Industrial, regional, and gender divides in British unemployment between the wars

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Abstract

During the 1920s and early 1930s, Britain experienced an unemployment crisis more persistent and severe than any employment downturn since industrialization. This paper assesses how labor market rigidities slowing or limiting the reallocation of labor across industries contributed to this persistent unemployment. I evaluate the extent to which labor reallocation occurred in interwar Britain and how these adjustments varied across industries, gender, and regions. By digitizing interwar British government records, I construct a dataset of unparalleled scope with unemployment by gender for 100 interwar industries. I capture reallocation by estimating adjustment coefficients and Markov transition probabilities, simulating the persistence of unemployment for men and women in different industries. I find that workers were easily brought into expanding industries, but workers in contracting industries faced rigidities inhibiting movement to other industries. The labor market for men had more adjustment on the whole than for women, and regions in the South and Midlands fared better than those in the North and in Wales. At this finer level of disaggregation, this heterogeneity in adjustment suggests that long-term unemployment in interwar Britain was experienced more acutely by some groups of workers than others.

JEL classification: N34, J64, J21, N14, N94

Keywords: labor reallocation; unemployment; rigidities; interwar; gender-disaggregated

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1 Introduction

Between World War I and World War II, Britain experienced the longest and most intense bout of unemployment since industrialization. During the brief recession at the end of the war, the unemployment rate climbed to 23.4% in May of 1921. From there, it never fully recovered, remaining over 10% in almost every month of the 1920s. The Great Depression, though comparatively mild in Britain, intensified unemployment even further. The unemployment rate doubled from the end of 1929 to the end of 1930, reaching a peak of 23.0% in January 1933. During the interwar period, mass unemployment became a pressing social and political issue, shaping electoral politics and contributing to the 1926 General Strike.

The causes of this prolonged employment downturn have been debated in a large literature focused on aggregate demand fluctuations and supply factors in interwar Britain. Our understanding of the role of labor market rigidities in this unemployment episode has been limited, however, by a reliance on aggregate data and macroeconomic methods. The divergent performance of industries in interwar Britain created the conditions for substantial structural change through labor reallocation across industries, but it is still unknown how much reallocation actually occurred and which workers benefited. Differences in the flexibility of the labor market by gender, by region, and by sector have yet to be explored.

This paper takes up these open questions by evaluating the extent to which reallocation of labor across industries occurred in interwar Britain. How much adjustment was there in the interwar labor market, and how did this vary by industry, gender, and region? Which unemployed workers were able to find other employment opportunities? To answer these questions, I digitized hundreds of interwar British government documents to build a dataset on unemployment for 100 industries, disaggregated by gender, for every month from 1923–1936. With this rich disaggregated data, I capture reallocation econometrically in two ways, estimating adjustment coefficients and Markov transition probabilities. I find substantial heterogeneity in adjustment by industry, gender, and region, suggesting that labor market rigidities and persistent unemployment in interwar Britain affected some groups of workers much more than others.

By developing a detailed dataset on unemployment and pursuing a novel empirical strategy, this paper contributes new evidence on labor market adjustment to long-running debates on interwar British unemployment. The discussion on unemployment benefits sparked by Benjamin and Kochin (1979) led to a proliferation of economic history research on interwar British unemployment using macroeconomic frameworks. This research has found evidence that both depressed aggregate demand (Broadberry 1983; Dimsdale, Nickell, and Horsewood 1989; Turner and Bowden 1997) and aggregate and institutional labor market rigidities such

as inflexible wages, unemployment insurance, and trade unionization (Beenstock and Warburton 1986, 1991; Hatton 1988; Hatton and Thomas 2013) contributed to high levels of overall unemployment in interwar Britain.[1] Luzardo-Luna (2019) finds additional evidence for interwar labor market frictions in a search-and-matching framework. My paper builds on this literature by analyzing labor market rigidities at a finer level of disaggregation using econometric methods, focusing on labor market flows across industries and incorporating gender and region.

My analysis is based on the first complete digitization of the Ministry of Labour's unemployment data for 1923–1936, which were printed monthly in the *Labour Gazette*. I digitized hundreds of pages of these documents using optical-character recognition (OCR) technology, cleaning and linking the monthly data to construct a comprehensive dataset on unemployment in 100 industries, disaggregated by gender, for every month in the period. Since their original publication, hand-collected subsets of this Ministry of Labour *Gazette* data have been the basis of reference works and early empirical research on interwar unemployment (Beck 1951; Chapman and Knight 1953; Feinstein 1972, for example). Recent papers have also used subsets or aggregates of this data: Gazeley and Rice (1992) analyze wages for four staple industries, Turner and Bowden (1997) incorporate twenty-one industry categories into a macroeconomic framework, Bowden, Higgins, and Price (2006) presents summary statistics for twenty-five industry categories and empirical results on short-time working for various subsets of ten industries, and Luzardo-Luna (2019) gives summary statistics for fifteen industry categories, incorporating four industries in his empirical analysis. My paper extends this research by contributing the full dataset on interwar unemployment by industry and gender. I analyze four times as many industries as in any previous study, which enables the use of econometric methods.

Additionally, despite the ready availability of gender-disaggregated unemployment data from the Ministry of Labour during this period, Bowden, Higgins, and Price (2006) and Heim (1984) are the only major papers that discuss unemployment separately for men and women. My paper disaggregates by gender whenever possible, more closely modeling the discriminating labor markets and distinct labor supply choices men and women workers faced during the interwar period.

The empirical approach I take is shaped by the limitations of the historical labor market data available for interwar Britain. There is no individual-level data available on the transitions of workers between industries in interwar Britain. While the Ministry of Labour left extremely rich archival data on unemployment in interwar British industries, data on employment is only available annually, and data on vacancies is not available for all industries

1. Turner and Bowden (1997) do allow for variation across sectors in their model.

or for every year. Circumventing these limitations, I estimate the amount of labor market adjustment across industries and by gender in two ways.

The first method is to estimate simple adjustment coefficients that relate changes in employment in an industry to changes in unemployment in the same industry using least squares. This takes advantage of the fact that unemployed workers are associated with the industries in which they were last employed in the Ministry of Labour data. For industries that were contracting in employment, the adjustment coefficients represent whether laid off workers joined the unemployed pool of labor in their industry or were hired in a different industry. For industries that were expanding in employment, these coefficients represent whether workers were hired from the unemployment pool associated with that industry or if they came from other industries or from outside the labor force. I estimate adjustment coefficients for six industry sectors and for expanding and contracting industries, first for the whole labor force and then separately for men and women. I also explore the speed of adjustment and how the average adjustment coefficient differed across the regions of England and Wales.

The second method estimates mobility across sectors and employment states by modeling these transitions as a Markov process. There is a large literature on estimating Markov transition probabilities from aggregate data (Lee, Judge, and Zellner 1970; MacRae 1977; Van Der Plas 1983; Kalbfleisch and Lawless 1984). Transition probabilities can be estimated from the counts or proportions of individuals or other micro components in aggregate states using some form of conditional least squares. For the period 1923–1936, I use aggregate data on the proportion of the labor force in twelve employment-industry states, representing employment and unemployment in six industry categories. To estimate the Markov transition probabilities between states, I set up and solve a quadratic programming problem minimizing the sum of squared residuals subject to constraints that the estimated probabilities are valid and sum to one and that transitions between employment and unemployment states operate according to the arrangement of the unemployment insurance program from which the data derive. I bootstrap standard errors for these probabilities using residual resampling. Then, I simulate 120,000 individuals in the Markov process. Their paths shed light on the persistence of unemployment for individuals in each employment-industry state.

The results of the adjustment coefficient analysis indicate that interwar industries not only had large differences in unemployment, but they also had differences in their ability to adjust their labor supply to these employment changes. Workers in services and building benefited from high levels of adjustment across industries, while workers in textiles and mining faced rigidities to adjustment. When these results are disaggregated by gender, it is apparent that on the whole, labor markets were less flexible for women than for men, with some variation by sector. Women faced more rigidites than men in the textile industries, but

fewer in the service industries and in the other manufacturing industries. When adjustment is considered by region, the South East and London regions had the most flexible labor markets, while labor markets in the North and Wales regions were the least flexible.

Adjustment coefficients were higher in industries that were expanding than in those that were contracting. This suggests that workers in industries with declining employment had few opportunities to move into other industries. During the Great Depression, the adjustment coefficients for contracting industries worsened while the coefficients for the expanding industries improved. The Great Depression thus increased the gap between contracting and expanding industries, deepening the industrial divide. This pattern holds when only men are considered, but not for women exclusively. Labor market adjustment decreased for women in both expanding and contracting industries during the Great Depression.

The results of the Markov analysis give some evidence on which industries workers were able to transition between. For men, unemployed mining workers were least likely to find employment, with movement primarily into building industries. Unemployed men in metal manufacturing were most likely to find alternative employment in textile manufacturing, other manufacturing, or in the services. For women, employed textiles workers had a high probability of becoming unemployed, but once unemployed were more likely than not to find work in another industry. In contrast, women employed in service industries were unlikely to become unemployed, but if they did, were likely to remain unemployed. Simulating the Markov chain for 120,000 individuals over thirteen time steps, men that began employed in other manufacturing and in service had the least unemployment while those who began in mining and textiles had the most unemployment. For women, employed service workers spent the fewest time steps in unemployment while employed textile workers spent the most. The heterogeneity in adjustment across industries and by gender thus led unemployment to be more persistent for some groups of workers than for others.

In order to better understand these results, my paper provides some additional evidence on the determinants of industry-level unemployment rates for men and women. I digitized almost 1,000 pages of the 1924 and the 1930 *Census of Production* to assemble a new dataset on the characteristics of 123 interwar production industries. Then, I linked this data with the Ministry of Labour *Gazette* data on industry-level unemployment. A regression model indicates that export industries and those that expanded substantially during World War I suffered higher unemployment rates. A one standard deviation increase in the percent of output exported in an industry corresponds to a 1.88 percentage point increase in that industry's unemployment rate, while a one standard deviation in an industry's growth during World War I corresponds to a 1.27 percentage point increase in the industry's unemployment rate in 1924. In contrast, industries that had high levels of female employment were associated with low unemployment overall, indicating a capacity of some industries to ab-

sorb new workers. The magnitude of this advantage is large, with a one standard deviation increase in the proportion of women corresponding to a 3.06 percentage point decline in the industry unemployment rate overall. When I disaggregate this analysis for men and women, the results are similar for men. Industry-level unemployment rates for women, however, depended critically on the composition of administrative and operative tasks in an industry. The results of this additional analysis shed some light on why certain industries had more adjustment than others during the interwar period, and why gender affected this labor market adjustment.

I also use my newly-digitized Ministry of Labour *Gazette* data to provide new descriptive statistics on interwar unemployment. For the first time, the monthly unemployment rate series for Britain can be disaggregated by gender. I can also identify the industries which accounted for the most unemployed male and female workers. Finally, the Ministry of Labour unemployment data can be linked with data on the distribution of workers in 12 regions of England and Wales from the 1931 *Census of England and Wales* industry report. Using the industry-level unemployment rates, it is possible to decompose regional unemployment differences into the proportion due to industry mix effects and the proportion due to other regional effects.

The paper is structured as follows. Section 2 gives a brief historical background on interwar British unemployment. Section 3 describes the Ministry of Labour *Gazette* data and offers summary statistics on unemployment by gender, by industry, and across regions. Section 4 describes the two empirical methods used to estimate the level of labor market adjustment for interwar industries. In Section 5, I present the main results on labor market adjustment from both methods in turn. Section 6 probes these results further by providing evidence on the determinants of industry-level unemployment rates. Finally, Section 7 concludes.

2 Historical background

"...[T]he immediate future for me—and I view the position of those that are older than myself, or those who may have had experiences as bad as mine—appears to be as one of a crowd rushing hither and thither to find an outlet of escape which at each turn finds the channel choked as it becomes more narrow."[2] *– an unemployed house painter in London describing the search for work*

The inflationary boom at the end of World War I—driven by pent-up consumption,

2. From Beales and Lambert (1934, 173)

nominal wage increases, and working week decreases—collapsed into a global depression from 1921 to 1922. This downturn was particularly severe in Britain,[3] where the unemployment rate increased from an average of 3.9% in 1920 to over 20% in the spring of 1921, reaching a maximum for the decade of 23.4% in May of 1921. The war had shifted Britain's position in the world economy substantially—Britain was no longer at the nexus of global trade or the arbiter of the international gold standard. Policy making was clouded by the uncertainty of reparations, inter-Allied war debt repayments, and labor militancy.

By the middle of the 1920s, the economy had recovered by many measures. From the end of the war, Britain had pursued an objective of returning to the gold standard at its pre-war parity with the dollar. Tight monetary policies throughout the early 1920s helped Britain avoid the high inflation experienced by other European countries. The pound was restored to the gold standard in 1925, making London once again the center of the international money market. By 1924, the issue of Britain's debts to the US was also settled, and the Dawes Plan temporarily handled questions of German reparations. Despite this seeming restoration of normality, however, unemployment remained remarkably high, averaging well over 10% in the late 1920s. The General Strike of 1926, motivated by the plight of coal miners, highlighted unemployment as an urgent social and political issue. By the 1929 General Election, remedies for unemployment were a key part of every major party's platform.

The worldwide Great Depression of the early 1930s exacerbated unemployment in Britain. The unemployment rate climbed to over 20%, where it remained for all of 1931 and 1932. The gold standard prevented credit expansion by means of lower interest rates, as the Bank rate was effectively linked to the United States' discount rate. With over three million workers unemployed, Britain finally refused to increase the Bank rate any further to protect its gold reserves in September 1931, forcing the pound off the gold standard. Under a new system of flexible exchange rates, the Bank rate was reduced from 6% to 2% through June 1932. Long-term interest rates fell, driving a sustained boom in home construction from 1933. Eventually, the expenditures of rearmament led to a full recovery before the onset of World War II. In international comparison, unemployment was higher and more persistent in Britain than in the rest of Europe during the 1920s, but Britain recovered relatively quickly from the Great Depression after leaving the gold standard.

Throughout the interwar period, Britain experienced substantial shifts in its economic structure. At the end of World War I, it faced increased international competition in mar-

3. The central dataset developed for this paper includes both Great Britain and Northern Ireland. However, in keeping with the existing literature that relies on the same sources including Northern Ireland, I use "interwar Britain" throughout the paper. Use of the shorthand term "United Kingdom" can be confusing for this period, as even after the creation of the Irish Free State in 1922, the name "United Kingdom of Great Britain and Ireland" was retained until 1927. A few cases in the paper in which data only include England and Wales are clearly marked.

kets for its major pre-war exports. The war had interrupted the cotton trade with Asian countries, who responded by developing their own supply lines. Production of coal increased throughout Europe, displacing British firms that had built up the capacity to meet domestic and international demand in wartime. Domestic markets were shifting away from traditional products and toward alternative substitutes—relying on electricity, gas, and oil rather than coal, and preferring road transport to railways, for example. Many industries grew up closer to large consumer markets, establishing industrial hubs in the Midlands and in Greater London. Trends toward agglomerations and branched firms raised the barriers to entry in some industries. The industrial structure was also affected by tariffs, subsidies, and direct government intervention, especially in the 1930s. These underlying shifts complicate our understanding of the cyclical trends of the interwar period.

3 *Labour Gazette* data and descriptive statistics

In 1911, Britain established the first national unemployment benefit scheme in the world. Originally available to about 2 million workers in volatile industries such as building and engineering, it expanded at the end of World War I to cover over 11 million workers in most industries. The benefit scheme included all contract or apprenticeship workers aged 16 or over in manual work, as well as those earning less than £250 per year in non-manual work. It excluded a few industries—agriculture, domestic service, forestry, and horticulture—due to their low risk of unemployment,[4] as well as various civil service, military, and teaching jobs (Garside 1980, 31-32).

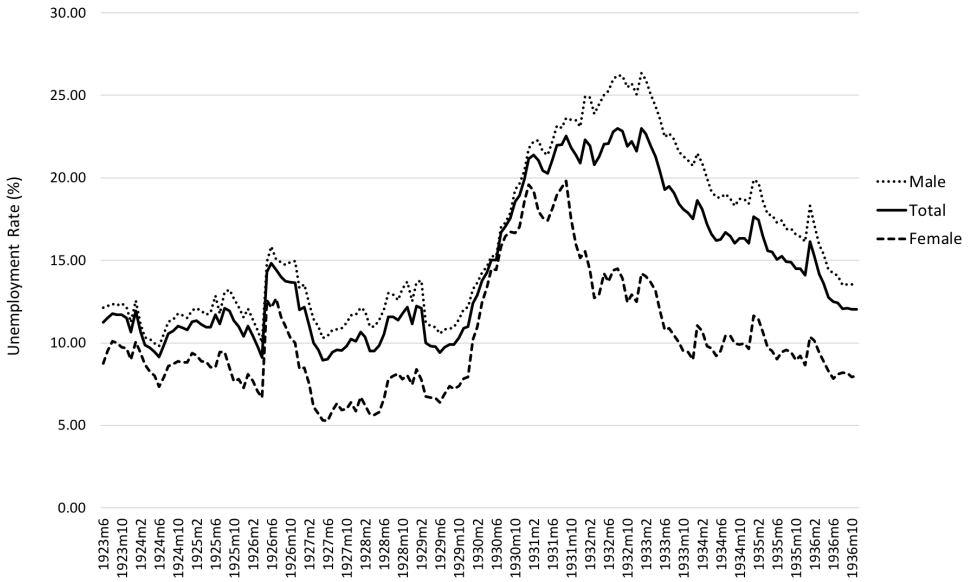
The operation and management of the National Insurance scheme led to the systematic collection and distribution of comprehensive unemployment statistics for insured workers in Britain during the interwar period. Each July, the number of persons registered under the scheme was determined by the issue of Unemployment Books at local unemployment exchanges. Workers who could not find employment lodged their book at the exchange. Every month, the *Labour Gazette* unemployment rate was calculated as the total "Books Lodged" on a given day, divided by the total number of workers insured in July.[5] Data on the numbers unemployed were printed each month in the Ministry of Labour's *Gazette*, with separate figures given for men and women across 100 industries.

This paper contributes the first complete digitization of this Ministry of Labour employment and unemployment data for 1923–1936. For 163 original Ministry of Labour *Gazettes*,

4. HC Deb 23 February 1921 vol 138 c1060. Mr. Thompson says, "The reason why the right hon. Gentleman excluded two classes from the insured people, namely, domestic servants and agricultural workers, was that the unemployment in those two classes was so small that they need not come into a general scheme."

5. Garside (1980, p. 55) details how this process was complicated somewhat by the Two Months file.

FIGURE 1: MONTHLY UNEMPLOYMENT RATE FOR BRITAIN BY GENDER, 1923–1936



Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936 for men and women.

representing every month over 14 years, June 1923 – December 1936,[6] I scanned the table "Unemployment in Insured Industries," which gives the number unemployed for the month in 100 industries, disaggregated by gender. I then used optical character recognition (OCR) software to convert the images to editable text and cleaned and verified every row and column of the data. Linking the monthly files generated a time series of unemployment for men and women in 100 industries over the 1923–1936 period.

3.1 Gender

Figure 1 presents the first monthly unemployment rate series for interwar Britain with women and men's unemployment rates disaggregated. The series with men and women together indicates that unemployment was persistently high throughout the interwar period, increasing dramatically during the Great Depression in the early 1930s. This trend is then decomposed into unemployment rates for women and for men in the labor market.

