*, 497–551.

Aizer, Anna, Ryan Boone, Adriana Lleras-Muney, and Jonathan Vogel, "Discrimination and Racial Disparities in Labor Market Outcomes: Evidence from WWII," 2020. NBER WP 27689.

Autor, David H., Lawrence F. Katz, and Melissa S. Kearney, "Trends in US Wage Inequality: Revising the Revisionists," *Review of Economics and Statistics*, 2008, *90*, 300–323.

Bound, John and George Johnson, "Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations," *American Economic Review*, 1992, *82*, 371–392.

Card, David, Thomas Lemieux, and W. Craig Riddell, "Unions and Wage Inequality," *Journal of Labor Research*, 2004, *25*, 519–559.

Collins, William J., "Race, Roosevelt, and Wartime Production: Fair Employment in World War II Labor Markets," *American Economic Review*, 2001, *91*, 272–286.

DiNardo, John, Nicole Fortin, and Thomas Lemieux, "Labor Market Institutions and the Distribution of Wages, 1973–1992: A Semi-Parametric Approach," *Econometrica*, 1996, *64*, 1001–1044.

Douty, H.M., "A Century of Wage Statistics: The BLS Contribution," *Monthly Labor Review*, 1984, *107*, 16–28.

Farber, Henry S., Daniel Herbst, Ilyana Kuziemko, and Suresh Naidu, "Unions and Inquality Over the Twentieth Century: New Evidence from Survey Data," *Quarterly Journal of Economics*, 2021, *136*, 1325–1385.

Ferrara, Andreas, "World War II and Black Economic Progress," 2020. Unpublished, University of Pittsburgh.

Geloso, Vincent J., Phillip Magness, John Noore, and Philip Schlosser, "How Pronounced is the U-Curve? Revisiting Income Inequality in the United States, 1971-1960," *Economic Journal*, 2022, *132*, 2366–2391.

Goldin, Claudia, "The Role of WWII in the Rise of Women's Employment," *American Economic Review*, 1991, *81*, 741–756.

_ **and Robert A. Margo**, "The Great Compression: The Wage Structure in the United States at Mid-Century," *Quarterly Journal of Economics*, 1992, *107*, 1–34.

Goldin, Claudia D. and Lawrence F. Katz, *The Race Between Education and Technology*, Harvard University Press, 2009.

Jaworski, Taylor, "You're in the Army Now: The Impact of World War II on Women's Education, Work, and Family," *Journal of Economic History*, 2014, *74*, 169–195.

_ , "World War II and the Industrialization of the American South," *Journal of Economic History*, 2017, *77*, 1048–1082.

Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce, "Wage Inequality and the Rise in Returns to Skill," *Journal of Political Economy*, 1993, *101*, 410–442.

Katz, Lawrence F. and Kevin M. Murphy, "Changes in Relative Wages, 1963–87: Supply and Demand Factors," *Quarterly Journal of Economics*, 1992, *107*, 35–78.

Kopczuk, Wojciech, Emmanuel Saez, and Jae Song, "Earnings inequality and Mobility in the United States: Evidence from Social Security Data since 1937," *Quarterly Journal of Economics*, 2010, *125*, 91–128.

Lee, David S., "Wage Inequality in the United States During the 1980s: Rising Dispersion or Falling Minimum Wage?," *Quarterly Journal of Economics*, 1999, *114*, 977–1023.

Piketty, Thomas and Emanuel Saez, "Income Inequality in the United States, 1913-1998," *Quarterly Journal of Economics*, 2003, *118*, 1–39.

Record, Jane Cassels, "The War Labor Board: An Experiment in Wage Stabilization: Comment: Reply," *American Economic Review*, 1944, *34*, 575–577.

Rose, Jonathan, "Government Interventions in Times of Economic Crisis." PhD dissertation, University of California, Berkeley 2009.

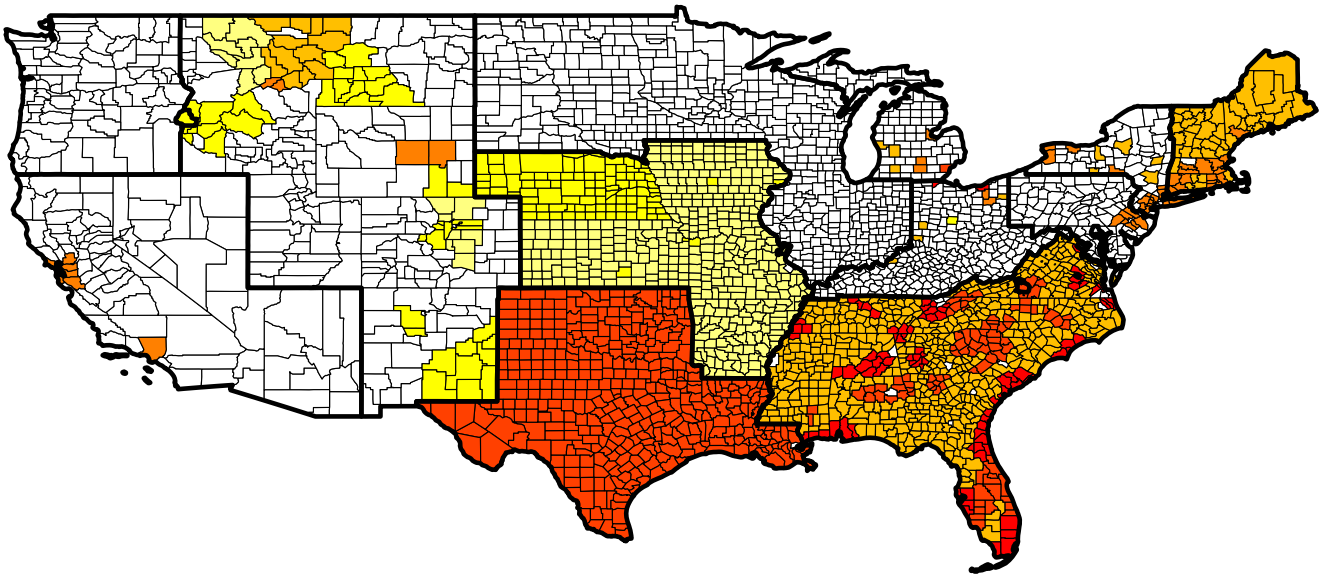
Shatnawi, Dina and Price V. Fishback, "The Impact of World War II on the Demand for Female Workers in Manufacturing," *Journal of Economic History*, 2018, *78*, 539–574.

United States Department of Labor, *The Termination Report of the National War Labor Board*, United States Department of Labor, 1949.