The most striking difference between the female and male series of unemployment in Figure 1 is their levels: the unemployment rate for men is higher than the aggregate series throughout the entire period, while the unemployment rate for women is lower. The unemployment rate for men ranged from its minimum of 9.8% in June 1924 to 26.3% in January 1933, with a mean of 16.1% for the period. In contrast, the unemployment rate for women

6. The *Gazettes* referenced are held by the Bodleian Libraries, Oxford. Prior to June 1923, unemployment statistics are only available for 63 industries.

ranged from 5.3% in June 1927 to a maximum of 19.8% in September 1931, with a mean of only 10.3% for the period.

The female and male unemployment series also have distinct trends. The onset of the Great Depression coincided with a steeper increase in the unemployment rate for women than for men.[7] Female unemployment rates began decreasing in 1931, while male unemployment rates remained high through 1933.

3.2 Industries

Which industries had the most unemployed workers in interwar Britain? Of the 100 industries in the *Labour Gazette*, Table 1 lists the ten industries that accounted for the highest proportion of overall unemployment 1923–1936 for both men and women.[8]

For men, coal mining accounts for the largest proportion of total unemployment (14.55%), followed by building (9.12%), distributive trades[9] (7.53%), and iron and steel founding (6.85%). For women, 19.56% of unemployed workers were associated with the cotton industry, followed by the distributive trades (12.38%); hotel, boarding house, and club services (7.89%); and the woolen and worsted industry (5.95%).

It is striking that the industries accounting for the most unemployment among men and women were so distinct—only two industries feature on both the male and female lists. This indicates that unemployment was concentrated in largely different industries for men and women. Further, many of the industries driving unemployment among women are rarely discussed in the literature on interwar unemployment, such as hotel and club services, tailoring, and pottery.

Though often left out of narratives of interwar British unemployment, the distributive trades accounted for a large portion of overall employment and unemployment during the interwar period. The rise in retail trades was driven by rising real incomes and a trend toward multiple retailing and branched retail networks. Multiple-shop retailers more than doubled their share of total retail sales over the interwar period (Jeffreys 1954, 72-73), often employing more workers per shop. While previously the distributive trades required technical skills and even apprenticeships, during the interwar period more emphasis was placed on commercial and service skills, attracting new entrants to the industry, including women (Jeffreys 1954, 52).

7. Appendix A discusses whether these trends reflected greater abuse by women of the unemployment insurance system after the "genuinely seeking work" requirement to receive unemployment benefits was dropped.

8. Appendix B considers the role of the staple industries in more detail.

9. Including wholesale distribution and retail distribution

Table 1: Industries accounting for the most unemployed workers, 1923–1936, by gender

Men			Women		
Industry	% of Total Unemp.	% of Total Emp.	Industry	% of Total Uemp.	% of Total Emp.
Coal Mining	14.55%	11.60%	Cotton Industry	19.56%	9.03%
Building	9.12%	9.26%	Distributive Trades	12.38%	20.73%
Distributive Trades	7.53%	12.53%	Hotel, Boarding House, Club	7.89%	6.42%
Iron and Steel Founding	6.85%	5.87%	Woolen and Worsted	5.95%	4.05%
Shipbuilding and Ship Repairing	6.17%	15.73%	Tailoring	4.06%	4.00%
Public Works Contracting, etc.	4.78%	1.88%	Linen	3.44%	1.45%
Canal, River, Dock Service	4.07%	1.58%	Pottery, Earthenware, etc.	2.50%	1.02%
Steel Melting, Rolling Mills, Forges	3.78%	1.66%	Hosiery	2.49%	2.47%
Local Government	2.77%	3.18%	Other Food Industries	2.42%	1.65%
Cotton Industry	2.58%	2.02%	Other Metal Industries	2.27%	2.15%
Total % of unemployed from 10 industries	62.20%			62.96%	

Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936 for men and women.

It is also notable that the ten industries that accounted for the most unemployment in interwar Britain sum to only 62.20% of unemployment for men and 62.96% of unemployment for women.[10] This represents only 10.0 percentage points of the average male unemployment rate for the period of 16.08%, and only 6.48 percentage points of the average female unemployment rate of 10.3%. These percentages indicate that there was widespread unemployment outside of these industries, suggesting that interwar unemployment cannot simply be attributed to one sector or one group of industries.

3.3 Regions

Unemployment in interwar Britain had a distinct regional pattern, with concentrations of high unemployment in the north of England and throughout Wales, and lower unemployment than average in the Midlands and in the South. These patterns are evident in the data on aggregate regional unemployment rates given in Appendix D. The rich industry-level unemployment data from the Ministry of Labour *Gazette* can be used to explore the extent to which these regional differences in unemployment rates were due to industrial mix.

There is no comprehensive data on unemployment by industry and region on an annual or monthly level for interwar Britain. To bring in data on the industrial composition of regions, I digitized Table C of the 1931 *Census of England and Wales* Industry Report.[11]

10. The change in this proportion over time is presented in Appendix C.

11. This source does not provide data on the industrial composition of Scotland and Northern Ireland, which are omitted from the analysis in this section.

Table 2: Industries with a disproportionate share of regional labor force in 1931

Region	Industries
Greater London	Commerce and Finance; Distributive Trades; Paper Making, Stationery, Printing, Bookbinding
South East	Personal Service (including Hotels and Catering), Defense and Central Government, Agriculture
South West	Agriculture; Personal Service (including Hotels and Catering); Defense and Central Government
Midland 1	Other Metal Industries; Construction and Repair of Vehicles; Bricks, Pottery, Glass, etc.
Midland 2	Mixed Fibers; Manufacture of Clothing (not Knitted); Silk, Natural and Artificial
East	Agriculture; Fishing; Food
North 1	Coal Mining; Ship Building and Repairing, Marine Engineering; Chemicals and Explosives
North 2	Agriculture; Iron and Steel; Water, Air, Transport and Communication
North 3	Wool, Worsted, and Shoddy; Coal Mining; Iron and Steel
North 4	Cotton; Textile Dyeing, Printing, Finishing; Water, Air, Transport and Communication
Wales 1	Coal Mining; Founding, Secondary Processes in Metal Working; Iron and Steel
Wales 2	Agriculture; Other Mining and Quarrying; Personal Service (including Hotels and Catering)

Analysis using regional industrial labor force data from Table C of the 1931 *Census of England and Wales* Industry Report. Industries listed for each region are the three with the greatest difference between the proportion of workers in the region in that industry and the proportion of workers in all of England and Wales in that industry.

This table gives the number of workers, including the employed and the unemployed, in fifty industries across twelve regions[12] in 1921 and 1931.

Table 2 demonstrates the varied industrial composition of regions in England and Wales using this newly-digitized *Census* data. For each region, the three industries most disproportionately represented in the region are listed. An analysis of the level of industrial specialization of regions is given in Appendix F.

Were the differences in regional unemployment rates due to the differing industrial composition of regions? To answer this question, I first map the 100 industries in the *Labour Gazette* to the fifty industries in the *Census of England and Wales*.[13] Then I calculate a synthetic unemployment rate for each region in every year from 1923 to 1936. For each *Census* region,[14] I assume that the distribution of workers across industries was constant throughout the interwar period at the 1931 level. This is due to the limited availability of *Census* data, but it is in line with other uses of *Census* statistics for the interwar period and is a frequent assumption in the regional economics literature.[15] Based on the proportion of workers in each industry in a region, I compute what the unemployment rate would be if it only reflected the industrial composition of the region. Comparing this synthetic unemployment rate with the actual unemployment rates from the *Twenty-Second Abstract of Labour Statistics* given in Appendix D gives an estimate of the size and direction of regional

12. The counties located in each region are provided in Appendix E.
13. The complete crosswalk between industries is in Appendix G.
14. Compiled into six larger regions to match with the *Abstract of Labour Statistics* data on regional unemployment
15. For example, this is how Feinstein (1972) uses *Census* data. See Gardiner et al. (2013, p. 904) for a discussion of this assumption in the regional economics literature.

Table 3: Magnitude and direction of regional effects on unemployment rate

	Midlands	North	Wales	South East	London	South West
Avg. percent of unemployment rate due to regional effect	30	21	32	49	29	12
Direction of regional effect on unemployment rate	−	−	+	+	−	−

The percent of the unemployment rate due to regional effects is the absolute value of the difference between the actual unemployment rate for the region and the synthetic unemployment rate based on the region's industrial mix, divided by the actual unemployment rate for the region. The average percent of the unemployment rate due to regional effects is the average over the 1923–1936 period. Industry mix unemployment rate calculated from author's digitization of *Labour Gazette* and *Census* data, UK average rate calculated from author's digitization of *Labour Gazette* data, actual regional unemployment rates from the *Twenty-Second Abstract Of Labour Statistics* (1937, p. 59)

unemployment effects beyond the direct effect of the composition of industries in a region.

The actual regional unemployment rate and the synthetic unemployment rate based on each region's industrial mix are plotted in Figure 2. While the actual unemployment rates and the synthetic unemployment rates based on industrial mix follow similar trends, in all regions there are sizable differences between the two series.[16]

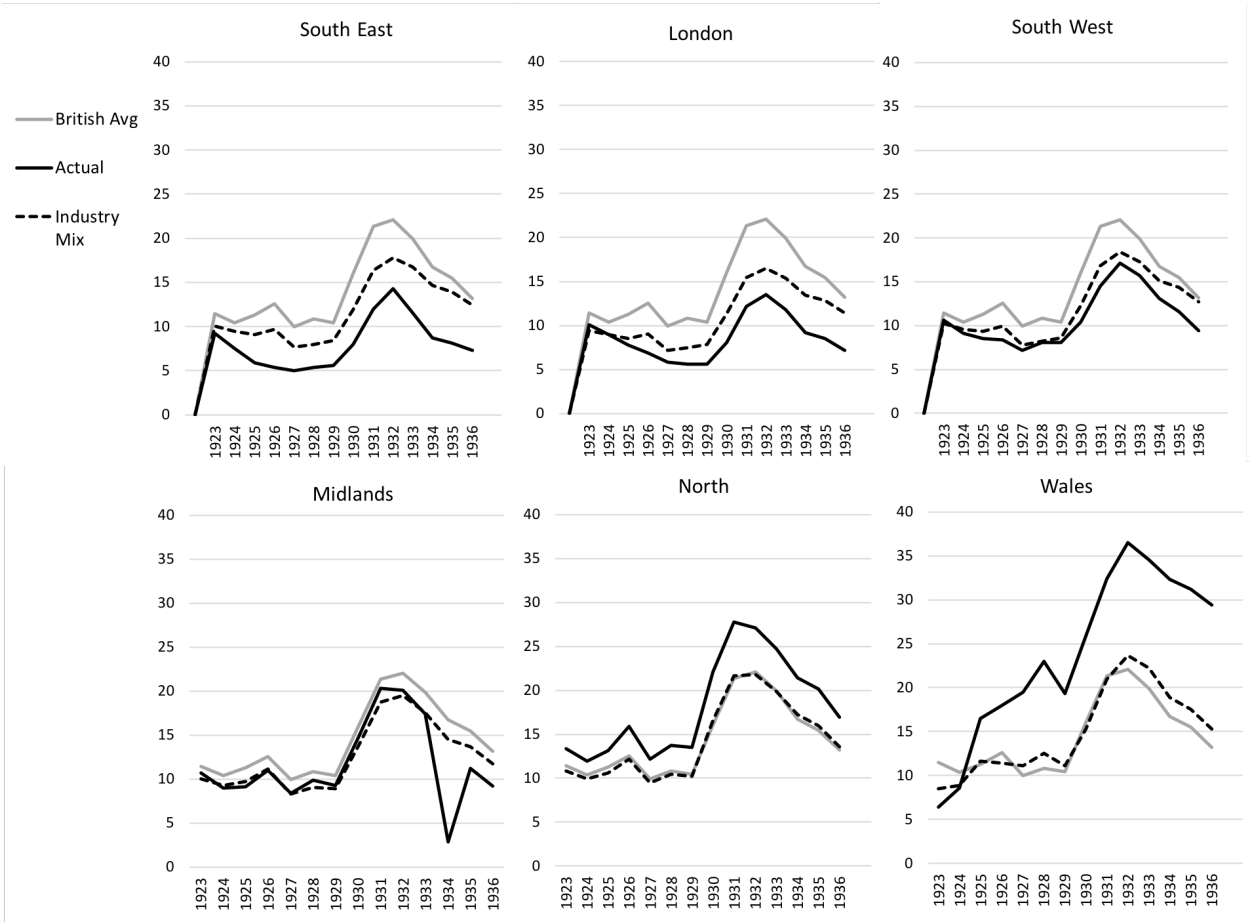
In the South East, London, and South West, regional unemployment rates were not only lower than the national average, but they were lower than would be expected based on the industrial mix of these regions. This indicates that a regional effect above and beyond the direct effect of industrial mix served to lower unemployment rates in these regions. In contrast, the actual unemployment rates in the North and Wales were much higher than expected based on the composition of industries in these regions. This suggests that regional effects exacerbated unemployment in these areas, in addition to the direct effect of declining industries located in these regions.

To better understand the magnitudes of these effects, I calculate the percent of the regional unemployment rate that can be attributed to a regional effect other than industrial mix.[17] The average of this percentage over the 1923–1936 period is give in the first row of Table 3, with the direction of the effect on the unemployment rate in the second row. 21% of the regional unemployment in the North and 31% of the regional unemployment in Wales can be attributed to a regional unemployment effect above and beyond the direct effect of declining industries in the region. An even larger percentage of the regional unemployment rate in the South East can be attributed to a regional effect outside of industrial mix, but, in that case, the regional effect served to lower the unemployment rate rather than increase it. Across all regions, between 12% and 49% of the regional unemployment rate cannot be

16. Appendix H gives the simple difference between these two series for all regions. Appendix I conducts a similar analysis for the North-South gap.

17. Calculated as the absolute value of the difference in the actual regional unemployment rate and the projected regional unemployment rate, divided by the actual regional unemployment rate, times 100.

Figure 2: Regional unemployment rates and synthetic unemployment rates based on industrial mix, 1923–1936



Y-axis is unemployment rate (%). Industry mix unemployment rate derived from author's digitization of *Labour Gazette* and *Census* data, UK average rate computed from author's digitization of *Labour Gazette* data, actual regional unemployment rates from the *Twenty-Second Abstract Of Labour Statistics* (1937, p. 59)

accounted for by the composition of industries in the region.

By combining my *Labour Gazette* unemployment data with the industrial composition of regions from the *Census of England and Wales*, it is possible to estimate the extent to which differences in regional unemployment rates were due to industrial mix. Figure 2 and Table 3 suggest that a significant portion of regional unemployment rate differences were due to regional effects above and beyond the direct effects of differences in the industrial composition of regions. Industrial mix effects, however, still played an important role.

4 Empirical strategy

The descriptive statistics highlight the growing divide between contracting and expanding industries during the interwar period. This divergence suggests that a significant amount of labor reallocation across industries was needed in order for market forces to restore full employment.

How much reallocation of labor across industries occurred before and during the Great Depression? From which industries were unemployed workers able to find other employment opportunities? These questions motivate the two stages of the empirical analysis in this paper. In the first section of the analysis, adjustment coefficients are estimated by industry, gender, region, and over time. For expanding industries, these adjustment coefficients represent whether the growth of employment was drawn from an industry's unemployed pool of labor. For contracting industries, the adjustment coefficients represent whether laid off workers joined the unemployed pool of labor in an industry or were hired in a different industry. The second section of the analysis uses a Markov framework to estimate the probability of transitioning between employment or unemployment in six broad industry categories. This offers some insight into which industries workers might have been transitioning to or from when labor reallocation across industries did occur, and more directly links slow or limited adjustment to persistent unemployment.

This section describes each empirical approach in more detail. The results of each analysis are given in Section 5.

4.1 Estimation of adjustment coefficients

The *Labour Gazette* associated unemployed workers with industries, offering a unique view into the total labor force, employed and unemployed, of industries during the interwar pe-

riod.[18] Every worker in an insured industry was issued an Unemployment Book in July of each year, where the employee and the employer's contributions to the tripartite unemployment program were recorded. When a worker become unemployed, they lodged their Unemployment Book at a local employment exchange, where it remained until they found new employment and provided the book to their new employer. The number of books lodged for each industry was counted monthly, establishing the number of unemployed workers each month in every insured industry.

The relative changes in the numbers employed (insured less unemployed) and unemployed can offer some insight into dynamics of entry into and out of employment and unemployment in industries. If employment was declining in an industry, a large increase in unemployment in that industry suggests that many laid off workers could not find jobs in other industries. If employment was increasing in an industry, a large decrease in unemployment in that industry suggests that hired workers came from the unemployment pool of that industry rather than from other industries.

These intuitions can be formalized by decomposing employment changes in an industry into the part represented by a change in unemployment in the industry, the part represented by net movement from other industries, and the part represented by net flows of labor force participation. An adjustment coefficient for each industry can be estimated, representing the extent to which employment increases drew workers from other industries and to which employment decreases led workers to find jobs in other industries.

The change in employment in an industry i from time $t-1$ to t can be represented

$$\Delta E_i = -\Delta U_i + \sum_{\substack{1 \le j \le 100 \\ j \neq i}} M_{i,j} + F_i \tag{1}$$

where ΔE_i is the change in employment in industry i from $t-1$ to t and ΔU_i is the change unemployment in industry i from $t-1$ to t. $M_{i,j}$ represents the net movement of workers between industry i and j between $t-1$ and t, with $M_{i,j}$ positive if there is a positive net movement from j into i. F_i represents the net flow between industry i and outside of the labor market, with F_i positive if there is a positive net flow into industry i from outside the labor market. If ΔE_i is positive, i.e. employment is expanding, then we would expect unemployment in the industry to decrease, positive flows from other industries, and possibly new workers being drawn into the industry from outside the labor force through positive flows in F_i. If ΔE_i is negative, we would expect unemployment to increase, labor flows from

18. The number insured is only a proxy for the full population working or looking for work in an industry, as unemployed workers could search for jobs in other industries. However, as soon as they found work in another industry, their association would be switched to the new industry.

i to other industries, and flows from i out of the labor force.[19]

Dividing through Equation (1) through by ΔE_i gives the shares

$$1 = \frac{-\Delta U_i}{\Delta E_i} + \frac{\sum_{\substack{1 \le j \le 100 \\ j \neq i}} M_{i,j} + F_i}{\Delta E_i} = -\beta + \delta, \tag{2}$$

where

$$\delta = \frac{\sum_{\substack{1 \le j \le 100 \\ j \neq i}} M_{i,j} + F_i}{\Delta E_i}$$

and the adjustment coefficient β is defined

$$\beta = \frac{-\Delta U_i}{\Delta E_i}.$$

The adjustment coefficient represents the extent to which the change in unemployment was proportional to the change in employment, thereby estimating the amount of adjustment across industries or from outside of the labor force. $-\beta$ gives the share of the change of employment that was reflected in a change in unemployment. $1 + \beta$ gives the share of the change of employment that came from flows of workers from other industries or from outside of the labor force.

For an expanding industry an estimate near 0 indicates that only a small proportion of the increase in employment in an industry came from a decrease in unemployment in the industry, and $1 + \beta$ gives the proportion who entered the industry from other industries or from outside the labor force. An estimate of β near -1 indicates that the expanding industry drew on workers from its own unemployment pool. For a contracting industry, an estimate near -1 indicates that most of the laid off workers became unemployed in that industry, with little flow of workers to other industries. An estimate near 0 indicates that a large proportion of the decrease in employment was movement of workers to other industries or outside the labor force.

β can be estimated using a least squares regression for groups of industries and over time periods:

$$y_{it} = \alpha + \beta_1 x_{it} \cdot p_1 + \beta_2 x_{it} \cdot p_2 + \beta_3 x_{it} \cdot p_3 + \boldsymbol{\gamma}' \mathbf{T}_t + \epsilon \tag{3}$$

where y_{it} is the change in unemployment in industry i from period $t-1$ to t and x_{it} is the change in employment in industry i from period $t-1$ to t. p_1 indicates the first time period,

19. In the context of the generous and largely non-contributory unemployment benefit system, there was little incentive for unemployed workers to leave the active labor force.

1925–1929; p_2 indicates the second time period, 1930–1933; and p_3 indicates the third time period, 1934–1936. The regression is a partial interaction between x_{it} and p, with no main effect for x_{it} but main effects for the time periods captured by the T_t year dummies. β_1 thus represents the adjustment coefficient for the period 1925–1929, β_2 represents the adjustment coefficient for the period 1930–1933, and β_3 represents the adjustment coefficient for the period 1934–1936.

Equation (3) is estimated on annual data with industry fixed effects for different subsamples of the data: for six industry categories including metal manufacturing, textile manufacturing, other manufacturing, mining, service, and building; and for expanding and contracting industries.[20] All estimates are given for the overall labor force as well as for men only and for women only.

Then, an additional analysis is conducted where the window of adjustment is expanded by one, two, or three years. In these models, the time period interaction is removed to allow for ease of analysis. The resulting model is,

$$y_{it} = \alpha + \beta x_{it} + \boldsymbol{\gamma}' \mathbf{T}_t + \epsilon, \tag{4}$$

again estimated for different industry groupings and for men and women separately.

Finally, to estimate differences in the level of labor market adjustment across regions, adjustment coefficients are estimated for all 100 industries for 1925–1936 according to Equation (4) and for the three time periods according to Equation (3). Then, the average adjustment coefficient for each region in England and Wales is computed, weighted by the distribution of workers in each industry in 1931.

4.2 Markov model for movement between industries

There are no individual-level data available for the interwar period on the transitions of workers across industries or between employment and unemployment. Labor market analyses for this period have instead focused on what can be readily observed from the Ministry of Labour *Gazette* data that is expanded for this paper. However, even when individuals' labor market transitions are not observed, it is possible to estimate mobility across sectors and employment states by modeling these transitions as a Markov process.

There is a large literature on estimating Markov transition probabilities from aggregate macro-level data (Lee, Judge, and Zellner 1970; MacRae 1977; Van Der Plas 1983; Kalbfleisch

20. All 100 industries are associated with one of these industry categories. The industries included in each category are listed in Appendix J.

and Lawless 1984). In this literature, transition probabilities are estimated from the counts or proportions of individuals or other micro components in aggregate states using some form of conditional least squares. A recent literature on collective graphical models in machine learning, where individual observations are generated by a graph but only contingency tables are observed, is analogous to this problem (Bernstein and Sheldon 2016). The method described in MacRae (1977) has been used recently to estimate time-homogenous transition probabilities between credit classes of mortgages (Walshe 2016) and to estimate transition probabilities between credit ratings of commercial bank loans (Jones 2005).

A transition matrix based on a time-homogeneous discrete Markov chain can be used to describe labor market mobility across industries and between employment and unemployment. The Markov model has a number of states, S, representing employment status and industry pairs. At any point in time, all labor market participants can be classified into one of these employment-industry states, indicating their employment or unemployment in a specific industry. The transition matrix P describes the probability of remaining in the current state or transitioning to a different state in one time step. Each element of P, p_{ij}, gives the probability of transitioning from state i to j from $t-1$ to t. P is thus:

$$P[i,j] = \begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1S} \\ p_{21} & p_{22} & \cdots & p_{2S} \\ \vdots & \vdots & \ddots & \vdots \\ p_{S1} & p_{S2} & \cdots & p_{SS} \end{bmatrix}$$

There are two assumptions. First, the Markov process is assumed to be first-order stationary, so the individual probabilities p_{ij} do not change over time. Second, it is assumed that an individual's state at time t is exclusively affected by their state at time $t-1$. If x_t represents the state of an individual at time t, then this means $p_{ij} = Pr(x_t = j|x_{t-1} = i) = Pr(x_t = j|x_{t-1} = i, x_0, \ldots, x_{t-2})$.

With complete data on individual transitions, p_{ij} is simply the total number of people who moved from state i to state j between time $t-1$ and time t, divided by the total number of people who were in state i at time $t-1$. Letting m_{ij} represent the number of people who moved from state i to j, then:

$$p_{ij} = \frac{m_{ij}}{\sum_{j=1}^{S} m_{ij}}$$

In the interwar case, we do not have data on individual industry or employment status transitions. Instead, we are restricted to aggregate data on the proportion of workers in each

industry and employment status pair. Using the same framework as in the full information case, following MacRae (1977), the aggregate proportions data can be used to estimate p_{ij} for all j and i with some error. As Appendix K describes, this amounts to setting up and solving a quadratic programming problem minimizing the sum of squared residuals subject to the constraints that each estimated $p_{ij} \in [0, 1]$ and that the rows of P sum to one.

I add two additional constraints to the quadratic programming problem that derive from the specific context of the interwar unemployment system. Recall that the numbers unemployed in every industry were determined from a count of the number of insured workers who had lodged their Unemployment Books at local employment exchanges. The industry with which an unemployed worker was associated in the official employment figures was thus fixed until that individual secured employment in a different industry, removing their Unemployment Book from the exchange. This means that workers were nominally unable to move from unemployment in one industry to unemployment in another industry without first gaining employment. Additionally, they were unable to move from employment in one industry to unemployment in a different industry without first gaining employment in the latter industry. I add these two additional constraints to the model so that the only estimated transitions are those from unemployment in any industry to employment in any industry, from employment in one industry to employment in any industry, and from employment in one industry to unemployment in the same industry.

For the period 1923–1936, I estimate this model with twelve employment-industry states, representing employment and unemployment in the same broad industry categories used in the adjustment coefficient analysis. The Markov analysis is then conducted separately for men and women. Projecting the estimated probabilities forward suggests that the model fits the data well. A simulation of 120,000 individuals in the Markov process is then conducted to shed light on the persistence of unemployment throughout the process for each employment-industry state.

5 Results on labor market adjustment across industries

5.1 Adjustment coefficient results

Table 4 presents the adjustment coefficients for all industries and by broad industry category for three time periods: 1925–1929, 1930–1933, and 1934–1936. These correspond to the period after the return to the gold standard and up to the Great Depression, a period during the global Great Depression, and finally the period of recovery and rearmament. Model (1) includes all 100 industries. Models (2)–(7) only include industries in the listed industry

category. For example, the regression for textile manufacturing industries in (3) includes only the carpet manufacturing, cotton, hemp, hosiery, jute, lace, linen, silk, woolen and worsted, and textile bleaching and dyeing industries. All 100 industries are represented in the six industry categories according to the table in Appendix J. Appendix L gives the proportion of insured, employed, and unemployed men and women in each of the industry groups. Every model includes year and industry fixed effects. These results are robust to the full interaction model specification, given in Appendix M.

The coefficients represent the amount of adjustment across industries, giving a sense of the flexibility and responsiveness of the labor market. A coefficient near −1 signifies little to no adjustment across industries. Changes in the number unemployed in an industry were inversely proportionate to changes in that industry's employment. For an expanding industry, the entire increase in employment is thus reflected in a decrease in unemployment in that industry, suggesting workers had been hired from the unemployment pool of the industry rather than from other industries. For a contracting industry, a coefficient of −1 signifies that unemployment increased proportionate to the decrease in employment, suggesting that few laid off workers moved to other industries.

In contrast, a coefficient near 0 signifies substantial adjustment across industries, with 0 indicating perfect labor market flexibility. For expanding industries, a coefficient near 0 signifies that they increased their employment levels by drawing new workers into the industry rather than tapping into their existing unemployment pool. For contracting industries, this indicates that workers who were laid off were able to secure jobs in other industries rather than remaining unemployed in that industry.

Model (1), using all 100 industries, suggests that during the Great Depression, there was somewhat less adjustment across industries overall than in the period before of after. The adjustment coefficient decreases from −0.80 in the late 1920s to −0.90 during the Great Depression, and then rises again to −0.71 from 1934–1936. These estimates suggest that if an industry laid off 100 workers in a given year during the Great Depression, 90 of those workers would remain unemployed in that industry and 10 would find jobs in other industries. In the late 1920s, only 80 workers would remain unemployed in that industry, and during the recovery years 1934–1936, only 71 workers would remain unemployed.

These overall trends mask heterogeneity across industry categories. The industry categories with the most adjustment were service in model (6), building in model (7), and other manufacturing in model (4). In all three periods, their adjustment coefficients were much larger than those in the worst performing industry categories including textile manufacturing (3) and mining (5). For example, looking at the late 1920s period, textile manufacturing had an adjustment coefficient of −1.01, signifying almost no adjustment across industries,

Table 4: Adjustment coefficients over time, for all industries and by industry category

	(1) Overall b/se	(2) Metals b/se	(3) Textiles b/se	(4) Other Manu. b/se	(5) Mining b/se	(6) Service b/se	(7) Building b/se
1925-1929 × Δ Employed	-0.80***	-0.94***	-1.01***	-0.66***	-0.90***	-0.11*	-0.50**
	(0.02)	(0.04)	(0.03)	(0.03)	(0.02)	(0.04)	(0.15)
1930-1933 × Δ Employed	-0.90***	-0.97***	-1.14***	-0.62***	-1.18***	0.26**	-0.53***
	(0.02)	(0.04)	(0.03)	(0.05)	(0.04)	(0.09)	(0.07)
1934-1936 × Δ Employed	-0.71***	-0.49***	-0.80***	-0.44***	-1.51***	-0.54***	-0.36*
	(0.04)	(0.06)	(0.11)	(0.04)	(0.19)	(0.11)	(0.14)
Constant	3407.65***	544.78	2406.97	1183.39***	-366.65	2576.82	5839.13
	(656.37)	(887.08)	(1396.19)	(306.14)	(1460.07)	(1836.96)	(5577.28)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of observations	1200	228	132	504	120	180	36
R2	0.798	0.904	0.968	0.727	0.976	0.520	0.933

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936, for both men and women.

whereas service had an adjustment coefficient almost ten times higher, at −0.11.

The trend across time also varies by industry category. The adjustment coefficients for mining and textiles became more negative over the Great Depression years, a 0.28 decrease for mining and 0.13 decrease for textiles. Both metal manufacturing and building had only a small decrease of 0.03. In contrast, the adjustment coefficients for the other manufacturing industries and for service industries became more positive, with an increase in other manufacturing of 0.04, and in services of 0.37. The adjustment coefficient for the service industries during the Great Depression is remarkable for being greater than 0. While a coefficient near 0 indicates significant adjustment across industries, a coefficient much greater than 0 suggests some amount of over-adjustment. For contracting service industries, this positive adjustment coefficient suggests that as employment decreased, unemployment also decreased. Not only were laid off workers not added to the unemployment pool for their industry, but previously unemployed workers were able to find employment in other industries. For the expanding industries in service, this implies that as employment increased, unemployment also increased. This could suggest new workers being drawn into the labor force as unemployed service workers.

During the recovery years, the adjustment coefficients recover for all of the manufacturing industry categories and for building. In fact, for all of these industry categories, there was more adjustment in the mid-1930s than there was in the late 1920s, especially in metal

manufacturing and in building. However, it is remarkable that the adjustment coefficient for mining continues declining precipitously even during the recovery years. The adjustment coefficient for the service industries also declines, possibly a correction to the overadjustment of the Great Depression years.

Table 5 suggests that there was less adjustment for women than for men on the whole during the late 1920s and during the Great Depression. The top panel presents the adjustment coefficients overall and by industry category using only men's employment and unemployment in each industry. The bottom panel uses only women's employment and unemployment. Surprisingly, for men across all industries in model (1), adjustment only slightly decreased during the Great Depression, from −0.82 in the late 1920s to −0.84. In contrast, for women in model (8), adjustment declined significantly during the Great Depression, from −0.88 to −1.12. This was driven by the exceptionally poor performance of the textile industries for women (10), whose adjustment coefficient declined five times more than the coefficient for men in those industries (3).

Another departure between men and women is in other manufacturing industries. In the late 1920s, the adjustment coefficient for women in these industries (11) was lower than for men (4). However, during the Great Depression, adjustment decreased for men and increased for women. The adjustment coefficient continued increasing for women to a remarkable level of −0.25 during the 1934–1936 period.

Both men and women had increased adjustment in the service industries during the Great Depression, though adjustment coefficients were generally higher for women in these industries than for men.

The adjustment coefficient has a slightly different interpretation for expanding and contracting industries, representing whether workers were drawn into the industry or whether workers were able to exit the industry. Table 6 groups industries by whether they were expanding in employment or contracting, with models (1)–(2) representing overall employment and models (3)–(6) disaggregating by gender.[21]

In general, expanding industries had much higher adjustment coefficients than contracting industries. When both men and women are taken together, the adjustment coefficients for contracting industries (1) range from −1.06 to −0.44, whereas the adjustment coefficients for expanding industries (2) range from −0.45 to −0.24. This suggests that workers in contracting industries faced not only decreasing employment but also more rigidities in their adjustment to these employment changes. Entry into an expanding industry's pool of potential labor was thus easier than exiting from a contracting industry's labor force.

21. Adjustment coefficients for expanding and contracting industries within each of the six industry categories are given in Appendix N.

Table 5: Adjustment coefficients over time, for all industries and by industry category, for men only and women only

Men	(1) Overall	(2) Metals	(3) Textiles	(4) Other Manu.	(5) Mining	(6) Service	(7) Building
1925-1929 × Δ Employed	-0.82***	-0.97***	-0.96***	-0.48***	-0.90***	-0.20***	-0.50**
	(0.02)	(0.03)	(0.04)	(0.04)	(0.02)	(0.05)	(0.15)
1930-1933 × Δ Employed	-0.84***	-1.00***	-1.00***	-0.66***	-1.18***	0.13	-0.53***
	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)	(0.09)	(0.08)
1934-1936 × Δ Employed	-0.68***	-0.51***	-0.75***	-0.42***	-1.51***	-0.64***	-0.35*
	(0.04)	(0.06)	(0.14)	(0.03)	(0.19)	(0.11)	(0.14)
Constant	2176.41***	-323.31	982.68	393.96	-406.27	2916.55*	5871.28
	(517.75)	(792.56)	(644.59)	(227.20)	(1447.41)	(1412.56)	(5613.99)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.814	0.917	0.937	0.698	0.977	0.547	0.932
Women	(8) Overall	(9) Metals	(10) Textiles	(11) Other Manu.	(12) Mining	(13) Service	(14) Building
1925-1929 × Δ Employed	-0.88***	-0.24**	-1.02***	-0.80***	0.02	0.04	-0.03
	(0.02)	(0.08)	(0.03)	(0.03)	(0.09)	(0.06)	(0.07)
1930-1933 × Δ Employed	-1.12***	-0.84***	-1.22***	-0.51***	-0.19	0.47***	-0.02
	(0.02)	(0.07)	(0.03)	(0.05)	(0.18)	(0.10)	(0.14)
1934-1936 × Δ Employed	-0.57***	-0.22**	-0.76***	-0.25***	-0.16	0.08	0.00
	(0.05)	(0.07)	(0.11)	(0.06)	(0.21)	(0.12)	(0.11)
Constant	1310.50***	185.78	1403.77	717.18***	36.82	-99.52	34.62
	(242.53)	(201.07)	(872.68)	(145.45)	(38.72)	(755.06)	(48.66)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.825	0.603	0.973	0.690	0.185	0.301	0.616
Num. of observations	1200	228	132	504	120	180	36

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. The top panel uses counts of employed and unemployed for men only, and the bottom panel uses counts of employed and unemployed for men only. Standard errors given in parentheses. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

The Great Depression served to widen the gap between expanding and contracting industries, decreasing adjustment for contracting industries and increasing adjustment for expanding industries. During the Great Depression, the adjustment coefficient for contracting industries fell by 0.17, while it increased for expanding industries by 0.18. The difference in the adjustment coefficients between contracting and expanding industries in models (1) and (2) were thus highest during the Great Depression.

This widening gap is echoed in the data for men's employment and unemployment (3, 4), but not for women (5, 6). Contracting industries had extremely low levels of adjustment across industries for women in the late 1920s, and this did not change much during the Great Depression. Expanding industries had better adjustment during the early 1920s, but, contrary to the overall trend, the adjustment coefficient for expanding industries actually decreased for women during the Great Depression.

During the recovery, the overall estimates and the estimates for men suggest that adjustment coefficients were increasing for contracting industries and decreasing for expanding industries. Workers from contracting industries were thus better able to find jobs in other industries during the recovery, but expanding industries were relying more on their existing labor supply for their growing employment needs.

Table 6: Adjustment coefficients over time for expanding or contracting industries, by gender

	Men and Women		Men Only		Women Only	
	Contracting	Expanding	Contracting	Expanding	Contracting	Expanding
	(1)	(2)	(3)	(4)	(5)	(6)
1925-1929 × Δ Employed	-0.89***	-0.43***	-0.81***	-0.49***	-1.23***	-0.67***
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)
1930-1933 × Δ Employed	-1.06***	-0.24***	-0.97***	-0.27***	-1.25***	-0.76***
	(0.02)	(0.05)	(0.02)	(0.05)	(0.02)	(0.06)
1934-1936 × Δ Employed	-0.44**	-0.45***	0.18	-0.42***	-0.78***	-0.63***
	(0.13)	(0.05)	(0.27)	(0.04)	(0.06)	(0.09)
Constant	-365.54	2244.58*	-442.21	1786.51*	-432.60*	1361.10***
	(658.33)	(872.86)	(524.22)	(720.83)	(216.57)	(307.83)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Num. of observations	483	717	505	695	490	710
R2	0.907	0.386	0.886	0.376	0.957	0.494

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Contracting industries are those that had a decrease of employment from $t-1$ to t, while expanding industries had an increase. For the gendered analysis, whether an industry is contracting or expanding is defined within the gender. Standard errors given in parentheses. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

The previous tables have looked at how employment changes relate to unemployment

changes within the same year. Table 7 explores different adjustment windows, giving a sense of how the speed of adjustment varied by gender and by industry category.

Each entry in the table is the adjustment coefficient and standard error from a regression model where the dependent variable is the change in unemployment from $t-1$ to t, and the independent variable is the change in employment from $t-k$ to t, where $k \in [1,4]$. The adjustment coefficients thus indicate how the changes in employment over the last $k-1$ years affect the change in unemployment in a year.[22]

The estimates for men and women indicate that the effect of employment shocks on the size of the unemployed pool are felt most strongly the same year and in the year afterward, with the size of the effect diminishing as the adjustment window widens. For women, the effects are sharper but less persistent.

Adjustment happened quickest in building and in metal manufacturing, while the effects of employment changes were most persistent for mining.