Vickers, Chris and Nicolas L. Ziebarth, "The Effects of the National War Labor Board on Labor Income Inequality," 2022. Unpublished, Auburn University.

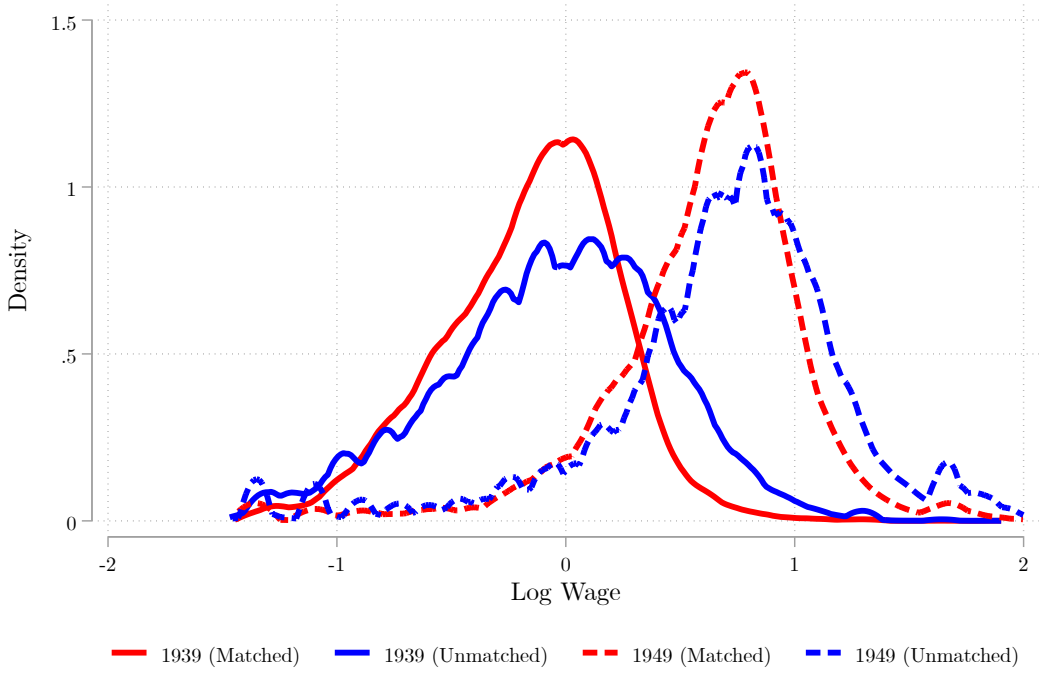
Western, Bruce and Jake Rosenfeld, "Unions, Norms, and the Rise in US Wage Inequality," *American Sociological Review*, 2011, *76*, 513–537.

Figure 1: Brackets for Stenographers



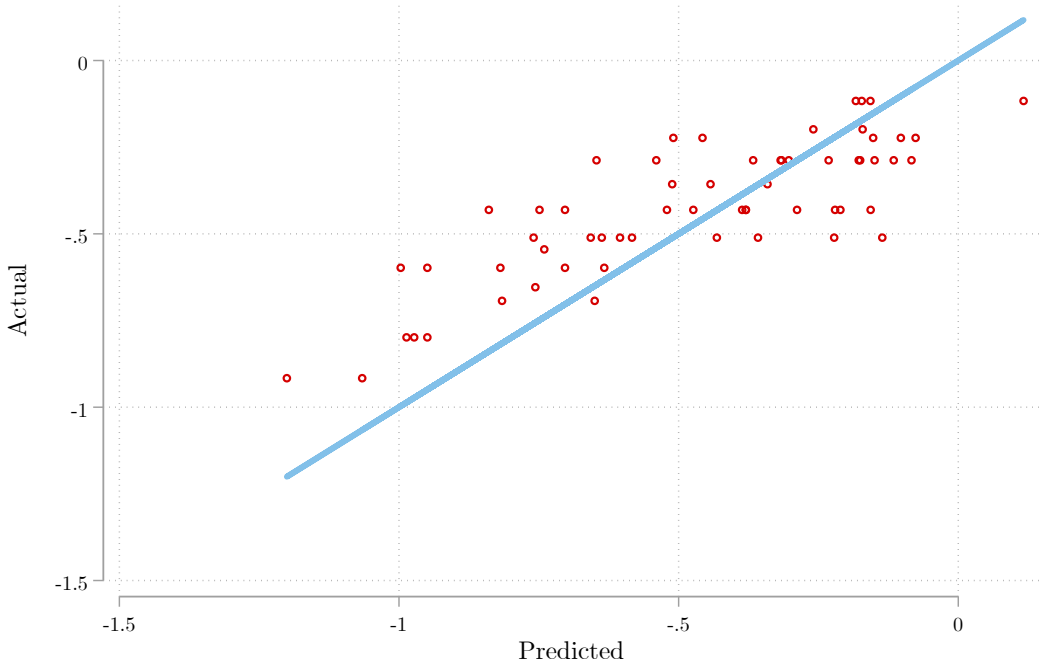
Notes: Darker values represent higher values for the bracket. Region I, which covers the northeast, defines brackets at the town level. So a shaded county in that region means that the county includes a city with a bracket assigned. For the other regions, brackets are assigned at the county level. The thick black lines represent the borders of NWLB regions. Counties are unshaded either because (1) the county is not listed in the brackets; (2) the county had no stenographers in the 1940 Census; or (3) the brackets for a region are missing or have not been collected.

Figure 2: Comparing the Matched and Unmatched Sample



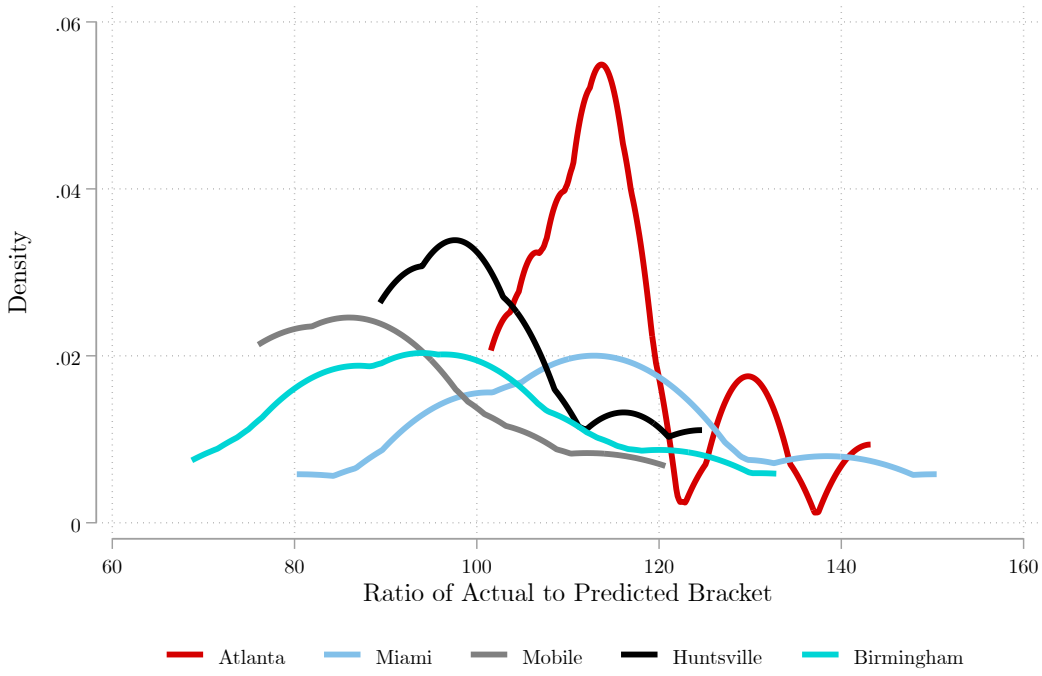
Notes: An observation is an occupation-county in a given year. The matched sample is the one that we can match to brackets and the unmatched are the rest. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943. The data are for a sample of office work occupations in the South collected by the BLS in the middle of 1943.

Figure 3: Actual vs. Predicted Brackets Based on 90% of Mean Rule



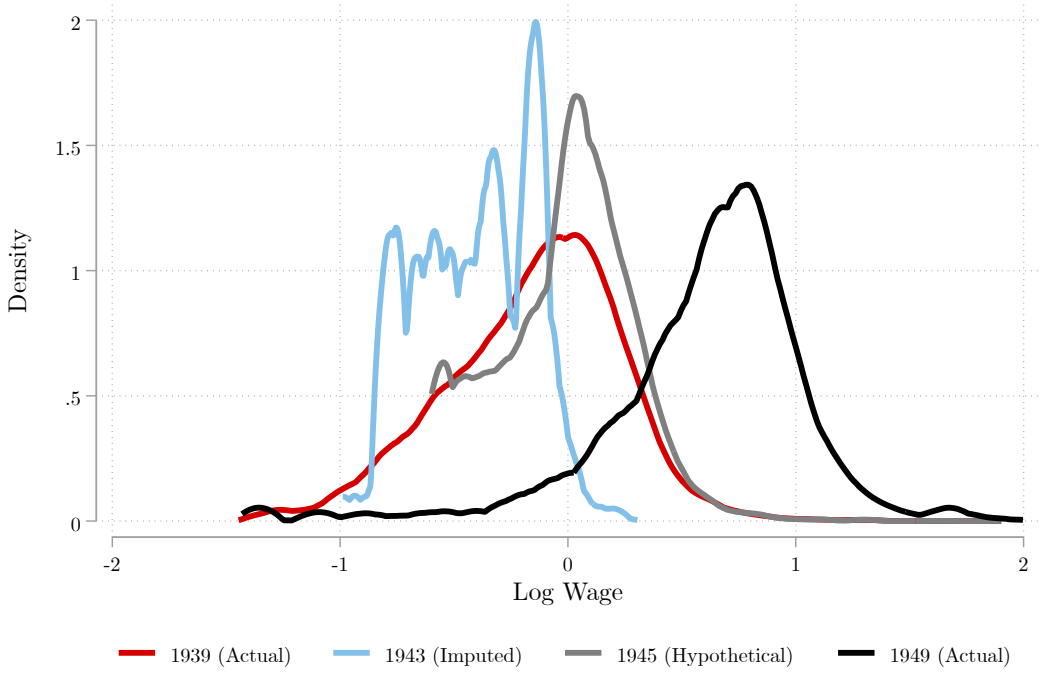
Notes: The actual and predicted brackets are plotted on a log scale. The predicted bracket is 90% of mean earnings in a given occupation and zone. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943. The data are for a sample of office work occupations in the South collected by the BLS in the middle of 1943.

Figure 4: Distributions by City of Actual Relative to Predicted Bracket



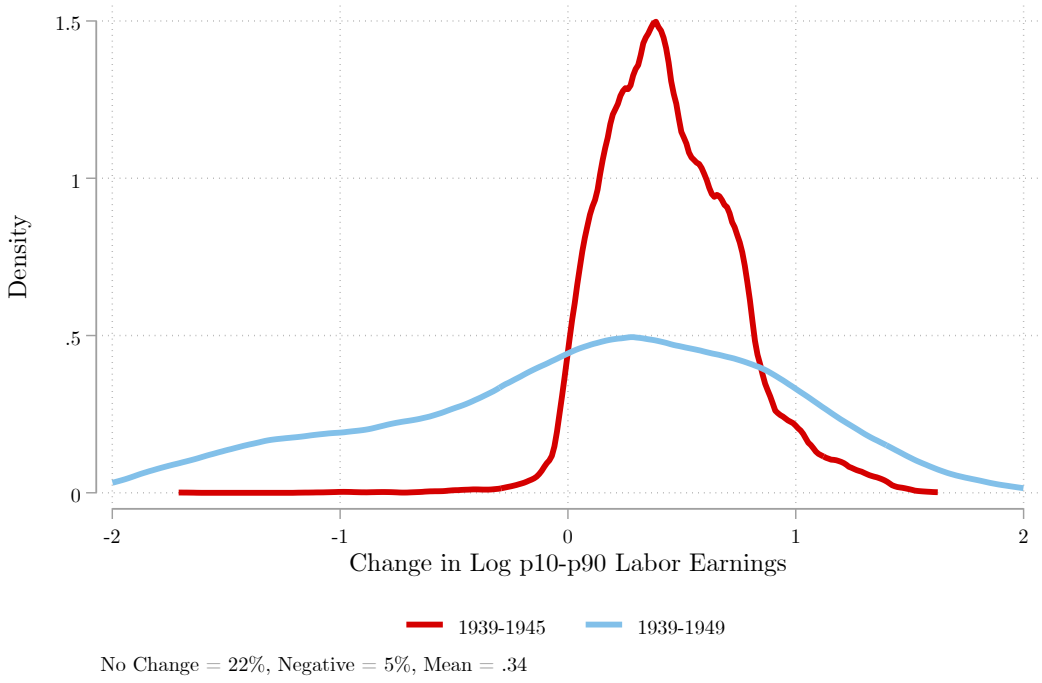
Notes: The predicted bracket is 90% of the mean wage by occupation and zone. The ratio of actual to predicted is multiplied by 100. The different cities represent different zones within NWLB Region IV. The data are for a sample of office work occupations in the South collected by the BLS in the middle of 1943.