Finally, adjustment coefficients can be estimated for all 100 industries individually for 1925–1926 and for the three time periods 1925–1929, 1930–1933, and 1934–1936 following Equation (4). Then, using the distribution of industries across twelve regions of England and Wales from the *Census of England and Wales* (1931), the average adjustment coefficient for each region can be calculated. The adjustment coefficients of all of the industries are weighted by the proportion of workers in that industry in each region in 1931.[23]

The results are given in Table 8. The South East and London regions had the most adjustment overall, while the North and Wales regions had the least adjustment. In all regions, adjustment actually increased during the Great Depression, though this increase was most significant in regions that already had a high level of adjustment.

The results of the adjustment coefficient analysis thus suggest that there was substantial heterogeneity in labor market adjustment across industries, by gender, and by region. Workers in service and other manufacturing had the most adjustment across industries, while textiles and mining had the least. When these results are disaggregated by gender, it is apparent that there was less adjustment on the whole for women than for men, but there were important variations in this pattern by industry. Adjustment coefficients were higher in industries that were expanding than in those that were contracting, and in the South East and London than in the North and Wales. This heterogeneity in adjustment suggests that while some groups of workers were at risk for long-term unemployment, other groups

22. The speed of adjustment is estimated separately for the three time periods in Appendix O. The full regression results for each entry of Table 7 are presented in Appendix P.

23. As a robustness check, the analysis is conducted with the proportion of workers in each region in 1921 as well. These results are presented in Appendix Q.

Table 7: Speed of adjustment by gender and industry category

Overall and by gender	(1) Contemporaneous $k = 1$	(2) One Year $k = 2$	(3) Two Years $k = 3$	(4) Three Years $k = 4$
Men and Women: Δ Employed, $t - k$ to t	-0.82***	-0.36***	-0.19***	-0.16***
	(0.01)	(0.02)	(0.02)	(0.02)
Men Only: Δ Employed, $t - k$ to t	-0.81***	-0.36***	-0.18***	-0.19***
	(0.01)	(0.02)	(0.02)	(0.02)
Women Only: Δ Employed, $t - k$ to t	-0.97***	-0.45***	-0.28***	-0.04
	(0.02)	(0.03)	(0.02)	(0.03)
By industry category				
Metals: Δ Employed, $t - k$ to t	-0.85***	-0.31***	-0.18***	-0.06
	(0.03)	(0.04)	(0.03)	(0.04)
Textiles: Δ Employed, $t - k$ to t	-1.07***	-0.52***	-0.37***	-0.15
	(0.02)	(0.09)	(0.07)	(0.11)
Other Manu.: Δ Employed, $t - k$ to t	-0.58***	-0.18***	-0.12***	-0.06**
	(0.02)	(0.03)	(0.02)	(0.02)
Mining: Δ Employed, $t - k$ to t	-0.96***	-0.46***	-0.20**	-0.35***
	(0.02)	(0.06)	(0.07)	(0.06)
Service: Δ Employed, $t - k$ to t	-0.10*	0.03	0.10	0.22***
	(0.05)	(0.07)	(0.06)	(0.06)
Building: Δ Employed, $t - k$ to t	-0.50***	-0.17*	-0.12	-0.08
	(0.06)	(0.08)	(0.07)	(0.07)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t - k$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Contracting industries are those that had a decrease of employment from $t-1$ to t, while expanding industries had an increase. For the gendered analysis, whether an industry is contracting or expanding is defined within the gender. Standard errors given in parentheses. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 8: Estimated average adjustment coefficients for twelve regions of England and Wales

	Overall	By Time Period		
	1925-1936	1925-1929	1930-1933	1934-1936
South East	-0.29	-0.27	-0.08	-0.44
Greater London	-0.32	-0.29	-0.15	-0.44
South West	-0.32	-0.31	-0.12	-0.45
East	-0.34	-0.34	-0.14	-0.46
North 2	-0.39	-0.38	-0.24	-0.48
Wales 2	-0.40	-0.38	-0.22	-0.56
Midland 1	-0.47	-0.45	-0.41	-0.52
Midland 2	-0.49	-0.49	-0.43	-0.47
North 4	-0.52	-0.50	-0.43	-0.48
North 1	-0.54	-0.52	-0.47	-0.76
Wales 1	-0.56	-0.55	-0.53	-0.81
North 3	-0.59	-0.58	-0.52	-0.68

The entries are the average adjustment coefficient of industry-level estimates from the model described by Equation (4). For each region, the adjustment coefficient of every industry is averaged, weighted by the proportion of of the labor force, employed and unemployed, in that industry according to the 1931 *Census of England and Wales* Industry Report Table C. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries.

of workers benefited from relatively easy access to alternative labor market opportunities.

5.2 Markov results

Table 9 gives the first statistical estimates of transitions across industries and between employment and unemployment in the interwar British labor market. The employment and unemployment proportions on which this analysis is based contain both male and female participants in the labor force. The entries in the table are the probabilities of moving from the employment-industry state on the row to the employment-industry state on the column. The diagonals give the probability of remaining in the same state. The italicized numbers are bootstrapped standard errors using the residual resampling method.

The results offer some insight into which industries workers could transition between during the interwar period. For example, the first row indicates that unemployed workers in metal manufacturing had a 49.7% chance of remaining unemployed, a 36.1% chance of finding employment in textile manufacturing, and a 14.2% chance of finding employment in other manufacturing industries. In contrast, unemployed workers in other manufacturing had a 62.2% chance of remaining unemployed in other manufacturing, a 5.3% chance of finding

employment again in other manufacturing, and a 32.6% chance of finding employment in the service industries. As the estimates are based off of movement in the aggregate proportion of workers in each employed-industry state, many transition estimates are zero. This does not indicate that no workers transitioned between these industries, but rather that the aggregate data did not reflect those transitions in trends of the two industries over the time period. The bootstrapped standard errors reflect this uncertainty.

For employed workers, those in the service industry were least likely to transition to unemployment (3.4%), while those in the textile industry were most likely (11.1%). Employment in other manufacturing was the most secure — workers had an 85.7% chance of remaining in the industry, a 3.6% chance of finding employment in metal manufacturing, a 6.3% chance of finding employment in service, and a 4.4% chance of becoming unemployed.

TABLE 9: MARKOV TRANSITION PROBABILITIES ACROSS EMPLOYMENT-INDUSTRY STATES

	Unemployment						Employment					
	Metals	Textiles	Other Manu.	Mining	Service	Building	Metals	Textiles	Other Manu.	Mining	Service	Building
Unemp. - Metals	0.4974						0.0000	0.3610	0.1415	0.0000	0.0000	0.0000
	0.167						*0.068*	*0.165*	*0.158*	*0.056*	*0.105*	*0.162*
Unemp. - Textiles		0.5448					0.0000	0.0000	0.0000	0.0000	0.0000	0.4552
		0.149					*0.083*	*0.126*	*0.117*	*0.060*	*0.141*	*0.186*
Unemp. - Other Manu.			0.6215				0.0000	0.0000	0.0527	0.0000	0.3258	0.0000
			0.199				*0.060*	*0.077*	*0.159*	*0.016*	*0.165*	*0.191*
Unemp. - Mining				0.8057			0.0000	0.0000	0.0000	0.0000	0.0000	0.1943
				0.107			*0.068*	*0.043*	*0.078*	*0.015*	*0.094*	*0.085*
Unemp. - Service					0.7390		0.1362	0.0000	0.0000	0.0000	0.1248	0.0000
					0.159		*0.072*	*0.045*	*0.124*	*0.021*	*0.141*	*0.112*
Unemp. - Building						0.6918	0.1186	0.0000	0.1896	0.0000	0.0000	0.0000
						0.176	*0.111*	*0.081*	*0.158*	*0.052*	*0.125*	*0.116*
Emp. - Metals	0.0959						0.4850	0.0000	0.0000	0.0975	0.0000	0.3216
	0.037						*0.241*	*0.129*	*0.190*	*0.082*	*0.111*	*0.165*
Emp. - Textiles		0.1114					0.2699	0.4606	0.0598	0.0983	0.0000	0.0000
		0.042					*0.170*	*0.211*	*0.160*	*0.120*	*0.069*	*0.099*
Emp. - Other Manu.			0.0440				0.0359	0.0000	0.8566	0.0000	0.0634	0.0000
			0.024				*0.109*	*0.054*	*0.157*	*0.014*	*0.087*	*0.105*
Emp. - Mining				0.0657			0.0000	0.1867	0.0365	0.7112	0.0000	0.0000
				0.032			*0.048*	*0.097*	*0.054*	*0.097*	*0.019*	*0.038*
Emp. - Service					0.0343		0.0014	0.0000	0.0461	0.0000	0.8402	0.0780
					0.020		*0.033*	*0.011*	*0.060*	*0.004*	*0.086*	*0.070*
Emp. - Building						0.0802	0.2304	0.2517	0.0034	0.0000	0.3168	0.1175
						0.049	*0.229*	*0.161*	*0.221*	*0.061*	*0.244*	*0.267*

Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936, for both men and women. Entries are coefficient estimates from the quadratic programming model described in Appendix K, representing the probability of transitioning from the row employment-industry state to the column employment-industry state. Bootstrapped standard errors, using residual resampling, are presented in italics.

Tables 10 and 11 estimate these transition probabilities separately for male and female workers. The results for men in Table 10 suggest that unemployed workers in mining were most likely to remain unemployed (79.3%) while those in metal manufacturing were least like to remain unemployed (56.6%). Unemployed metal manufacturing workers transitioned to textile and other manufacturing as well as service industries, while unemployed miners relied on transitions to the building industries.

Employment in the service industries for men was most secure. Workers had an 84.3% chance of remained employed, a 9.0% chance of transitioning to building, a 2.4% chance of transitioning to other manufacturing, and a 4.3% chance of becoming unemployed. In contrast, metal manufacturing workers had a 9.0% chance of becoming unemployed, though the results for unemployment in metal working suggest they would not be unemployed for long.

For women, the estimates in Table 11 suggest that unemployed textile workers had a 49.4% chance of remaining unemployed, a 16.8% chance of regaining work in textiles, and a significant chance of finding work in every other industry category. In contrast, unemployed service workers were much more likely to remain in unemployment, at 64.5%, or otherwise were likely to be rehired in the service industries (31.9%).

Women in the service industries, however, were much less likely to become unemployed (2.3%) than female textile workers (12.5%). Female workers in the service industries had an 88.0% chance of remaining employed, a 6.3% chance of transitioning to other manufacturing, and a small chance of transitioning to metal manufacturing.

TABLE 10: MARKOV TRANSITION PROBABILITIES ACROSS EMPLOYMENT-INDUSTRY STATES, MEN ONLY

	Unemployment						Employment					
	Metals	Textiles	Other Manu.	Mining	Service	Building	Metals	Textiles	Other Manu.	Mining	Service	Building
Unemp. - Metals	0.5662						0.0000	0.1707	0.1417	0.0000	0.1214	0.0000
	0.138						*0.093*	*0.090*	*0.136*	*0.059*	*0.129*	*0.144*
Unemp. - Textiles		0.6741					0.0000	0.0000	0.0000	0.0000	0.0000	0.3259
		0.268					*0.095*	*0.143*	*0.168*	*0.082*	*0.208*	*0.183*
Unemp. - Other Manu.			0.6936				0.0000	0.0000	0.0000	0.0000	0.3064	0.0000
			0.202				*0.074*	*0.049*	*0.150*	*0.020*	*0.179*	*0.150*
Unemp. - Mining				0.7931			0.0000	0.0000	0.0000	0.0000	0.0000	0.2069
				0.088			*0.052*	*0.036*	*0.071*	*0.023*	*0.093*	*0.087*
Unemp. - Service					0.7390		0.2334	0.0000	0.0000	0.0000	0.0292	0.0000
					0.152		*0.073*	*0.047*	*0.128*	*0.028*	*0.138*	*0.108*
Unemp. - Building						0.7448	0.0006	0.0000	0.2102	0.0444	0.0000	0.0000
						0.134	*0.099*	*0.061*	*0.126*	*0.044*	*0.104*	*0.091*
Emp. - Metals	0.0896						0.3513	0.2298	0.1117	0.0754	0.0389	0.1033
	0.035						*0.231*	*0.107*	*0.206*	*0.091*	*0.089*	*0.149*
Emp. - Textiles		0.0743					0.6876	0.0000	0.0009	0.2371	0.0000	0.0000
		0.070					*0.323*	*0.209*	*0.228*	*0.250*	*0.112*	*0.117*
Emp. - Other Manu.			0.0382				0.0999	0.0000	0.8239	0.0000	0.0380	0.0000
			0.027				*0.147*	*0.038*	*0.211*	*0.022*	*0.114*	*0.155*
Emp. - Mining				0.0709			0.0735	0.0820	0.0213	0.7524	0.0000	0.0000
				0.027			*0.068*	*0.070*	*0.051*	*0.084*	*0.021*	*0.041*
Emp. - Service					0.0429		0.0000	0.0000	0.0244	0.0000	0.8428	0.0899
					0.023		*0.031*	*0.012*	*0.077*	*0.005*	*0.111*	*0.102*
Emp. - Building						0.0685	0.1264	0.0143	0.0007	0.0000	0.2075	0.5826
						0.038	*0.178*	*0.093*	*0.203*	*0.056*	*0.244*	*0.285*

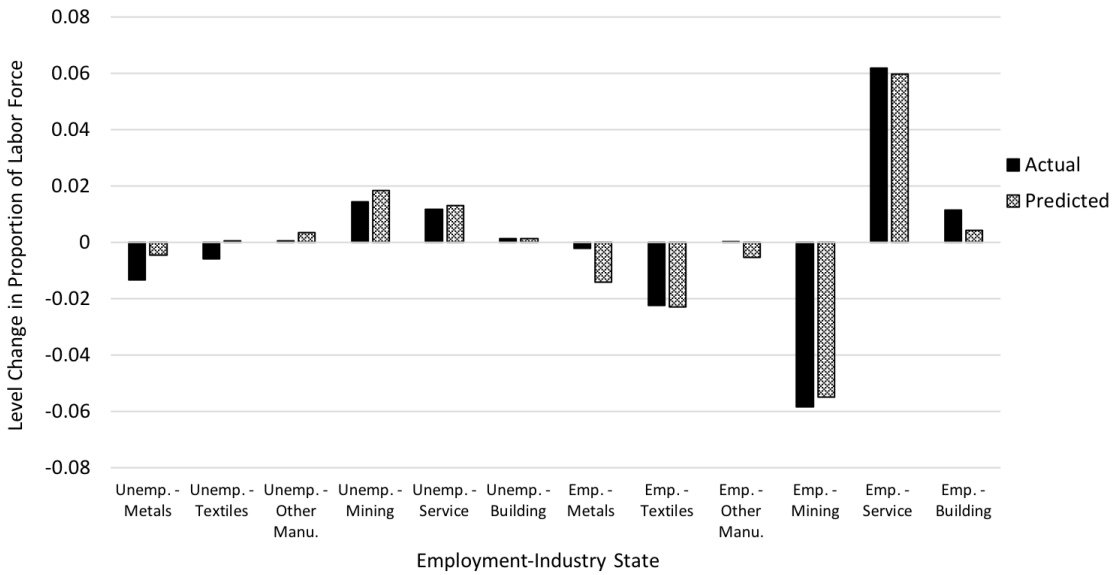
Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936, for men only. Entries are coefficient estimates from the quadratic programming model described in Appendix K, representing the probability of transitioning from the row employment-industry state to the column employment-industry state. Bootstrapped standard errors, using residual resampling, are presented in italics.

TABLE 11: MARKOV TRANSITION PROBABILITIES ACROSS EMPLOYMENT-INDUSTRY STATES, WOMEN ONLY

	Unemployment						Employment					
	Metals	Textiles	Other Manu.	Mining	Service	Building	Metals	Textiles	Other Manu.	Mining	Service	Building
Unemp. - Metals	0.5856						0.0000	0.0000	0.0000	0.0000	0.4144	0.0000
	0.330						*0.110*	*0.290*	*0.237*	*0.106*	*0.264*	*0.107*
Unemp. - Textiles		0.4939					0.0000	0.1680	0.1833	0.0157	0.0335	0.1056
		0.091					*0.060*	*0.131*	*0.116*	*0.029*	*0.093*	*0.072*
Unemp. - Other Manu.			0.3301				0.0000	0.6230	0.0469	0.0000	0.0000	0.0000
			0.222				*0.106*	*0.262*	*0.198*	*0.026*	*0.223*	*0.065*
Unemp. - Mining				0.8057			0.0000	0.0000	0.0000	0.1034	0.0000	0.0909
				0.435			*0.267*	*0.373*	*0.382*	*0.231*	*0.397*	*0.100*
Unemp. - Service					0.6449		0.0362	0.0000	0.0000	0.0000	0.3188	0.0000
					0.248		*0.110*	*0.124*	*0.145*	*0.041*	*0.224*	*0.084*
Unemp. - Building						0.0000	0.0000	0.0000	0.9999	0.0000	0.0000	0.0000
						0.381	*0.275*	*0.420*	*0.340*	*0.250*	*0.434*	*0.125*
Emp. - Metals	0.0416						0.8274	0.0000	0.0000	0.0000	0.1310	0.0000
	0.046						*0.332*	*0.114*	*0.284*	*0.014*	*0.291*	*0.023*
Emp. - Textiles		0.1252					0.0001	0.8261	0.0397	0.0089	0.0000	0.0000
		0.025					*0.044*	*0.081*	*0.075*	*0.008*	*0.043*	*0.013*
Emp. - Other Manu.			0.0671				0.0001	0.0000	0.8359	0.0000	0.0969	0.0000
			0.024				*0.051*	*0.066*	*0.113*	*0.001*	*0.076*	*0.005*
Emp. - Mining				0.0000			0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
				0.355			*0.201*	*0.435*	*0.296*	*0.246*	*0.175*	*0.130*
Emp. - Service					0.0230		0.0340	0.0000	0.0625	0.0000	0.8805	0.0000
					0.017		*0.059*	*0.019*	*0.058*	*0.003*	*0.078*	*0.006*
Emp. - Building						0.0022	0.0001	0.0000	0.9976	0.0000	0.0000	0.0000
						0.301	*0.333*	*0.343*	*0.403*	*0.058*	*0.378*	*0.077*

Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936, for women only. Entries are coefficient estimates from the quadratic programming model described in Appendix K, representing the probability of transitioning from the row employment-industry state to the column employment-industry state. Bootstrapped standard errors, using residual resampling, are presented in italics.

FIGURE 3: PREDICTED VS. ACTUAL CHANGE IN PROPORTION OF THE LABOR FORCE IN EACH STATE, 1923–1936



Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936, for both men and women. The figures for men and women separately are given in Appendix R. The actual figures give the level change in the proportion of the labor force in each employment-industry state in the raw data over the period. The predicted figures give the level change predicted by the Markov process described by Table 9 when the probabilities are projected forward by 13 steps.

Using these estimated transition probabilities, the Markov chain can be multiplied forward 13 steps from the 1923 distribution of labor force participants across states. The predicted change in the proportion of the labor force in each state over these years, 1923 to 1936, is then the difference between the simulated 1936 proportion and the initial 1923 proportion. Figure 3 compares the predicted change in the proportion of the labor force in each state for men and women together to the actual change. The similarities between the two series suggests that the estimated probabilities are fairly consistent with the observed data. The results for the models for men and women separately are given in Appendix R.