Figure 5: Distributions of Hourly Earnings by Occupation and Region



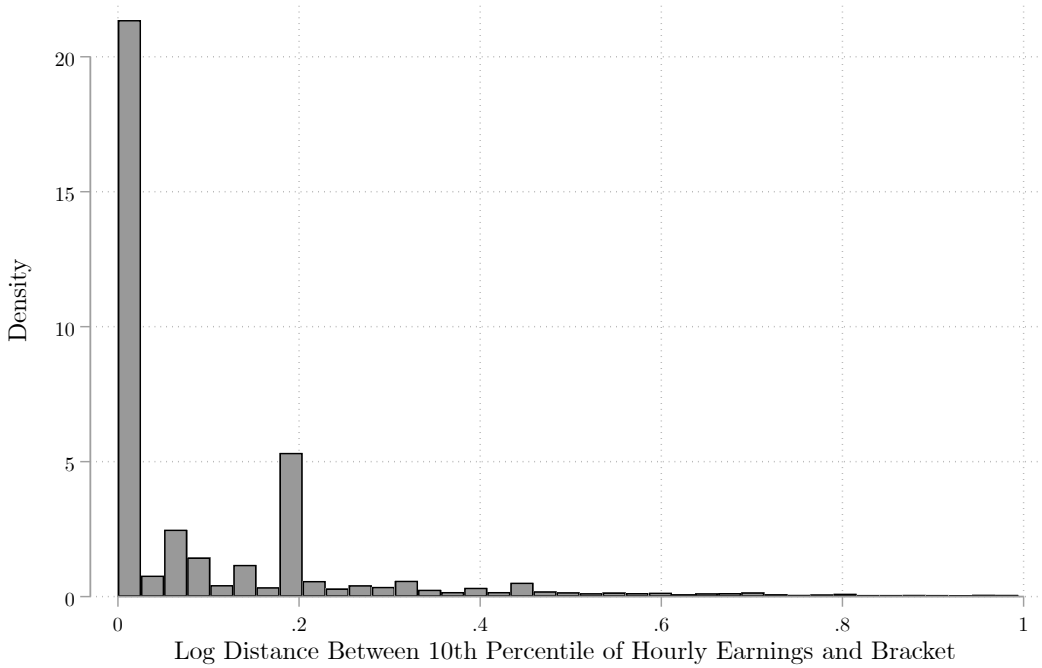
Notes: The distribution in 1939 is the actual distribution of 1939 hourly earnings from the 1940 Census of Population and similarly for 1949. The imputed distribution in 1943 is based on imputing earnings from the brackets based on the relationship between the brackets and average earnings in the BLS data. The hypothetical distribution in 1945 is the earnings applying the brackets (and NWLB minimum wage) to the 1939 earnings distribution. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943. We report the average by occupation-region of the earnings calculated in these ways for the various years.

Figure 6: Hypothetical Changes in Within Occupation-County Inequality



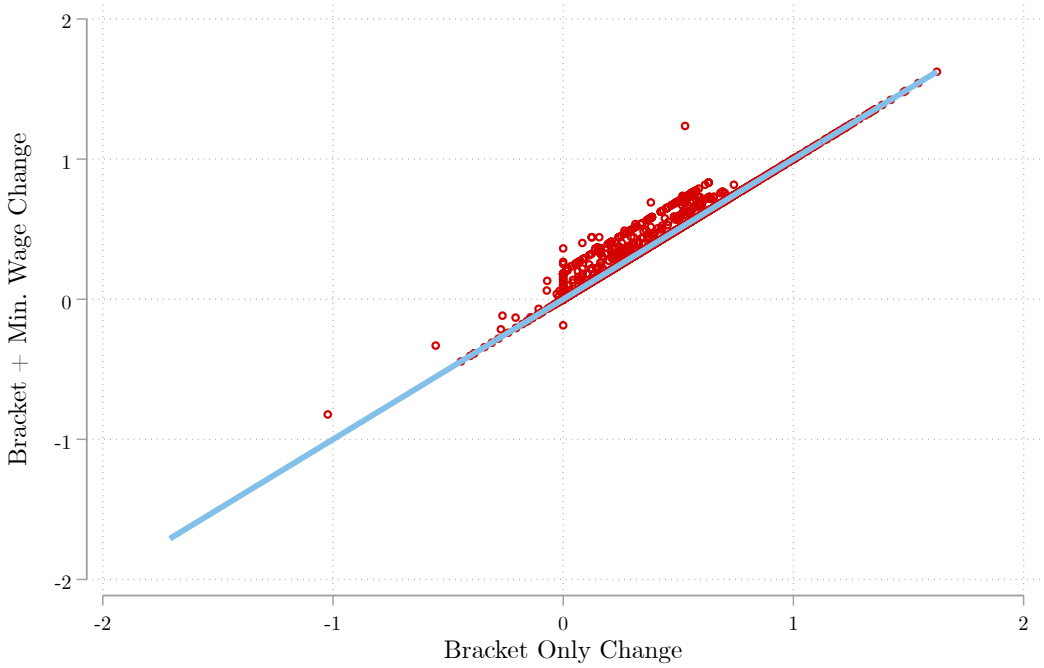
Notes: The change in inequality is between the actual distribution in 1939 and the hypothetical distribution in 1945. A positive value of this change reflects a *decrease* in inequality. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 7: Difference Between Bracket and 10th Percentile of Hourly Earnings



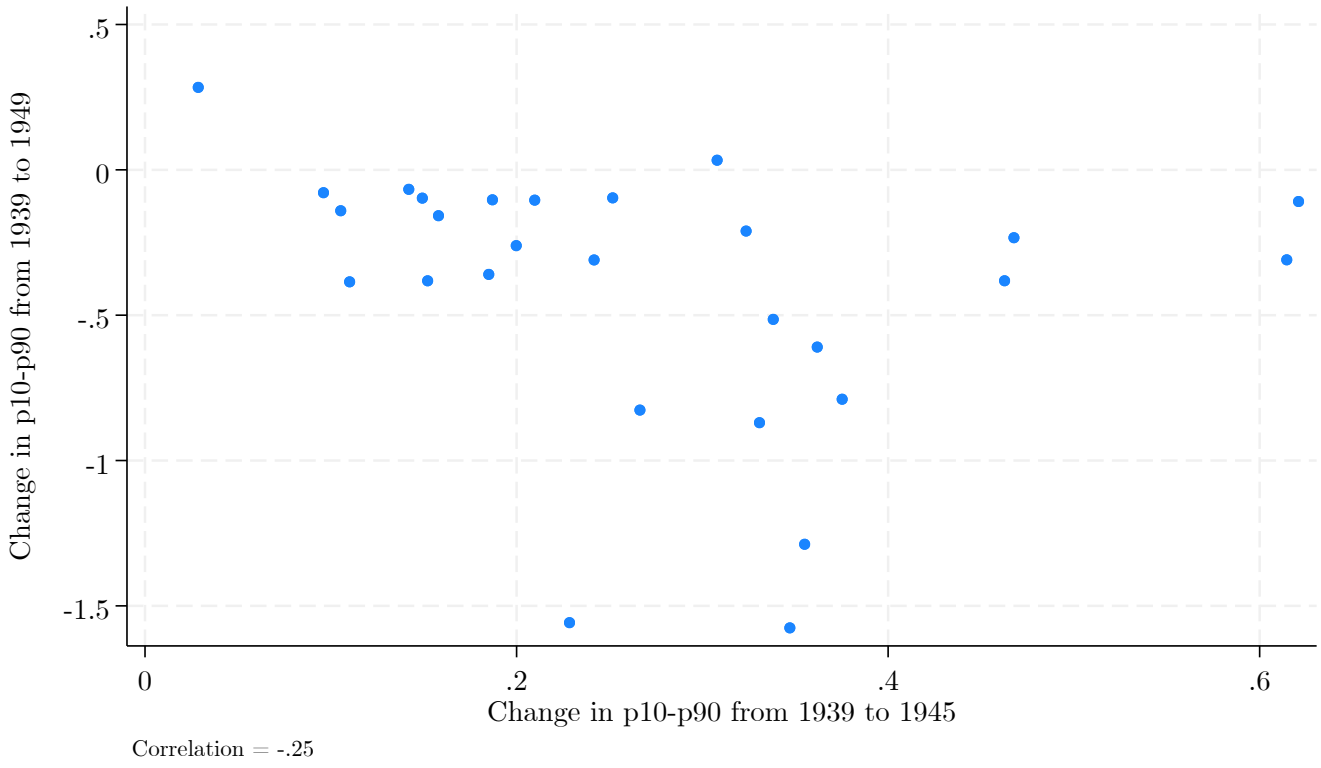
Notes: The distribution is conditional on no hypothetical effect on the p10-p90 measure of inequality. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943. The distribution shows how much faster the 10th percentile of hourly earnings in 1939 would have to grow above the average growth rate between 1939 and 1943 to just reach the level of the bracket.

Figure 8: Brackets vs. Minimum Wage on p10-p90 Inequality?



Notes: The x-axis plots the hypothetical effects on the change in the p10-p90 difference of the bracket alone while the y-axis plots the hypothetical effect of both the bracket and the minimum wage. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 9: Within Occupation Changes in p10-p90 Before and After the War

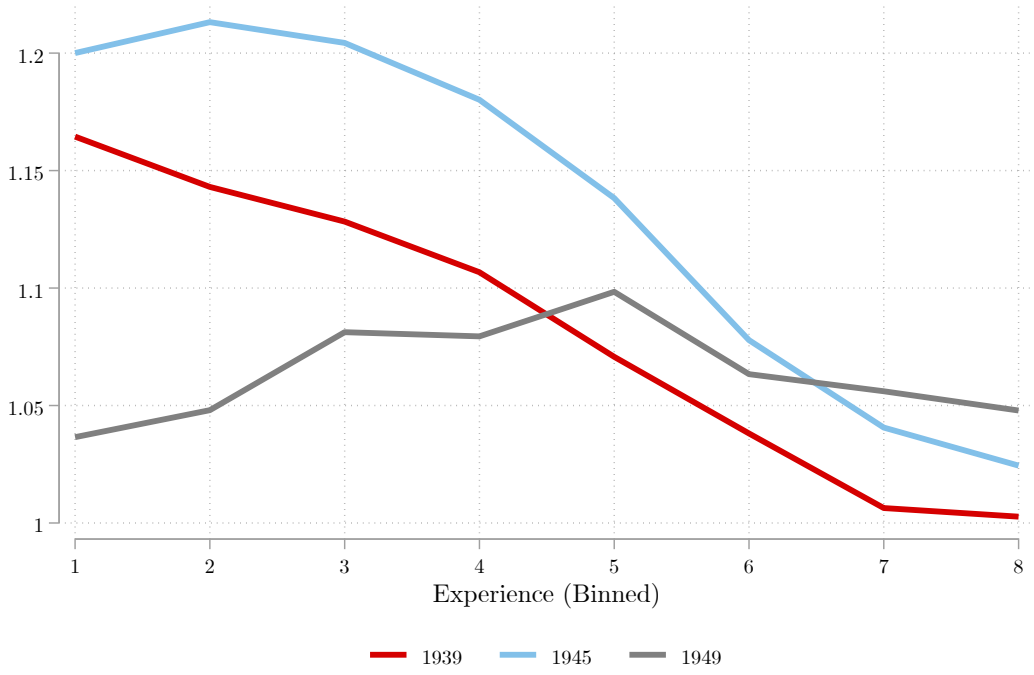


Notes: A point represents an occupation. The change between 1939 and 1949 is the actual change in earnings inequality while the change from 1939 to 1943 is the hypothetical one. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 10: Hypothetical Changes in Earnings by Initial Earnings: Occupations