The estimated transition probabilities highlight two major processes occurring in the Markov chain. First, how likely is it for an individual in an industry to become unemployed? Then, how likely are they to find a job again if they become unemployed? Because six of the states of the Markov process correspond to unemployment and six correspond to employment, the estimated transition probabilities can be used to weight a random walk, capturing some of these dynamics.

For a single person, simulating the Markov model represented by the transition probabilities in Table 9 thirteen time steps gives a prediction for the state the individual visited on each step. For example, if we start an individual in unemployment in service, there is a 73.9% chance they stay in that state, a 23.3% chance they move to metal manufacturing, and a 2.9% chance they regain employment in service. Rolling a weighted die, say they move to

TABLE 12: AVERAGE PROPORTION OF TIME STEPS SPENT IN UNEMPLOYMENT BY INITIAL STATE

	Total (1)	Men (2)	Women (3)
Employment			
Metals	0.138	0.134	0.066
Textiles	0.140	0.144	0.140
Other Manu.	0.098	0.111	0.085
Mining	0.161	0.166	0.131
Service	0.104	0.120	0.060
Building	0.134	0.134	0.080
Unemployment			
Metals	0.248	0.266	0.221
Textiles	0.264	0.321	0.227
Other Manu.	0.267	0.317	0.228
Mining	0.430	0.416	0.587
Service	0.356	0.359	0.249
Building	0.315	0.350	0.150

Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936. 120,000 individuals were simulated over 14 steps in the Markov processes represented by the transition probabilities in Table 9 in column (1), Table 10 in column (2), and Table 11 in column (3), with 10,000 individuals starting the process in each of the possible employment-industry states for each Markov chain. In each simulation, the proportion of time steps in which an unemployment state was visited, in any industry, was calculated. The entries in this table give the mean proportion of time steps spent in unemployment, based on the initial state in which the individual began the simulation.

employment in metal manufacturing in step 1. Then, they have a 35.1% chance of staying in employment, a 9.0% chance of becoming unemployed, and a 55.9% chance of finding employment in another industry. Rolling another weighted die, they might move to unemployment in metal manufacturing. Continuing in this fashion, the transitions for thirteen steps are simulated based on the estimated transition probabilities in Table 9, producing a random walk. Then, the number of steps in which they ended up in any of the unemployment states can be counted.

Table 12 gives the results of simulating 120,000 people in the Markov chain for everyone, for only males, and for only females. 10,000 individuals are started in each initial state. Using the paths that are generated, the proportion of time spent in unemployment states can be estimated. This gives an estimate of the persistence of unemployment for individuals in each initial state, taking into account the risk of becoming unemployed and the duration of that unemployment if it occurs. However, this cannot account for any variation between individuals that is not captured by their employment-industry state.

The results indicate that workers who began the simulation employed in mining and textiles experienced the most unemployment, while those who began employed in other manufacturing and service experienced the least. This was especially true for male workers. An employed male miner is estimated to have spent 16.6% of time steps in unemployment, while an employed male in other manufacturing is only estimated to have spent 11.1% of steps in unemployment. For women, employed textile workers spent the most amount of time in unemployment (14.0%), while employed service workers spent the least amount of time (6.0%).

Taken together, the results from the estimation of this Markov model suggest that long-term unemployment was closely associated with the rigidities identified in the adjustment coefficient analysis. There was significant heterogeniety by industry and gender in the likelihood of becoming unemployed and then in finding employment in another industry. The results of the simulation combining these two processes indicate that workers in mining for men and in textiles for women experienced the most unemployment, while men and women in service and in other manufacturing experienced the least. Long-term unemployment caused by rigidities to adjustment was thus more acute for some groups of workers than others.

5.3 Comparison of results

The two methods of measuring the amount of labor market adjustment by industry and gender give results that are broadly consistent.

For men, the results of the adjustment coefficient analysis indicate that the least amount

of adjustment occurred in textiles and in mining. The Markov transition probabilities concur that employed workers in these industries were likely to become unemployed in the industry with few opportunities to move to other industries. In the simulation, men who began employed in textiles and in mining experienced the most persistent unemployment. Additionally, both the adjustment coefficient analysis and the Markov simulation suggest that male workers in service and in other manufacturing experienced high levels of adjustment. However, the transition probabilites suggest that if a worker did become unemployed in these industries and fail to immediately secure other employment, they could have difficulty finding other employment opportunities.

According to the adjustment coefficient analysis, women experienced the least amount of adjustment in textiles, a moderate amount of adjustment in other manufacturing, and the most adjustment in service. These correspond closely with the Markov transition probability results. The simulation further suggests that women in textiles experienced the most persistent unemployment, women in other manufacturing experienced moderately persistent unemployment, and women in services experienced the least persistent unemployment.

Comparing men and women in the same industries, the adjustment coefficient results suggest that women in the textile industry faced more rigidities to adjustment than men, but that women in other manufacturing faced fewer rigidities. The results from the Markov simulation confirm that unemployment was less persistent for women in other manufacturing than for men, but the results are in the opposite direction for the textile industry. The estimated transition probabilities indicate that female textile workers had a higher chance of becoming unemployed than male textile workers, but once unemployed had a better chance of finding work in other industries.

6 Additional evidence on the determinants of industry-level unemployment rates

The results of the previous section have demonstrated that there was significant heterogeneity in the amount of labor market adjustment across industries, gender, and regions in interwar Britain, with especially notable differences between industry categories by gender.

To better understand these results, this section provides some additional evidence on the determinants of industry-level unemployment rates for men and women. Linking the *Labour Gazette* unemployment data with industry-level data from the *Census of Production* and other sources offers some insight on the key differences between industries. A regression model for unemployment in 1924 and 1931 suggests that export industries were structurally disadvantaged in this period. Additionally, industries that were able to tap into the fe-

male labor supply performed better. Unemployment rates for women depended critically on whether the industry had a high proportion of administrative, technical, and clerical occupations. The results of this additional analysis thus give us some sense of why certain industries had more adjustment than others during the interwar period, and why gender affected this labor market adjustment.

6.1 Model for industry unemployment

Traditional explanations for interwar unemployment, in aggregate and by industry, emphasize the role of wages and trade unions. Under the classical model of unemployment, if wages are rigid at a level above market rates, unemployment will occur. This view was espoused most strongly during the interwar period by Arthur Cecil Pigou, who famously claimed that unemployment was caused by "uneconomically high wage-rates... against the interest of the community as a whole" (Pigou 1927, p. 366). Trade unions, common during this period, often achieved wage increases or resisted wage reductions (Cannan 1927, p. 411; Hatton and Thomas 2013, for example). In addition to the direct effect on wages, trade unions also had an indirect effect on employment during the interwar years by increasing other costs of employing labor and by bargaining for short-time working arrangements that best took advantage of the unemployment insurance system (Whiteside and Gillespie 1991, p. 677).

The shock of World War I also had a differential effect on British industries. Henry Clay wrote in 1929 that the export industries' losses during the interwar period were "as directly and certainly a cost of the war as the losses which are represented by the War Debt or War Pensions" (Clay 1929, 102). World War I severely disturbed markets, leading to the emergence of new competitors and substitute goods that disproportionately affected industries involved in world trade. The export exposure of industries captures the shock of World War I as well as the differential challenges posed by deflation, the restoration of the gold standard, and trade policy during the interwar years. The war also caused some industries to expand to meet munitions and supplies needs, leading to long-term problems of overcapacity and overcapitalization, as in the iron and steel industry (Burnham and Hoskins 1943, p. 49–50).

There were significant changes in the composition of the workforce in some industries during the interwar period that also could have affected unemployment rates. Women and younger workers were increasingly drawn into newer manufacturing industries. These demographic changes may have reduced costs of production, as these workers could be paid less and could adapt more flexibly to new industrial production and organization methods (Heim 1984, pp. 586–587). The trend toward agglomeration and branching in many industries also shifted the types of jobs that were available, increasing the number of administrative and

clerical jobs.

These different factors can be put together in a least-squares regression model. The regression takes the form,

$$y_{it} = \alpha_0 + \boldsymbol{\beta}'\mathbf{x}_{it}^{C} + \boldsymbol{\gamma}'\mathbf{x}_{it}^{S} + \boldsymbol{\delta}' x_{it,2}^{S} \cdot \mathbf{T}_t + \boldsymbol{\zeta}'\mathbf{d}_{it} + \boldsymbol{\eta}'\mathbf{T}_t + \epsilon \tag{5}$$

where y_{it} is the unemployment rate for industry i at time t, $\mathbf{x}_{it}^{C}$ is a vector of characteristics of industry i relating to classical explanations of unemployment, $\mathbf{x}_{it}^{S}$ is a vector of characteristics of industry i relating to longer-term effects from World War I and changes in the workforce composition, $\mathbf{d}_{it}$ is a vector of controls, $\mathbf{T}_t$ are time dummies, and $x_{it,2}^{S} \cdot \mathbf{T}_t$ is an interaction term between the time dummy and the output growth during World War I.

Vector $\mathbf{x}_{it}^{C}$ contains the industry's real wage level, the total wage bill as a percent of net output, and the density of trade unions. $\mathbf{x}_{it}^{S}$ contains the percent of output exported, output growth during World War I, the proportion of women in an industry, the proportion of young workers in an industry, and the proportion of administrative, technical, and clerical workers in an industry. $\mathbf{d}_{it}$ contains controls including the the intensity of short-time work, the number insured, and lagged output. Use of the *Labour Gazette* unemployment rates without taking into account short-time can lead to biased results because workers on short-time were counted as unemployed in the data.

6.2 Expanded data

As described in Section 3, the basis of this analysis is the newly digitized Ministry of Labour data on unemployment for 100 industries, disaggregated by gender, from June 1923 to December 1936. This data was reliably collected by the British government throughout the period but only covers the portion of the population under the national unemployment benefit scheme. For the regression analysis, I also incorporate data from the *Labour Gazette* on the incidence and intensity of short-time working for 124 industries in October 1924 and October 1931.[24]

The primary data source on the characteristics of industries is the *Census of Production* for 1924 and 1930. For all 123 industries in the *Census of Production*, I digitized 9 tables in 1924 and in 1930, totaling close to 1,000 pages of the *Census of Production* for these years. 87 of the 100 *Gazette* industries map to those in the *Census of Production*.[25] The covariates

24. Short-time working data by industry and gender is only available for October 1924, October 1928, and October 1931. The 1924 and 1928 data is available in the October – December 1929 *Gazette*, and the 1931 data is available in the January – March 1933 *Gazette*.

25. For the complete mapping of *Labour Gazette* and *Census of Production* industries, see Appendix S.

from the *Census of Production* include wages as a proportion of net output, the percent of production exported, the proportion of workers under age eighteen, and the proportion of workers in administrative roles rather than operative roles.

The trade union data comes from the *Twenty-Second Abstract of Labour Statistics* (1935, pp. 140–141), which gives the number of members of trade unions, male and female, for 34 industry categories annually from 1923 to 1935. I link the trade union density to each industry in a category and impute zero for the six industries in which no trade unions were reported.[26]

Annual output data for 28 industry groups is taken from Lomax (1959, pp.192-193). I use this annual output data to control for output in the previous year and to construct a measure of the growth of industries during World War I. Sixteen industries, primarily in services, are not covered by any of the output categories in the Lomax data.

The resulting data for the analysis includes 79 industries representing almost all industries in manufacturing, mining, and building.[27] Service industries are not covered in the *Census of Production* and so are omitted.

6.3 Results for determinants of industry unemployment rates

Table 13 gives the results of the regression in Equation 5 for men and women together in model (1), for men only in (2), and for women only in (3). Models (2) and (3) use gender-disaggregated data for the covariates when available. In all of the models, the data is on the industry-year level for two years, 1924, and 1931. All models control for time trends, for the number insured in each category, and for output in the previous year.

Industries that exported a larger share of their output faced significantly higher unemployment rates in the overall model and in the model for men only. The coefficients of 0.122 ($p < 0.05$) and 0.119 ($p < 0.05$), respectively, indicate that a one standard deviation increase in the percentage of output exported (15.48 percentage points) corresponds to a 1.88 and 1.84 percentage point increase in the industry unemployment rate. In the model for women only, export exposure has no significant effect on industry unemployment rates.

The expansion of an industry during World War I is also positively associated with the industry's unemployment rate. The main effects of 0.074 ($p < 0.01$) and 0.081 ($p < 0.01$) in the overall model and the model with men only, respectively, suggest that in 1924, a

26. Fishing; Gas, Water and Electricity Supply Industry; Hotel, Boarding House, Club Services; Industries and Services Not Separately Specified; Laundries, Dyeing and Dry Cleaning; and Professional Services

27. In these industry categories, the excluded industries are Fishing, Gas and Water Supply; Sawmilling; Stationery and Typewriting Requisites; Heating and Ventilating; Steel Melting and Iron Puddling Furnaces; and Stove and General Ironfounding.

one standard deviation increase in the growth of the industry during World War 1 (17.18 percentage points) would lead to a 1.27 percentage point increase in the industry's overall unemployment rate and an 1.39 percentage point increase in the unemployment rate for men only. However, the interaction terms indicate that this effect is completely reversed in 1931. There is no significant effect of an industry's growth during the war on the unemployment rate for women.

With a coefficient of -0.123 ($p < 0.001$) in the overall model and a coefficient of -0.0944 ($p < 0.01$) in the male-only model, the proportion of women in an industry is negatively associated with unemployment rates in that industry. The effect is dramatic, with a one standard deviation increase in the percent of women employed in the industry (24.84 percentage points) associated with a 3.06 percentage point decline in the industry unemployment rate overall and a 2.33 percentage point decline in the industry unemployment rate for men. This offers some corroboration of the narrative that expanding industries were able to tap into previously underutilized labor supply to achieve cost reductions. There is no corresponding effect on female unemployment rates.

The wage effects are also large. A one standard deviation increase in the total wage bill as a percentage of net output (14.39 percentage points), reflecting higher bargained wages, corresponds to a 2.79 percentage point increase in industry unemployment rates in the overall model and to a 3.13 percentage point increase in the male-only model. However, the coefficient on the real wage level is negative in both models, suggests that increasing real wages actually decreases unemployment across industries. While this seems contrary to theory, this coefficient could be picking up higher wages in expanding industries with low employment. The real wage level is inversely related with the unemployment rate for women, but the total wage bill has no effect. This is broadly consistent with the results in Bean (2015), who finds that in interwar London, the female labor supply on the extensive margin was not closely associated with wage rates.

One of the strongest determinants of the industry-level unemployment rate for women is whether the industry employed many administrative, technical, and clerical staff. Patterns of agglomeration and branching led to an increase in these roles in many manufacturing industries, which were likely more accessible to women than the traditional roles of operatives or laborers. The coefficient of -0.422 ($p < 0.01$) suggests that a one standard deviation increase in this percentage (5.51 percentage points) corresponded to a 2.33 percentage point decrease in the unemployment rate for women in the industry.

There is no statistically significant effect for trade unions above and beyond the variation captured by the wage measures. The proportion of employees under eighteen years of age is also not significant. The intensity of short-time working has a significant, positive effect on

the unemployment rate in the overall and the male models because workers on short-time were counted as unemployed by the Ministry of Labour, which increases the unemployment rate for some industries.

These results are robust to the inclusion of industry category fixed effects and to clustering at the industry group level rather than the industry level (Table 35 in Appendix T). They are also robust to the exclusion of lagged output as a control and to the use of an alternative dependent variable, the difference between the industry unemployment rate and the aggregate unemployment rate in the year (Table 36 in Appendix T).

TABLE 13: DETERMINANTS OF INDUSTRY-LEVEL UNEMPLOYMENT RATES IN 1924 AND 1931, SERVICE INDUSTRIES EXCLUDED

	(1) Total b/se	(2) Men b/se	(3) Women b/se
Percent of output exported	0.122*	0.119*	-0.005
	(0.052)	(0.056)	(0.030)
Output growth during WW1	0.074**	0.081**	0.063
	(0.028)	(0.030)	(0.033)
Year=1931 × Output growth during WW1	-0.113*	-0.125*	0.047
	(0.047)	(0.048)	(0.047)
Real wage level	-0.031**	-0.025*	-0.034**
	(0.010)	(0.012)	(0.011)
Total wage bill as a percent of net output	0.194***	0.218***	0.040
	(0.054)	(0.052)	(0.060)
Trade union density	1.835	0.646	4.492
	(3.247)	(2.851)	(3.928)
Percent of all employees that are female	-0.123***	-0.094**	0.020
	(0.034)	(0.029)	(0.035)
Percent of all employees in administrative, technical, and clerical roles	-0.148	-0.091	-0.422**
	(0.150)	(0.156)	(0.125)
Percent of all employees under 18 years old	-0.100	-0.074	-0.136
	(0.123)	(0.122)	(0.132)
Short-time hours per employee	1.256**	1.432**	0.542
	(0.455)	(0.463)	(0.467)
Year=1931	16.033***	15.467***	12.456***
	(1.748)	(1.746)	(1.492)
Constant	27.485**	22.472*	27.857***
	(9.074)	(9.985)	(7.114)
Controls	Yes	Yes	Yes
Num. of observations	156	156	156
Num. of industries	79	79	79
Adj. R^2	0.659	0.660	0.538

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors, clustered at the industry level, given in parentheses. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the industry-level unemployment rate. Controls include number insured in the industry and lagged output. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

The results of this regression analysis help us understand why there were such significant differences between industries during the interwar period, and how gender affected these

differences. While some industries were able to take advantage of the changing composition of the labor supply and to manage wage pressures, other industries were disadvantaged by poor trade conditions and persistent effects from World War I.

7 Conclusion

This paper evaluates the extent to which reallocation of labor across industries occurred in interwar Britain in order to understand how slow or limited labor market adjustment contributed to persistent unemployment. I digitize hundreds of British government records to construct a comprehensive dataset on unemployment by gender for 100 industries, covering each month from 1923–1936. After a series of descriptive statistics on the differences in interwar unemployment rates across industries, gender, and regions, two methods are used to measure the labor market adjustment on the industry level. First, adjustment coefficients representing whether laid off workers were able to find employment in other industries are estimated for groups of industries, disaggregated for men and women. Then, a Markov model for transitions between industries and employment states is used to estimate the probability of workers moving between employment and unemployment across six industries.

The results of the adjustment coefficient analysis suggest that interwar industries not only had large differences in unemployment, but that they also had differences in their ability to adjust their labor supply to these employment changes. Adjustment coefficients are higher in industries that were expanding than in those that were contracting, suggesting that workers in declining industries faced the additional challenge of rigidities to movement into other industries. The Great Depression widened this gap by increasing levels of adjustment for expanding industries and decreasing adjustment for contracting industries. Industries in services and in building had particularly high levels of adjustment, while textile manufacturing and mining industries had the lowest levels of adjustment. There were fewer rigidities for men in the labor market than for women, though this varied by industry, and the labor market was more flexible in the South East and London regions than in the North and in Wales.

The estimated transition probabilities from the Markov analysis suggest that for men, unemployed mining workers were least likely to find employment while unemployed metal workers were most likely to find other employment. For women, employed textile workers had a high probability of becoming unemployed but had other opportunities once unemployed, while service workers were less likely to become unemployed but had fewer opportunities if it did occur. Simulating the employment and unemployment paths of men and women in different industries, persistent unemployment was most likely for textile and mining workers

and least likely for service and other manufacturing workers.