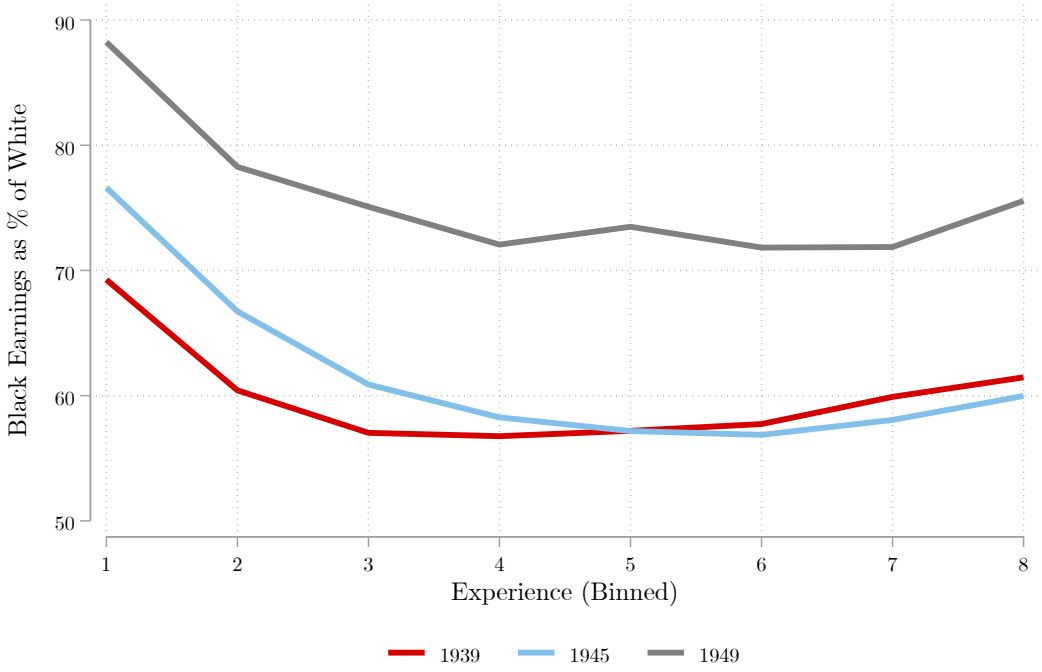
Notes: A point represents an occupation. Variables have been centered. The blue line is the line of best fit and the black line is a negative 45-degree line. These changes in mean earnings are between the hypothetical distribution assuming the bracket and minimum wage are binding and the 1939 distribution. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 11: Hypothetical Effects of Brackets on Education Skill Premium



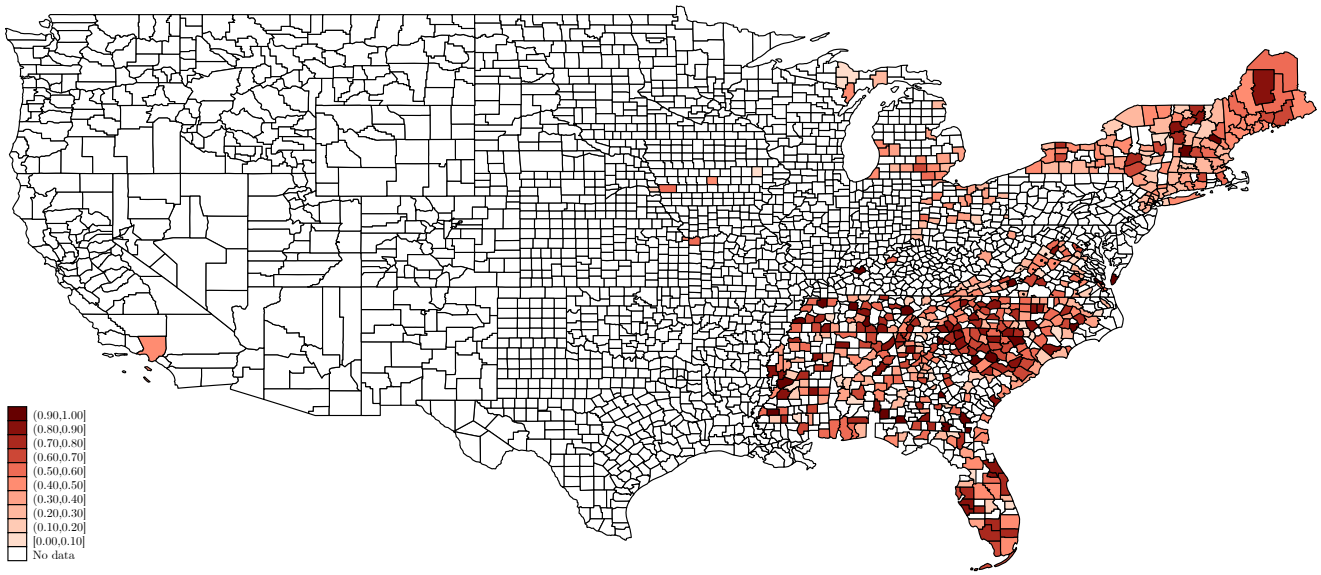
Notes: The premium is between those with some college degree and those with a high School degree. The 1939 Overall is the skill premium in the full 1940 Census of Population. The 1939 Matched is the earnings skill premium from the 1940 Census of Population for white-collar and metal trades occupations. The WLB simulated is the hypothetical skill premium imposing the brackets and the minimum wage for white-collar and metal trades occupations. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 12: Hypothetical Effects of Brackets on Racial Gap



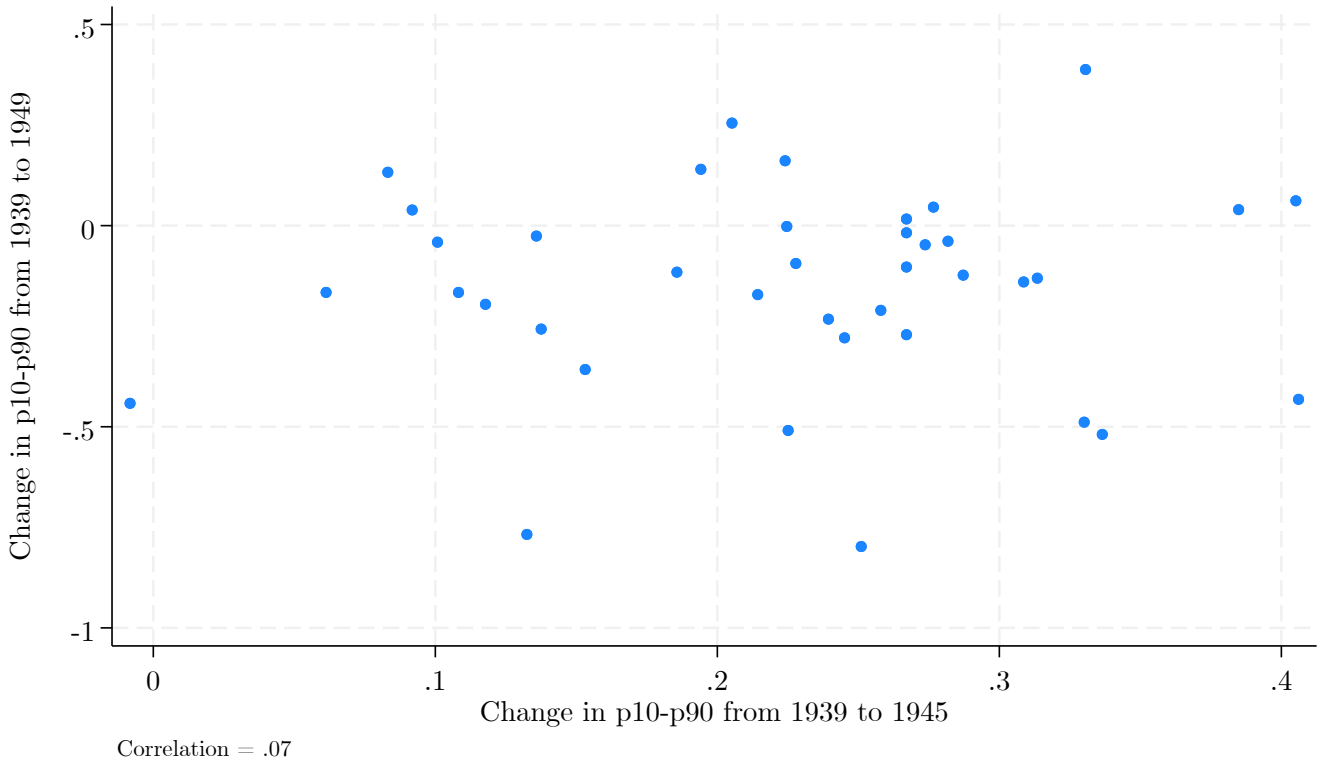
Notes: The 1939 line is Black earnings as a percentage of white earnings for our matched sample in the 1940 Census of Population. The 1949 line is for the 1950 Census of Population. The WLB simulated is the hypothetical racial gap imposing the brackets and the minimum wage. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 13: Geographic Variation in Changes in Within County Inequality: Electricians