Taken together, these analyses suggest that the interwar labor market was not uniformly rigid or flexible. For workers in certain declining industries and for women, there were significant barriers preventing movement into other industries. However, for some of the leading industries and regions, there was more adjustment than has been assumed to have occurred during this period. This heterogeneity in adjustment suggests that labor market rigidities did contribute to persistent unemployment in interwar Britain, but this long-term unemployment was experienced much more acutely by some groups of workers than others. By analyzing labor market rigidities at a finer level of industry, gender, and region disaggregation, a more complex picture of persistent unemployment in the interwar period has emerged.

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Appendices

A Relative unemployment rates and numbers insured for men and women

Prior work on interwar unemployment has ascribed the rapid increase in female unemployment in 1930 to changes in the National Insurance scheme which made it easier to claim unemployment benefit without actually seeking work. For example, Booth and Glynn (1975) write that "...in the early 1930s, when the condition that claimants must be 'genuinely seeking work' was dropped, the female average [unemployment rate] rose to 80-90 per cent of the male rate. When the Anomalies Act of 1931 partially reversed the previous policy, female rates tended to return to pre-1929 levels" (617). The implied mechanism is that women who were unattached to the labor force falsely became insured and claimed unemployment benefits once they did not have to prove they were genuinely seeking work. However, using the full *Labour Gazette* data, Table 14 shows that while the female unemployment rate did rise to 90% of the male unemployment rate in 1930, there was no significant relative increase in the numbers of females insured. This is inconsistent with the view that women abused the insurance system more than men, and thought it is still probable that there was some abuse of the unemployment insurance system during these years, this abuse would have been in equal measure for men and women.

Table 14: Relative unemployment rates and numbers insured for men and women

	Male		Female		Ratio Female:Male	
Year	Unemp. Rate	# Insured	Unemp. Rate	# Insured	Unemp. Rate	# Insured
1923	12.1	8,526,900	9.6	2,975,900	0.79	0.35
1924	11.1	8,480,600	8.7	3,033,400	0.79	0.36
1925	12.4	8,717,400	8.8	3,174,600	0.71	0.36
1926	13.5	8,843,800	9.9	3,197,200	0.73	0.36
1927	11.3	8,576,200	6.3	3,207,800	0.56	0.37
1928	12.3	8,621,900	7.1	3,259,600	0.57	0.38
1929	11.7	8,755,350	7.4	3,338,650	0.63	0.38
1930	16.7	8,931,530	15.0	3,474,170	0.90	0.39
1931	22.8	9,187,000	18.1	3,583,000	0.79	0.39
1932	25.4	9,302,300	13.6	3,505,700	0.54	0.38
1933	23.2	9,344,400	11.5	3,538,600	0.50	0.38
1934	19.3	9,435,200	10.0	3,524,800	0.52	0.37
1935	17.7	9,531,000	9.8	3,527,000	0.55	0.37
1936	15.0	9,720,700	8.8	3,618,000	0.58	0.37

Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936. Unemployment rate expressed in percentage. The final two columns give the female unemployment rate divided by the male unemployment rate, and the number of insured females divided by the number of insured males.

B The role of the staple industries

Many histories of British interwar unemployment focus on the role of staple industries: coal mining, cotton textiles, iron and steel,[28] engineering,[29] shipbuilding, and sometimes also woollen and worsted textiles. These older industries drove British economic growth during the nineteenth century, and their visible decline was widely discussed during the interwar period. More recent research has also emphasized the staple industries. Gazeley and Rice (1996, p. 297), for example, use employment data from Chapman and Knight (1953) to find that 87% of employment losses from 1929 to 1932 were in the staple industries. My complete Ministry of Labour *Gazette* data allows us to complement these figures on employment changes with data on changes in the numbers unemployed.

Figure 4 gives the number unemployed throughout the interwar period across three broad categories of industries: staple industries, other manufacturing industries, and non-manufacturing industries. In both the data for males in 4a and for females in 4b, the staple industries hold a less prominent position than might be expected. For males, we see that unemployment in the staple industries was higher than the other categories throughout the 1920s, but that unemployment in non-manufacturing matched and then outpaced unemployment in the staples throughout the 1930s.[30] For females, the highest numbers unemployed throughout the interwar period were in other manufacturing rather than the staple industries.[31] While the staple industries certainly played an important role in British interwar unemployment, these figures suggest that we cannot simply conclude that unemployment was driven by the staple industries.

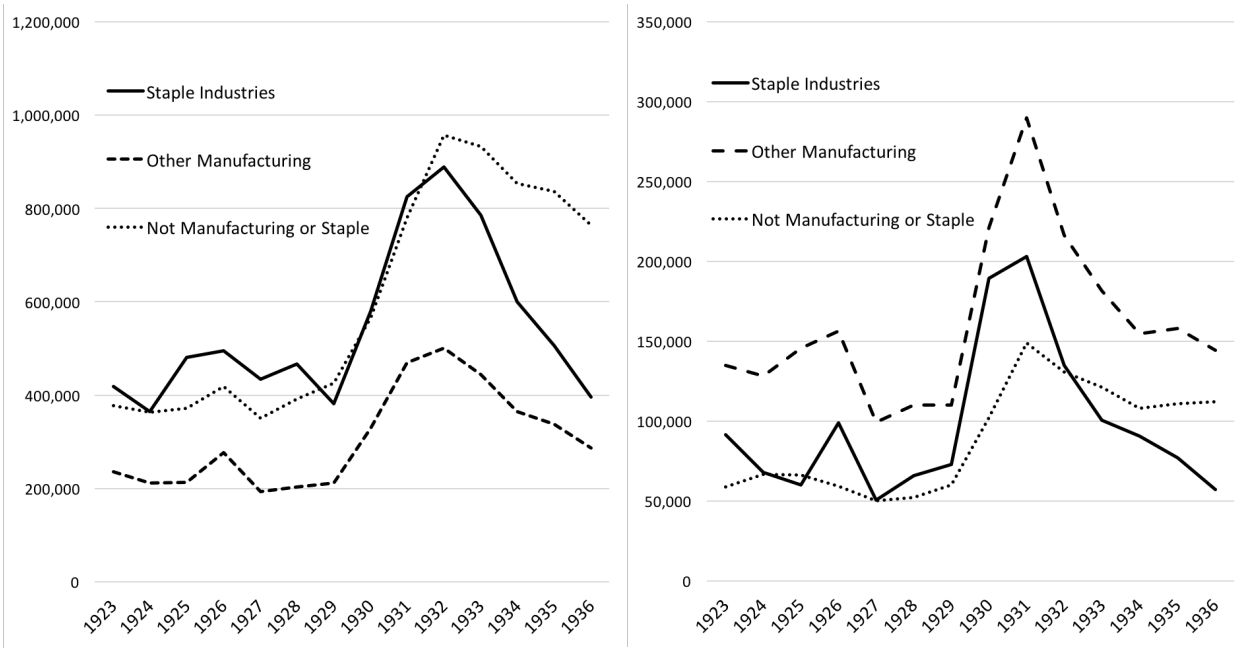
28. Includes the industries Iron and Steel Tube Making, Pig Iron Manufacture/Blast Furnaces, Steel Melting and Iron Puddling Furnaces, Wire/Wire Netting/Wire Rope Manufacture, and Stove/Grate/Pipe/General Ironfounding

29. Industry category containing the industries General Engineering/Engineer's Iron and Steel Founding, Constructional Engineering, Electrical Engineering, and Marine Engineering

30. Led by Building, Distributive Trades, Public Works Contracting, and Canal, River, Dock and Harbour Service

31. Led by Linen, Tailoring, Pottery, and Hoisery

Figure 4: Numbers unemployed in staple vs. non-staple industries, 1923–1936



(a) Male

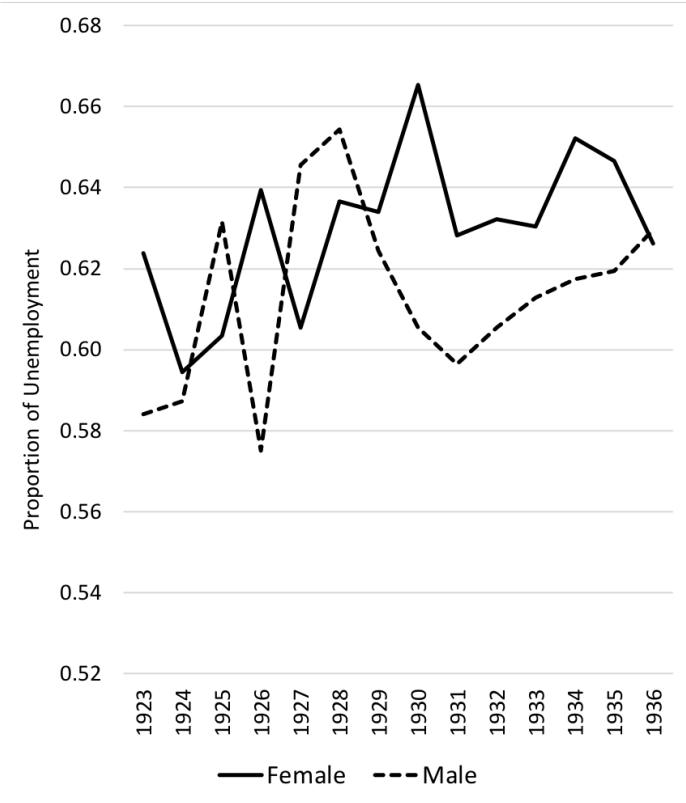
(b) Female

Analysis using gender-disaggregated unemployment data from the Ministry of Labour *Gazette*, 1923–1936.

C Proportion of unemployment accounted for by the top ten industries in each year

The ten industries that accounted for the most unemployment sum to only 62% on average of overall unemployment during the interwar period. This proportion does change over time, as given in Figure5. The male trend shows a clear dip in concentration from 1925–1926 and from 1928–1931. In both of these periods, national macroeconomic events might have caused unemployment to become more widespread across industries—Britain's return to the gold standard in 1925 created contractionary pressures throughout the national economy, and the worldwide collapse of demand in 1929 had far-reaching effects. The female trend, however, shows little recognizable pattern. This could be because a full 32% of female unemployment was driven by only two industries, indicating higher concentration overall, or because there were more industries in which very few females worked than very few males.

Figure 5: Proportion of unemployment accounted for by top ten industries in each year



Analysis using gender-disaggregated unemployment data from the Ministry of Labour *Gazette*, 1923–1936.

D Regional unemployment rates in Britain, 1923–1936

Table 15: Regional unemployment rates in Britain, 1923–1936

Year	London	South East	South West	Midlands	North East	North West	Scotland	Wales	N. Ireland
1923	10.1	9.2	10.6	10.7	12.2	14.5	14.3	6.4	18.2
1924	9.0	7.5	9.1	9.0	10.9	12.9	12.4	8.6	16.6
1925	7.8	5.9	8.5	9.1	15.0	11.4	15.2	16.5	23.9
1926	6.9	5.4	8.4	11.0	17.2	14.7	16.4	18.0	23.2
1927	5.8	5.0	7.2	8.4	13.7	10.7	10.6	19.5	13.2
1928	5.6	5.4	8.1	9.9	15.1	12.4	11.7	23.0	17.0
1929	5.6	5.6	8.1	9.3	13.7	13.3	12.1	19.3	14.8
1930	8.1	8.0	10.4	14.7	20.2	23.8	18.5	25.9	23.8
1931	12.2	12.0	14.5	20.3	27.4	28.2	26.6	32.4	27.8
1932	13.5	14.3	17.1	20.1	28.5	25.8	27.7	36.5	27.2
1933	11.8	11.5	15.7	17.4	26.0	23.5	26.1	34.6	26.5
1934	9.2	8.7	13.1	2.9	22.1	20.8	23.1	32.3	23.4
1935	8.5	8.1	11.6	11.2	20.7	19.7	21.3	31.2	24.8
1936	7.2	7.3	9.4	9.2	16.8	17.1	18.7	29.4	22.7

Source: *Twenty-Second Abstract Of Labour Statistics* (1937, p. 59)

E Counties included in each of the 1931 *Census of England and Wales* regions

Appendix B, p. 195, of the 1931 *Census of England and Wales* reports the counties in each region as follows:

South East
Bedfordshire, Berkshire, Buckinghamshire, Essex, Hertfordshire, Kent, London*, Middlesex, Oxfordshire, Southampton, Surrey, Sussex (East), Sussex (West), Isle of Wight

Greater London
Including the City of London and Metropolitan Police Districts

North 1
Durham, Northumberland

North 2
Cumberland, Westmorland, Yorkshire (East Riding), Yorkshire (North Riding)

North 3
Yorkshire (West Riding), Yorkshire C.B.

North 4
Cheshire, Lancashire

Midland 1
Gloucestershire, Herefordshire, Shropshire, Staffordshire, Warwickshire, Worcestershire

Midland 2
Derbyshire, Leicestershire, Northamptonshire, Nottinghamshire, Soke of Peterborough

East
Cambridgeshire, Isle of Ely, Huntingdonshire, Lincolnshire (Parts of Holland, Kesteven, and Lindsey), Norfolk, Rutlandshire, Suffolk (East), Suffolk (West)

South West
Cornwall, Devonshire, Dorsetshire, Somersetshire, Wiltshire

Wales 1
Brecknockshire, Carmarthenshire, Glamorganshire, Monmouthshire

Wales 2
Anglesey, Caernarvonshire, Cardiganshire, Denbighshire, Flintshire, Merionethshire, Montgomeryshire, Pembrokeshire, Radnorshire

F Industrial specialization of regions in England and Wales

The *Census of England and Wales* (1931) data on the distribution of workers among industries in a region can be used to measure the industrial diversification or specialization of each region. For each region, I calculate a modified Herfindahl-Hirschman index to capture the level of industrial specialization in a region. Typically, the Herfindahl-Hirschman index is constructed by summing the squared market share of firms in an industry, where a larger result indicates that an industry is more concentrated and less competitive. I modify this index to get a measure of the industrial specialization of a region by summing the squared industry shares of total employment in a region. A higher value indicates that a region's employment is concentrated in fewer industries.

Table 16: Herfindahl-Hirschman index of specialization for regions in England and Wales, 1921 and 1931

	1921	1931
Greater London	0.070	0.076
South East	0.104	0.091
South West	0.099	0.090
Midlands 1	0.049	0.052
Midlands 2	0.068	0.063
East	0.120	0.102
North 1	0.100	0.101
North 2	0.071	0.069
North 3	0.064	0.063
North 4	0.075	0.069
Wales 1	0.124	0.126
Wales 2	0.115	0.097

Analysis using Table C of the 1931 *Census of England and Wales* Industry Report. The Herfindahl-Hirschman index of specialization is calculated as the sum of the squared industry shares of total employment in the region.

The modified Herfindahl-Hirschman index is given for 12 regions in Table 16. In both 1921 and 1931, Midlands 1—the west Midlands, including Birmingham—had the most diversified economy. Wales 1, the south of Wales, was the most specialized region. For all regions, the Herfindahl-Hirschman values were generally similar between 1921 and 1931, but the majority of regions show a slight increase in diversification from 1921 to 1931.

G Linking *Labour Gazette* and 1931 *Census* industries

Table 17: Crosswalk between Labour Gazette (1923–1936) and Census of England and Wales (1931) industries

Labour Gazette Industry	*Census of England and Wales* Industry Category
Brick, Tile, etc., Making	Manufacture of Bricks, Pottery, Glass, etc.
Building and Construction of Works	
Building	Building, Decorating, Stone and Slate Cutting, and Contracting
Public Works Contracting, etc.	Building, Decorating, Stone and Slate Cutting, and Contracting
Chemicals, etc.	
Chemicals Manufacture	Chemicals and Explosives
Explosives Manufacture	Chemicals and Explosives
Oil, Grease, Glue, Soap, Ink, Match, etc.	Greases, Glue, etc.
Paint, Varnish, Japan, Red and White Lead	White Lead, Paints, and Varnish
Clothing Trades	
Blouses, Shirts, Collars, Underclothing	Manufacture of Clothing (not Knitted)
Boot, Shoe, Slipper and Clog Trades	Manufacture of Clothing (not Knitted)
Dress Industries Not Separately Specified	Manufacture of Clothing (not Knitted)
Dress and Mantle Making and Millinery	Manufacture of Clothing (not Knitted)
Hat and Cap (Including Straw Plait) Man	Manufacture of Clothing (not Knitted)
Tailoring	Manufacture of Clothing (not Knitted)
Commerce, Banking, Insurance and Finance	Other Commerce and Finance
Construction and Repair of Vehicles	
Construction and Repair of Carriages, Carts, etc.	Construction and Repair of Vehicles
Construction and Repair of Motor Vehicles, Cycles, and Aircraft	Construction and Repair of Vehicles
Railway Carriage, Wagon, and Tram-Car Building	Construction and Repair of Vehicles
Distributive Trades	Distributive Trades
Engineering, etc.	
Constructional Engineering	Engineering (not Marine or Electrical)
Electrical Engineering	Electrical Installations, Cables, and Apparatus
General Engineering; Engineers' Iron and Steel Founding	Engineering (not Marine or Electrical)
Marine Engineering, etc.	Ship Building and Repairing; Marine Engineering
Fishing	Fishing
Food, Drink, and Tobacco	
Bread, Biscuit, Cake, etc., Making	Food
Cocoa, Chocolate and Sugar Confectionery	Food
Drink Industries	Drink
Food Industries Not Separately Specified	Food
Grain Milling	Food
Tobacco, Cigar, Cigarette and Snuff Man	Tobacco, Cigars, Cigarettes, Snuff
Gas, Water and Electricity Supply Industries	Gas, Water, Electricity
Glass Trades	
Glass (excluding Bottles and Scientific	Manufacture of Bricks, Pottery, Glass, etc.
Glass Bottle Making	Manufacture of Bricks, Pottery, Glass, etc.
Leather and Leather Goods	
Saddlery, Harness and Other Leather Goods	Saddlery, Harness, Bags, Trunks, and Other Goods of Leather
Tanning, Currying and Dressing	Furs, Skins, Leather
Metal Manufacture	
Iron and Steel Tube Making	Founding and Other Secondary Processes in Metal Working
Manufacture of Brass, Cotton, Zinc, Tin	Extracting and Refining of Other Metals and Alloys
Manufacture of Tin Plates	Founding and Other Secondary Processes in Metal Working
Pig Iron Manufacture (Blast Furnaces)	Smelting, Converting, Refining, and Rolling of Iron and Steel
Steel Melting and Iron Puddling Furnaces, Rolling Mills and Forges	Smelting, Converting, Refining, and Rolling of Iron and Steel
Wire, Wire Netting, Wire Rope Manufacture	Other Metal Industries (not Precious Metals, Jewelry, or Plate)
Metal Trades	
Bolts, Nuts, Screws, Rivets, Nails, Etc	Other Metal Industries (not Precious Metals, Jewelry, or Plate)
Brass and Allied Metal Wares Manufacture	Other Metal Industries (not Precious Metals, Jewelry, or Plate)
Electrical Cable, Wire, and Electric Lamp Manufacture	Electrical Installations, Cables, and Apparatus

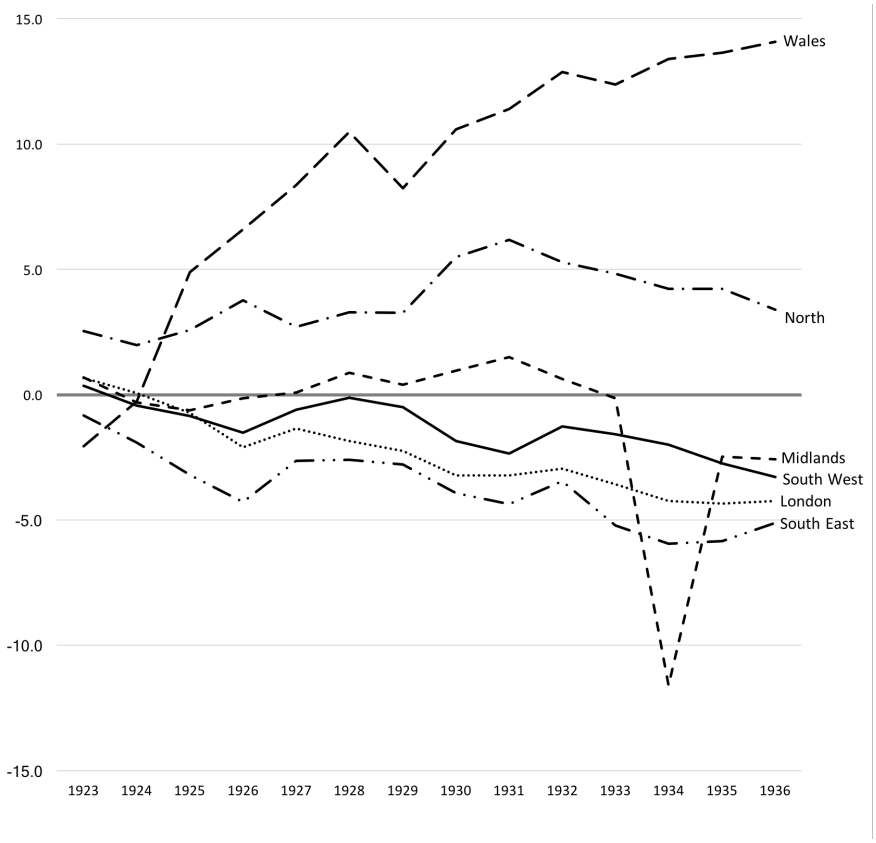
Electrical Wiring and Contracting	Electrical Installations, Cables, and Apparatus
Hand Tool, Cutlery, Saw, File Making	Cutlery and Small Tools (not Machine Tools)
Heating and Ventilating Apparatus	Founding and Other Secondary Processes in Metl Working
Metal Industries Not Separately Specified	Other Metal Industries (not Precious Metals, Jewelry, or Plate)
Stove, Grate, Pipe, etc., and General I	Founding and Other Secondary Processes in Metl Working
Watches, Clocks, Plate, Jewelry, etc.	Precious Metals, Jewelry, Plate
Mining	
Clay, Sand, Gravel, and Chalk Pit Digging	Other Mining and Quarrying
Coal Mining	Coal Mining
Iron Ore and Ironstone Mining and Quarrying	Other Mining and Quarrying
Lead, Tin, and Copper Mining	Other Mining and Quarrying
Mining and Quarrying Not Separately Specified	Other Mining and Quarrying
Slate Quarrying and Mining	Other Mining and Quarrying
Stone Quarrying and Mining	Other Mining and Quarrying
Miscellaneous Trades and Services	
Entertainment and Sports	Entertainment and Sport
Hotel, Boarding House, Club Services	Personal Service (including Hotels and Catering)
Industries and Services Not Separately	Other Industries, or Industry not stated
Laundries, Dyeing and Dry Cleaning	Personal Service (including Hotels and Catering)
Local Government	Local Government
National Government	Defense and Central Civil Government (British and Imperial)
Professional Services	Professions
Non-Metalliferous Mining Products	
Artificial Stone and Concrete Manufacture	Building, Decorating, Stone and Slate Cutting, and Contracting
Cement, Limekilns and Whiting Works	Treatment of Non-Metalliferous Mine and Quarry Products
Coke Ovens and By-Product Works	Treatment of Non-Metalliferous Mine and Quarry Products
Other Manufacturing Industries	
Brush and Broom Making	Other Manufacturing Industries
Musical Instrument Making	Musical Instruments
Oilcloth, Linoleum, etc., Manufacture	Other Manufacturing Industries
Rubber Manufacture	Rubber
Scientific and Photographic Instrument	Other Manufacturing Industries
Toys, Games and Sports Requisites Manufacture	Other Manufacturing Industries
Pottery, Earthenware, etc.	Manufacture of Bricks, Pottery, Glass, etc.
Printing and Paper Trades	
Cardboard Boxes, Paper Bags, and Stationery	Paper Making; Manufacture of Stationery; Printing, Bookbinding
Paper and Paper Board Making	Paper Making; Manufacture of Stationery; Printing, Bookbinding
Printing, Publishing, and Bookbinding	Paper Making; Manufacture of Stationery; Printing, Bookbinding
Stationery and Typewriting Requisites	Paper Making; Manufacture of Stationery; Printing, Bookbinding
Wall Paper Making and Paper Staining	Paper Making; Manufacture of Stationery; Printing, Bookbinding
Sawmilling, Furniture and Woodwork	
Furniture Making, Upholstering, etc.	Furniture (not Metal or Basket); Fittings
Sawmilling and Machined Woodwork	Wood Working and Basket Ware
Wood Box and Packing Case Making	Wood Working and Basket Ware
Woodworking Not Separately Specified	Wood Working and Basket Ware
Shipbuilding and Ship Repairing	
Shipbuilding and Ship Repairing	Ship Building and Repairing; Marine Engineering
Textile Trades	
Carpet Manufacture	Mixed Fibers and Miscellaneous Products
Cotton Industry	Cotton
Hemp Spinning and Weaving, Rope, Cord,	Flax, Hemp, Jute
Hosiery	Mixed Fibers and Miscellaneous Products
Jute	Flax, Hemp, Jute
Lace	Mixed Fibers and Miscellaneous Products
Linen	Mixed Fibers and Miscellaneous Products
Silk Industry	Silk, Natural and Artificial
Textile Bleaching, Printing, Dyeing, etc.	Textile Dyeing, Printing, Bleaching, Calendering, Finishing
Textile Industries Not Separately Specified	Mixed Fibers and Miscellaneous Products
Woolen and Worsted	Wool, Worsted, and Shoddy
Transport and Communication	
Canal, River, Dock and Harbor Service	Water, Air, and Other Transport and Communication
Railway Service	Railways
Road Transport Not Separately Specified	Road
Shipping Service	Water, Air, and Other Transport and Communication
Tramway and Omnibus Service	Water, Air, and Other Transport and Communication
Transport, Communication, and Storage Not Separately Specified	Water, Air, and Other Transport and Communication

Mapping of 100 *Labour Gazette* industries to 49 *1931 Census of England and Wales* industries. The only un-matched industry in the *Census* is Agriculture.

H Difference between actual regional unemployment rates and sythetic regional unemployment rates due to industrial mix

Figure 6 plots the difference between the actual regional unemployment rates and the synthetic regional unemployment rates based on industrial mix for all regions. If unemployment was entirely determined by the industrial mix of a region, all six lines would be near the x-axis, reflecting that there was no difference between actual regional unemployment rates and the synthetic unemployment rates. Instead, it is clear that the North and Wales fared worse than projected based on their industrial mix, while other regions fared better. The regional effect that worsened unemployment in the North decreased with the recovery in the 1930s, while in contrast, the regional effect for Wales intensified throughout the period. Regional effects were beneficial for the South West, South East, and London and slightly increased during the period. The Midlands experienced both a positive and a negative regional effect — negative during the economic downturn when they had more unemployment than projected with industrial mix, but distinctly positive during the recovery.

Figure 6: Difference between actual regional unemployment rate and projected unemployment rate based on industrial mix, 1923–1936



Industry mix unemployment rate calculated from employment and unemployment data from the Ministry of Labour *Gazette* and from the 1931 *Census of England and Wales* data. The difference is calculated by subtracting the industry mix unemployment rate from the actual regional unemployment rates from the *Twenty-Second Abstract Of Labour Statistics* (1937, p. 59)

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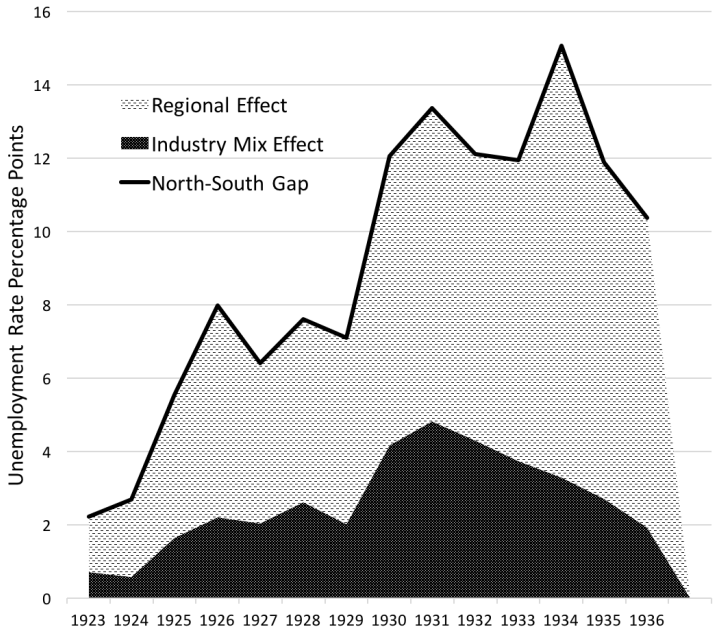
I Decomposition of the North-South gap in regional unemployment rates

The synthetic regional unemployment rate based on a region's industrial mix can be used to decompose the "North-South" gap into industrial mix and regional effects. The results are given in Figure 7. The black line shows the actual difference in unemployment rates between the North of England (and Wales) and the South of England, where the North includes the North and Wales regions, and the South includes the London, South East, South West, and Midlands regions. The gap between the north and south of the country increases through 1934 to over 15 percentage points, with an especially striking jump during the Great Depression. It recovers somewhat from 1934 to 1936 with recovery and rearmament.

The dark area at the bottom of the graph shows the projected gap given the differing industrial mix of the north and south, with the residual lighter area under the line representing other regional effects. Differences in the industrial composition of the North of England and Wales and the South of England would have led to a gap in their unemployment rates of just under 5 percentage points at its maximum. Regional effects above and beyond industrial composition thus account for a large portion of the gap in unemployment rates — on average, 71% of the North-South gap is due regional effects above and beyond industrial mix.

Figure 7: North-south unemployment rate gap decomposed into industry mix and regional effects, 1923–1936



Industry mix unemployment rate calculated from employment and unemployment data from the Ministry of Labour *Gazette* and from the 1931 *Census of England and Wales* data. The North-South gap is calculated using actual regional unemployment rates from the *Twenty-Second Abstract Of Labour Statistics* (1937, p. 59). The residual is the regional effect.

J Industries in each industry group and category

Table 18: Industry categories, groups, and industries in the Ministry of Labour *Gazette*

Industry Group	Industries
Metal Manufacturing, Metal Trades, and Engineering	
Engineering, etc.	Constructional Engineering
Engineering, etc.	Electrical Engineering
Engineering, etc.	General Engineering; Engineers' Iron and Steel Founding
Engineering, etc.	Marine Engineering, etc.
Metal Manufacture	Iron and Steel Tube Making
Metal Manufacture	Manufacture of Brass, Cotton, Zinc, Tin, Lead, etc.
Metal Manufacture	Manufacture of Tin Plates
Metal Manufacture	Pig Iron Manufacture (Blast Furnaces)
Metal Manufacture	Steel Melting and Iron Puddling Furnances, Rolling Mills and Forges
Metal Manufacture	Wire, Wire Netting, Wire Rope Manufacture
Metal Trades	Bolts, Nuts, Screws, Rivets, Nails, Etc., Manufacture
Metal Trades	Brass and Allied Metal Wares Manufacture
Metal Trades	Electrical Cable, Wire, and Electric Lamp Manufacture
Metal Trades	Electrical Wiring and Contracting
Metal Trades	Hand Tool, Cutlery, Saw, File Making
Metal Trades	Heating and Ventilating Apparatus
Metal Trades	Metal Industries Not Separately Specified
Metal Trades	Stove, Grate, Pipe, etc., and General Iron Founding
Metal Trades	Watches, Clocks, Plate, Jewellery, etc., Manufacture
Textile Manufacturing	
Textile Trades	Carpet Manufacture
Textile Trades	Cotton Industry
Textile Trades	Hemp Spinning and Weaving, Rope, Cord, Twine, etc., Making
Textile Trades	Hosiery
Textile Trades	Jute
Textile Trades	Lace
Textile Trades	Linen
Textile Trades	Silk Industry
Textile Trades	Textile Bleaching, Printing, Dyeing, etc.
Textile Trades	Textile Industries Not Separately Specified
Textile Trades	Woolen and Worsted
Other Manufacturing and Production Industries	
Brick, Tile, etc., Making	Brick, Tile, etc., Making
Chemicals, etc.	Chemicals Manufacture
Chemicals, etc.	Explosives Manufacture
Chemicals, etc.	Oil, Grease, Glue, Soap, Ink, Match, etc., Manufacture
Chemicals, etc.	Paint, Varnish, Japan, Red and White Lead Manufacture
Clothing Trades	Blouses, Shirts, Collars, Underclothing, etc., Making
Clothing Trades	Boot, Shoe, Slipper and Clog Trades
Clothing Trades	Dress Industries Not Separately Specified
Clothing Trades	Dress and Mantle Making and Millinery
Clothing Trades	Hat and Cap (Including Straw Plait) Manufacture
Clothing Trades	Tailoring
Construction and Repair of Vehicles	Construction and Repair of Carriages, Carts, etc.
Construction and Repair of Vehicles	Construction and Repair of Motor Vehicles, Cycles and Aircraft
Construction and Repair of Vehicles	Railway Carriage, Wagon, and Tram-Car Building
Fishing	Fishing
Food, Drink, and Tobacco	Bread, Biscuit, Cake, etc., Making
Food, Drink, and Tobacco	Cocoa, Chocolate and Sugar Confectionery
Food, Drink, and Tobacco	Drink Industries
Food, Drink, and Tobacco	Food Industries Not Separately Specified
Food, Drink, and Tobacco	Grain Milling
Food, Drink, and Tobacco	Tobacco, Cigar, Cigarette and Snuff Manufacture
Gas, Water and Electricity Supply Indus	Gas, Water and Electricity Supply Indus
Glass Trades	Glass (excluding Bottles and Scientific Glass) Manufacture
Glass Trades	Glass Bottle Making
Leather and Leather Goods	Saddlery, Harness and Other Leather Goods Manufacture
Leather and Leather Goods	Tanning, Currying and Dressing

Other Manufacturing Industries	Brush and Broom Making
Other Manufacturing Industries	Musical Instrument Making
Other Manufacturing Industries	Oilcloth, Linoleum, etc., Manufacture
Other Manufacturing Industries	Rubber Manufacture
Other Manufacturing Industries	Scientific and Photographic Instrument and Apparatus Manufacture
Other Manufacturing Industries	Toys, Games and Sports Requisites Manufacture
Pottery, Earthenware, etc.	Pottery, Earthenware, etc.
Printing and Paper Trades	Cardboard Boxes, Paper Bags, and Stationery
Printing and Paper Trades	Paper and Paper Board Making
Printing and Paper Trades	Printing, Publishing, and Bookbinding
Printing and Paper Trades	Stationery and Typewriting Requisites (Not Paper)
Printing and Paper Trades	Wall Paper Making and Paper Staining
Sawmilling, Furniture and Woodwork	Furniture Making, Upholstering, etc.
Sawmilling, Furniture and Woodwork	Sawmilling and Machined Woodwork
Sawmilling, Furniture and Woodwork	Wood Box and Packing Case Making
Sawmilling, Furniture and Woodwork	Woodworking Not Separately Specified
Mining	
Mining	Clay, Sand, Gravel, and Chalk Pit Digging
Mining	Coal Mining
Mining	Iron Ore and Ironstone Mining and Quarrying
Mining	Lead, Tin, and Copper Mining
Mining	Mining and Quarrying Not Separately Specified
Mining	Slate Quarrying and Mining
Mining	Stone Quarrying and Mining
Non-Metalliferous Mining Products	Artificial Stone and Concrete Manufacture
Non-Metalliferous Mining Products	Cement, Limekilns and Whiting Works
Non-Metalliferous Mining Products	Coke Ovens and By-Product Works
Services	
Commerce, Banking, Insurance and Finance	Commerce, Banking, Insurance and Finance
Distributive Trades	Distributive Trades
Miscellaneous Trades and Services	Entertainment and Sports
Miscellaneous Trades and Services	Hotel, Boarding House, Club Services
Miscellaneous Trades and Services	Industries and Services Not Separately Specified
Miscellaneous Trades and Services	Laundries, Dyeing and Dry Cleaning
Miscellaneous Trades and Services	Local Government
Miscellaneous Trades and Services	National Government
Miscellaneous Trades and Services	Professional Services
Transport and Communication	Canal, River, Dock and Harbour Service
Transport and Communication	Railway Service
Transport and Communication	Road Transport Not Separately Specified
Transport and Communication	Shipping Service
Transport and Communication	Tramway and Omnibus Service
Transport and Communication	Transport, Communication, and Storage Not Separately Specified
Building and Shipbuilding	
Building and Construction of Works	Building
Building and Construction of Works	Public Works Contracting, etc.
Shipbuilding and Ship Repairing	Shipbuilding and Ship Repairing

Industry categories given in bold sub-headings. Industry groupings taken from the Ministry of Labour *Gazette*.

K Details on estimating Markov transition probilities from aggregate data

With complete data, a transition matrix based on a Markov model can be used to describe the labor market mobility across industries. The Markov model has a discrete number of states, S, which in this case are employment status and industry pairs. At any point in time, all labor market participants can be classified into one of these employment-industry states, representing their employment or unemployment in a specific industry. The transition matrix P describes the probability of remaining in the current state or transitioning to a different state in one time step. Each element of P, p_{ij}, gives the probability of being in state i at time $t-1$ and then moving to state j for t. P is thus:

$$P[i,j] = \begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1S} \\ p_{21} & p_{22} & \cdots & p_{2S} \\ \vdots & \vdots & \ddots & \vdots \\ p_{S1} & p_{S2} & \cdots & p_{SS} \end{bmatrix}$$

There are two relevant assumptions. First, the Markov process is assumed to be first-order stationary, so the individual probabilities p_{ij} do not change over time. Second, it is assumed that an individual's state at time t is exclusively affected by their state at time $t-1$. If x_t represents the state of an individual at time t, then this means $p_{ij} = Pr(x_t = j|x_{t-1} = i) = Pr(x_t = j|x_{t-1} = i, x_0, \ldots, x_{t-2})$.

When data is available on transitions between employment-industry states, the probability of an individual moving from state i to state j between time $t-1$ and t is simply the total number of people who moved from i to j divided by the total number of people who were in state i at time $t-1$. Letting m_{ij} represent the number of people who moved from state i to j, then:

$$p_{ij} = \frac{m_{ij}}{\sum_{j=1}^{S} m_{ij}}$$

Then, the probability of being in state j at time t is given by the relationship $q_j(t) = \sum_{i=1}^{s} q_i(t-1)p_{ij}$. This weights the probability of moving from any state i into state j from $t-1$ to t by the probability of being in state i in $t-1$. Summing over all possible states, including j, gives the overall likelihood of being in state j at time t.