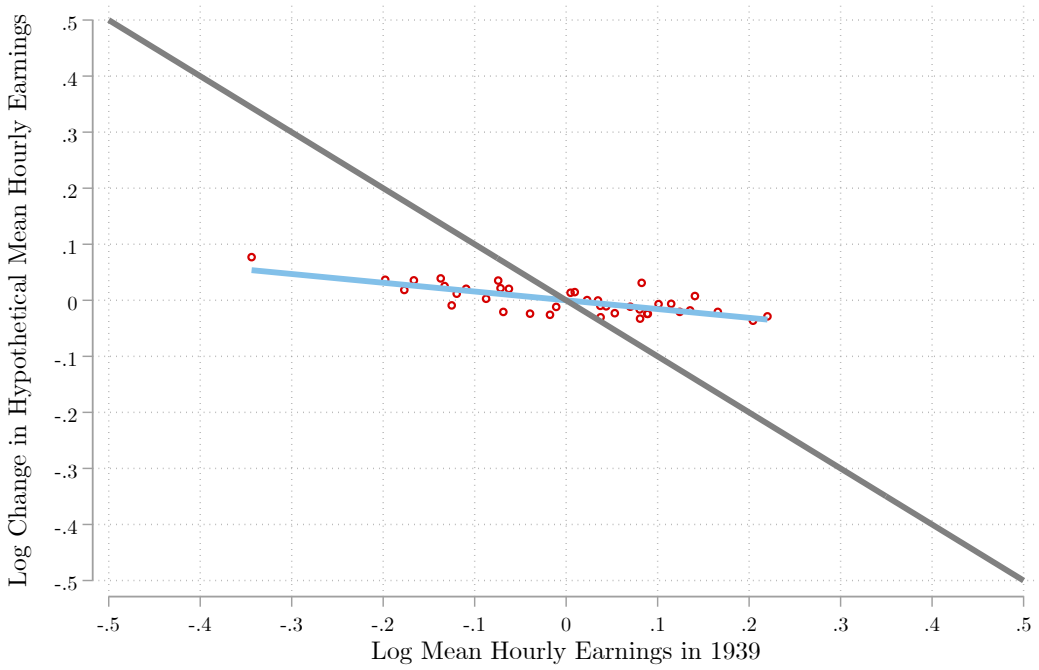
Notes: In Region IV, geographic divisions for brackets are defined at the county level. Counties were divided into "A", "B", "C", and "D" zones, with different brackets defined for each covered occupation for each zone. These changes in inequality are between the hypothetical distribution assuming the bracket and minimum wage are binding and the 1939 distribution. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 14: Within State Changes in p10-p90 Before and After the War



Notes: A point represents a state. The change between 1939 and 1949 is the actual change in earnings inequality while the change from 1939 to 1943 is the hypothetical one. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Figure 15: Hypothetical Changes in Earnings by Initial Earnings: States



Notes: A point represents a state. Variables have been centered. The blue line is the line of best fit and the black line is a negative 45-degree line. These changes in mean earnings are between the hypothetical distribution assuming the bracket and minimum wage are binding and the 1939 distribution. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Table 1: Hypothetical Changes in Inequality from 1939 to 1949 by Occupation

	100× Change in Log...								
		p10-p90			p10-p50			p50-p90	
Occupation	1939 - 1949	1939-1945	1945 - 1949	1939 - 1949	1939-1945	1945 - 1949	1939 - 1949	1939-1945	1945 - 1949
Draftsmen	-36.0	18.5	-54.5	-34.4	20.3	-54.7	-1.5	-1.8	0.3
Bookkeepers	-9.7	14.9	-24.7	-28.7	14.3	-43.0	19.0	0.6	18.4
Messengers and office boys	-31.0	36.2	-55.2	-41.7	37.6	-67.3	10.7	-1.4	12.1
Office machine operators	-38.5	11.0	-49.5	-45.9	8.7	-54.6	7.4	2.3	5.1
Stenographers, typists, and secretaries	-51.4	33.8	-85.2	-48.2	33.8	-82.0	-3.3	0.0	-3.3
Telephone operators	-7.9	9.6	-17.5	-25.4	10.1	-35.5	17.5	-0.5	18.0
Clerical and kindred workers (n.e.c.)	-26.1	20.0	-46.0	-36.9	15.1	-52.0	10.8	4.9	5.9
Carpenters	-30.9	61.5	-92.4	-38.0	55.6	-93.6	7.1	5.9	1.2
Cranemen,derrickmen, and hoistmen	-38.2	15.2	-53.4	-39.2	15.2	-54.4	1.0	-0.0	1.0
Electricians	-128.8	35.5	-164.3	-97.4	33.5	-131.0	-31.4	2.0	-33.4
Machinists	-61.0	36.2	-97.2	-63.7	31.8	-95.5	2.8	4.4	-1.6
Millwrights	-82.6	26.6	-109.3	-78.4	25.3	-103.7	-4.2	1.4	-5.6
Molders, metal	-23.3	46.8	-70.1	-28.0	31.9	-59.9	4.7	14.9	-10.2
Painters, construction and maintenance	-38.2	46.3	-84.4	-49.9	36.6	-86.5	11.8	9.6	2.1
Pattern and model makers, except paper	-155.8	22.9	-178.6	-124.4	16.9	-141.4	-31.3	5.9	-37.3
Tool makers, and die makers and setters	-157.6	34.7	-192.3	-126.5	32.2	-158.7	-31.1	2.5	-33.6
Furnacemen, smeltermen and pourers	-14.1	10.5	-24.6	-14.4	12.6	-27.0	0.4	-2.0	2.4
Heaters, metal	-78.9	37.5	-116.4	-37.4	24.5	-61.9	-41.5	13.1	-54.6
Oilers and greaser, except auto	-15.8	15.8	-31.6	-20.8	15.8	-36.6	5.0	-0.0	5.0
Sawyers	-10.4	21.0	-31.4	-20.7	20.4	-41.1	10.3	0.5	9.7
Truck and tractor drivers	-21.0	32.4	-53.4	-22.7	29.4	-52.1	1.7	3.0	-1.3
Welders and flame cutters	-87.0	33.1	-120.1	-87.6	26.1	-113.7	0.6	6.9	-6.3
Elevator operators	-10.3	18.7	-29.0	-16.1	18.7	-34.8	5.8	-0.0	5.8
Guards, watchmen, and doorkeepers	-6.7	14.2	-20.9	-22.6	14.2	-36.8	15.9	-0.0	15.9
Housekeepers and stewards, except private household	28.4	12.4	25.5	4.2	12.4	1.3	24.2	-0.0	24.2
Janitors and sextons	3.3	30.8	-27.5	-2.3	30.1	-32.4	5.6	0.7	4.9
Practical nurses	-10.9	62.1	-73.0	-39.9	45.3	-85.2	29.0	16.8	12.2
Laborers (nec)	-9.6	32.4	-34.8	-14.4	32.2	-39.3	4.8	0.2	4.5

Notes: The changes in inequality between 1939 and 1945 is the change relative to the hypothetical distribution and similarly for the change between 1945 and 1949. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.

Table 2: Hypothetical Changes in Inequality from 1939 to 1949 by State

	100× Change in Log...								
	p10-p90			p10-p50			p50-p90		
State	1939 - 1949	1939-1945	1945 - 1949	1939 - 1949	1939-1945	1945 - 1949	1939 - 1949	1939-1945	1945 - 1949
AL	4.6	37.2	-23.1	-15.6	25.7	-31.8	20.2	11.5	8.7
AR	13.3	21.9	5.0	0.0	21.9	-8.3	13.3	0.0	13.3
CA	-76.8	13.8	-90.0	-83.0	8.5	-90.7	6.3	5.3	0.7
CO	6.2	40.5	-34.3	-13.2	37.5	-50.7	19.4	3.0	16.4
CT	-17.2	21.4	-38.6	-30.1	10.1	-40.2	12.9	11.3	1.6
FL	1.7	36.2	-25.1	-19.4	21.2	-31.1	21.1	15.1	6.0
GA	-4.8	36.9	-32.1	-20.5	26.8	-37.3	15.8	10.1	5.2
IA	-2.6	13.6	-16.2	-19.7	12.3	-32.0	17.1	1.3	15.8
ID	38.8	33.1	5.8	23.6	26.7	-3.1	15.2	6.4	8.8
ID	-44.2	-0.8	-43.3	-24.0	-35.2	11.2	-20.2	34.3	-54.5
KS	-4.1	9.8	-14.2	-15.8	9.2	-25.2	11.6	0.6	11.1
KY	-9.4	22.8	-32.2	-26.0	8.5	-34.4	16.6	14.3	2.2
LA	-43.2	40.6	-83.8	-41.5	40.6	-82.1	-1.7	0.0	-1.7
MA	-1.8	26.7	-28.5	-16.1	18.6	-34.7	14.3	8.1	6.2
MD	-16.6	6.1	-22.7	-14.0	3.0	-17.0	-2.6	3.2	-5.7
ME	-14.0	30.9	-44.9	-31.7	22.9	-54.6	17.7	8.0	9.7
MI	-48.9	33.0	-81.9	-49.5	26.6	-76.1	0.7	6.5	-5.8
MO	-16.6	10.8	-27.4	-37.2	6.5	-43.7	20.6	4.3	16.3
MS	4.0	58.6	-34.5	-13.3	44.4	-37.6	17.2	14.2	3.1
MT	-50.9	22.5	-73.4	-49.9	22.9	-72.8	-1.1	-0.4	-0.7
NC	-0.2	32.5	-22.7	-17.7	18.2	-25.9	17.5	14.3	3.2
NE	16.1	22.4	-6.3	-4.7	22.4	-27.1	20.8	0.0	20.8
NH	25.5	20.5	5.0	4.1	12.5	-8.4	21.4	8.0	13.4
NJ	-19.6	11.8	-31.3	-29.3	6.5	-35.8	9.8	5.3	4.5
NM	-25.7	13.8	-39.5	-26.3	14.3	-40.6	0.6	-0.5	1.1
NY	-35.8	15.3	-51.1	-51.9	7.3	-59.2	16.1	8.0	8.1
OH	-27.9	24.5	-52.4	-32.9	17.1	-50.0	5.0	7.4	-2.4
OK	-12.3	28.7	-41.0	-18.7	31.3	-50.1	6.4	-2.6	9.0
OR	-21.1	25.8	-46.9	-25.5	25.7	-51.2	4.5	0.1	4.4
PA	-23.2	23.9	-47.2	-34.7	20.5	-55.2	11.5	3.5	8.0
RI	-27.1	26.7	-53.8	4.0	26.9	-22.8	-31.1	-0.1	-31.0
SC	-3.9	38.2	-32.0	-16.9	21.9	-28.8	13.0	16.3	-3.2
TN	-10.3	36.2	-37.0	-29.3	25.5	-45.3	19.1	10.8	8.3
TX	-51.9	33.7	-85.5	-60.1	32.1	-92.2	8.2	1.5	6.7
VA	-11.6	18.6	-30.1	-25.4	9.5	-35.0	13.9	9.1	4.8
VT	14.0	19.4	-5.4	-0.6	15.4	-16.0	14.6	4.0	10.6
WA	-79.8	25.1	-104.9	-75.9	25.1	-101.0	-3.9	-0.0	-3.9
WV	-13.1	31.3	-44.4	-26.1	21.9	-48.0	13.0	9.4	3.6
WY	3.9	9.2	-5.3	2.2	9.3	-7.1	1.7	-0.1	1.8

Notes: The changes in inequality between 1939 and 1945 is the change relative to the hypothetical distribution and similarly for the change between 1945 and 1949. The hourly earnings variable is calculated using reported labor income and weeks worked and assuming a 40-hour workweek. Earnings in 1943 are adjusted for growth in production worker compensation between 1940 and 1943.