In our case, we do not have data on individual industry or employment status transitions. Instead, we are restricted to aggregate data on the proportion of workers in each industry

and employment status pair. Using the same framework as in the full information case, we can replace the probabilities q_j with our aggregate proportions data to estimate p_{ij} for all j and i with some error.

The aggregate data is the number of labor force participants in each employment-industry state $s \in 1, \cdots, S$ at each each time $t \in [1, T]$. For each state s, we have a column vector y_s whose components $y_s(2), y_s(3), \cdots, y_s(T)$ give the proportion of individuals in the state at time t. Then,

$$y_s(t) = \sum_{i=1}^{S} y_i(t-1)p_{is} + u_s(t) \tag{6}$$

For each s, we want to estimate the column vector p_s with components representing the probability of transitioning into j from all states: $p_{1,s}, p_{2,s}, ..., p_{S,s}$. The data on the proportion of individuals in every state in every potential previous period can be written as:

$$X_s = \begin{bmatrix} y_1(1) & y_2(1) & \cdots . & p_S(1) \\ y_1(2) & y_2(2) & \cdots & y_S(2) \\ \vdots & \vdots & \ddots & \vdots \\ y_1(T-1) & y_2(T-1) & \cdots & y_S(T-1) \end{bmatrix}$$

For each state, the proportion of individuals at time t depends on the proportion of individuals in all other states, and the same state, at time $t-1$. Thus, X_s is the same for all states s, but the subscript is maintained for clarity.

Then (6) can be written in matrix form,

$$\mathrm{y}_s = X_s \mathrm{p}_s + \mathrm{u}_s$$

and put into a system of equations for all s. However, the equations for one of the states s are redundant because y is a series of proportions, p are probabilities that sum to 1 across states, and X is also given in proportions. Removing the final state S gives the system:

$$\mathrm{y} = X\mathrm{p} + \mathrm{u},$$

where

- y is the vector $[\mathrm{y}_1^\top, \mathrm{y}_2^\top, ...\mathrm{y}_{S-1}^\top]^\top$, which has the dimensions $((T-1)(S-1)) \times 1$
- X is a block diagonal matrix of dimension $((T-1)(S-1)) \times ((S(S-1))$ where $X_1 = X_2 =$

$\cdots = X_{S-1}$:

$$X = \begin{bmatrix} X_1 & 0 & \cdots . & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_{S-1} \end{bmatrix}$$

- p is $[\mathrm{p}_1^\top, \mathrm{p}_2^\top, ..., \mathrm{p}_{S-1}^\top]^\top$ with the dimensions $(S(S-1)) \times 1$.

The final system thus looks like:

$$\begin{bmatrix} y_1(2) \\ y_1(3) \\ \vdots \\ y_1(T) \\ y_2(2) \\ \vdots \\ y_2(T) \\ \vdots \\ y_{S-1}(2) \\ \vdots \\ y_{S-1}(T) \end{bmatrix} = \begin{bmatrix} X_1 & 0 & \cdots . & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_{S-1} \end{bmatrix} \begin{bmatrix} p_{1,1} \\ p_{2,1} \\ \vdots \\ p_{S,1} \\ p_{1,2} \\ \vdots \\ p_{S,2} \\ \vdots \\ p_{1,S-1} \\ \vdots \\ p_{S,S-1} \end{bmatrix} + \begin{bmatrix} \mathbf{u}_1 \\ \vdots \\ \mathbf{u}_{S-1} \end{bmatrix}$$

The transition probabilities p can be estimated using least squares with linear constraints so long as $(T-1) \geq S$. We require the transition probabilities to be between 0 and 1, inclusive, and for the rows of $P[i, j]$ to sum to 1. Following Walshe (2016) and Jones (2005), this can be written as the quadratic programming problem minimizing the sum of squared residuals subject to constraints:

$$\begin{aligned} \underset{p}{\text{minimize}} \quad & \mathrm{u}^\top \mathrm{u} = (\mathrm{y} - X\mathrm{p})^\top (\mathrm{y} - X\mathrm{p}) \\ \text{subject to} \quad & G\mathrm{p} \leq \eta, \quad G_{S \times (S(S-1))} = [I_1, I_2, \ldots I_{S-1}] \quad \eta_{S \times 1} = [1, 1, ..., 1]', \\ & \mathrm{p} \geq 0 \end{aligned} \tag{7}$$

The first constraint ensures that each transition probability is less than or equal to one, and that the probabilities of transitioning from a state s at a given time t sum to 1. The second constraint forces the probabilities to be greater than or equal to zero. Additional constraints can be used to assign $p_{i,j}$ for some i and j to a specific value, such as zero, as in the application.

L Proportion of male and female workers in each industry group

Table 19: Adjustment coefficients over time for expanding or contracting industries, by industry category

	Total			Men			Women		
	Insured	Emp.	Unemp.	Insured	Emp.	Unemp.	Insured	Emp.	Unemp.
Metal Manu.	0.132	0.129	0.152	0.153	0.149	0.173	0.077	0.077	0.071
Textile Manu.	0.104	0.097	0.144	0.056	0.053	0.068	0.234	0.208	0.452
Other Manu.	0.234	0.246	0.167	0.208	0.220	0.143	0.305	0.310	0.264
Mining	0.101	0.092	0.154	0.138	0.127	0.191	0.003	0.003	0.004
Service	0.327	0.342	0.239	0.308	0.320	0.247	0.377	0.397	0.207
Building	0.102	0.094	0.143	0.138	0.130	0.178	0.004	0.004	0.002
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entries are the total proportion of each group in each of the six industry categories over the period 1923–1936. "Insured" are proportions of those covered by the unemployment insurance scheme, both employed and unemployed. "Emp." covers those in employment and "Unemp." covers those out of employment. Data from the Ministry of Labour *Gazette*.

M Adjustment coefficient analysis: robustness checks

Table 20: Adjustment coefficients over time, for all industries and by industry category: robustness to full interaction model specification

	(1) Overall b/se	(2) Metals b/se	(3) Textiles b/se	(4) Other Manu. b/se	(5) Mining b/se	(6) Service b/se	(7) Building b/se
Δ Employed	-0.80***	-0.94***	-1.01***	-0.66***	-0.90***	-0.11*	-0.50**
	(0.02)	(0.04)	(0.03)	(0.03)	(0.02)	(0.04)	(0.15)
1930-1933	-3164.31***	-1751.04	-3325.67	-896.57	-1658.60	-5144.94*	-15485.19
	(933.66)	(1269.50)	(1988.18)	(456.77)	(2056.66)	(2491.15)	(7886.43)
1934-1936	-2368.10*	249.45	-4654.58*	-918.80*	-2445.88	-549.85	-8806.43
	(962.12)	(1344.09)	(2024.85)	(445.22)	(2101.03)	(2666.39)	(8903.73)
1930-1933 × Δ Employed	-0.10***	-0.03	-0.13**	0.04	-0.28***	0.37***	-0.03
	(0.03)	(0.06)	(0.04)	(0.06)	(0.04)	(0.08)	(0.17)
1934-1936 × Δ Employed	0.09*	0.44***	0.21	0.22***	-0.61**	-0.43***	0.15
	(0.04)	(0.07)	(0.12)	(0.05)	(0.20)	(0.11)	(0.18)
Constant	3407.65***	544.78	2406.97	1183.39***	-366.65	2576.82	5839.13
	(656.37)	(887.08)	(1396.19)	(306.14)	(1460.07)	(1836.96)	(5577.28)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of observations	1200	228	132	504	120	180	36
R2	0.798	0.904	0.968	0.727	0.976	0.520	0.933

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. This model includes the main effect for the change in employment and for each time period in addition to the interaction effects. The dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near -1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936, for both men and women.

Table 21: Adjustment coefficients over time for expanding or contracting industries by gender: robustness to grouping of industries as expanding or contracting based on overall employment change rather than the employment change within gender

	Men Only		Women Only	
	Contracting	Expanding	Contracting	Expanding
	(1)	(2)	(3)	(4)
1925-1929 × Δ Employed	-0.82***	-0.50***	-1.22***	-0.54***
	(0.02)	(0.03)	(0.02)	(0.03)
1930-1933 × Δ Employed	-0.98***	-0.27***	-1.25***	-0.49***
	(0.02)	(0.05)	(0.01)	(0.07)
1934-1936 × Δ Employed	0.08	-0.43***	-0.82***	-0.23**
	(0.26)	(0.04)	(0.06)	(0.08)
Constant	-331.07	1711.94*	-195.54	1200.27***
	(547.29)	(693.50)	(190.35)	(348.74)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	483	717	483	717
R2	0.884	0.383	0.963	0.405

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Contracting industries are those that had a decrease of employment overall, from $t-1$ to t, while expanding industries had an increase. Standard errors given in parentheses. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

N Adjustment coefficient analysis: results for expanding and contracting industries by industry category

Table 22: Adjustment coefficients over time for expanding or contracting industries, by industry category

	Metals		Textiles		Other Manu.		Mining		Service		Building	
	Contr. (1)	Expan. (2)	Contr. (3)	Expan. (4)	Contr. (5)	Expan. (6)	Contr. (7)	Expan. (8)	Contr. (9)	Expan. (10)	Contr. (11)	Expan. (12)
1925-1929 × Δ Employed	-0.95***	-1.00***	-1.28***	-0.96***	-0.64***	-0.75***	-0.64***	-0.05	-0.76***	-0.05	-3.88	-0.77
	(0.06)	(0.08)	(0.04)	(0.07)	(0.06)	(0.05)	(0.07)	(0.05)	(0.14)	(0.05)	(1.54)	(0.36)
1930-1933 × Δ Employed	-0.98***	-1.03***	-1.20***	-1.35***	-0.70***	-0.59***	-0.80***	0.47***	-0.86**	0.47***	-0.77*	-0.76***
	(0.06)	(0.25)	(0.02)	(0.17)	(0.11)	(0.07)	(0.08)	(0.11)	(0.27)	(0.11)	(0.13)	(0.14)
1934-1936 × Δ Employed	-0.80	-0.49***	-1.06***	-1.38***	-0.38*	-0.47***	9.95***	-0.48***		-0.48***		-0.44*
	(3.35)	(0.08)	(0.13)	(0.35)	(0.16)	(0.04)	(1.91)	(0.12)		(0.12)		(0.16)
Constant	-1670.11	2967.25	-3855.62**	8533.87**	5.27	2014.54***	4824.15	1346.51	-1249.27	1346.51	-73428.48	12752.26
	(1178.14)	(1533.86)	(1135.81)	(3072.47)	(525.35)	(358.64)	(2415.52)	(2365.85)	(1825.98)	(2365.85)	(38442.90)	(11541.58)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num. of observations	97	131	62	70	210	294	56	136	44	136	14	22
R2	0.896	0.710	0.989	0.869	0.598	0.665	0.977	0.572	0.743	0.572	0.974	0.936

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Contracting industries are those that had a decrease of employment from $t-1$ to t, while expanding industries had an increase. Standard errors given in parentheses. Analysis using employment and unemployment data for both men and women from the Ministry of Labour *Gazette*, 1924–1936.

O Adjustment coefficient analysis: speed of adjustment by time period

Table 23: Speed of adjustment by time period

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
1925-1929 × Δ Employed	-0.80***	-0.33***	-0.05	0.09*
	(0.02)	(0.03)	(0.03)	(0.05)
1930-1933 × Δ Employed	-0.90***	-0.41***	-0.25***	-0.18***
	(0.02)	(0.03)	(0.02)	(0.02)
1934-1936 × Δ Employed	-0.71***	-0.31***	-0.21***	-0.14***
	(0.04)	(0.05)	(0.03)	(0.03)
Constant	3407.65***	-5886.41***	2600.34*	-2313.74
	(656.37)	(1187.62)	(1156.74)	(1231.05)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	1200	1000	900	800
R2	0.798	0.353	0.268	0.245

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (3), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-1$ to t in industry i. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. This model includes both men and women. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

P Adjustment coefficient analysis: full regression results for the speed of adjustment by gender and industry

Table 24: Speed of adjustment, both men and women

	(1) Contemporaneous $k = 1$	(2) One Year $k = 2$	(3) Two Years $k = 3$	(4) Three Years $k = 4$
Δ Employed, $t - k$ to t	-0.82***	-0.36***	-0.19***	-0.16***
	(0.01)	(0.02)	(0.02)	(0.02)
Constant	3451.39***	-5850.70***	2515.40*	-1444.81
	(661.48)	(1190.33)	(1183.43)	(1254.35)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	1200	1000	900	800
R2	0.795	0.348	0.232	0.203

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t - 1$ to t in industry i and where "Δ Employed" is the change in employment from $t - k$ to t in industry i. This model includes data on employment and unemployment for both men and women. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 25: Speed of adjustment, men only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed	-0.81***	-0.36***	-0.18***	-0.19***
	(0.01)	(0.02)	(0.02)	(0.02)
Constant	2169.55***	-4200.02***	1626.80	-1535.91
	(520.60)	(973.09)	(967.72)	(983.45)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	1200	1000	900	800
R2	0.812	0.359	0.229	0.252

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t - 1$ to t in industry i and where "Δ Employed" is the change in employment from $t - k$ to t in industry i. This model only uses data on employment and unemployment for men. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 26: Speed of adjustment, women only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed	-0.97***	-0.45***	-0.28***	-0.04
	(0.02)	(0.03)	(0.02)	(0.03)
Constant	1387.56***	-1525.33**	1025.66*	-149.54
	(256.72)	(494.72)	(487.82)	(557.82)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	1200	1000	900	800
R2	0.804	0.284	0.210	0.075

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only uses data on employment and unemployment for women. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near -1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 27: Speed of adjustment, metals only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed, -kto	-0.85***	-0.31***	-0.18***	-0.06
	(0.03)	(0.04)	(0.03)	(0.04)
Constant	528.29	-11180.20***	221.15	-1134.08
	(980.82)	(2099.90)	(1866.39)	(2164.51)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	228	190	171	152
R2	0.881	0.439	0.404	0.293

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only includes metal industries. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near -1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 28: Speed of adjustment, textiles only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed, -k*to*	-1.07***	-0.52***	-0.37***	-0.15
	(0.02)	(0.09)	(0.07)	(0.11)
Constant	2249.69	-17684.49**	5938.80	-979.32
	(1475.14)	(5596.22)	(5472.30)	(6537.37)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	132	110	99	88
R2	0.964	0.476	0.423	0.257

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only includes textile industries. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 29: Speed of adjustment, other manufacturing only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed, -k*to*	-0.58***	-0.18***	-0.12***	-0.06**
	(0.02)	(0.03)	(0.02)	(0.02)
Constant	1089.78***	-3258.62***	926.13*	-495.88
	(311.27)	(424.64)	(377.55)	(409.44)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	504	420	378	336
R2	0.713	0.432	0.431	0.393

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only includes other manufacturing industries. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 30: Speed of adjustment, mining only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed, -k*to*	-0.96***	-0.46***	-0.20**	-0.35***
	(0.02)	(0.06)	(0.07)	(0.06)
Constant	-1061.60	5826.77	1580.39	-18602.16**
	(1914.04)	(7016.70)	(7654.07)	(6463.16)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	120	100	90	80
R2	0.959	0.448	0.205	0.422

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only includes mining industries. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 31: Speed of adjustment, service only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed, -k*to*	-0.10*	0.03	0.10	0.22***
	(0.05)	(0.07)	(0.06)	(0.06)
Constant	2417.51	-7927.29***	1601.16	-4095.55
	(2094.42)	(2170.27)	(2080.60)	(2323.45)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	180	150	135	120
R2	0.365	0.362	0.355	0.426

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only includes service industries. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 32: Speed of adjustment, building only

	(1) Contemporaneous b/se	(2) One Year b/se	(3) Two Years b/se	(4) Three Years b/se
Δ Employed, -k*to*	-0.50***	-0.17*	-0.12	-0.08
	(0.06)	(0.08)	(0.07)	(0.07)
Constant	5766.90	-18321.18	13892.47	-5504.06
	(5297.99)	(10283.63)	(10846.62)	(11903.93)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Num. of observations	36	30	27	24
R2	0.928	0.776	0.748	0.734

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The coefficient estimates are for the model described by Equation (4), where the dependent variable is the change in unemployment from $t-1$ to t in industry i and where "Δ Employed" is the change in employment from $t-k$ to t in industry i. This model only includes building industries. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near −1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries. Standard errors given in parentheses. Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Q Adjustment coefficient analysis: robustness of average adjustment coefficients by region to 1921 industrial composition

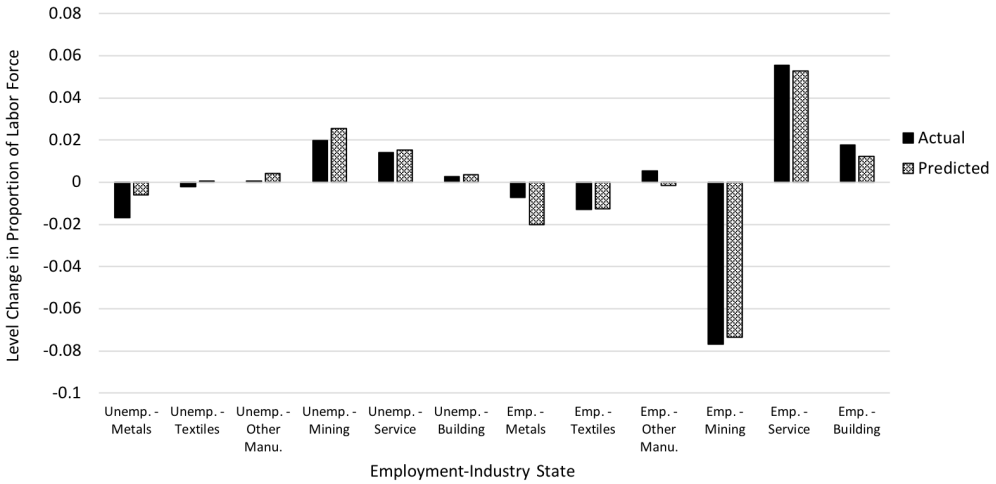
Table 33: Estimated average adjustment coefficients for twelve regions of England an Wales: robustness to 1921 industrial composition

	Overall	By Time Period		
	1925-1936	1925-1929	1930-1933	1934-1936
South East	-0.32	-0.30	-0.11	-0.43
Greater London	-0.32	-0.29	-0.18	-0.42
East	-0.35	-0.35	-0.19	-0.42
South West	-0.35	-0.34	-0.17	-0.44
Wales 2	-0.42	-0.40	-0.26	-0.54
North 2	-0.43	-0.41	-0.33	-0.45
Midland 1	-0.49	-0.47	-0.47	-0.49
Midland 2	-0.57	-0.57	-0.57	-0.57
North 4	-0.57	-0.56	-0.51	-0.46
Wales 1	-0.57	-0.56	-0.57	-0.79
North 1	-0.58	-0.57	-0.55	-0.73
North 3	-0.64	-0.64	-0.61	-0.69

The entries are the average adjustment coefficient of industry-level estimates from the model described by Equation (4). For each region, the adjustment coefficient of every industry is averaged, weighted by the proportion of of the labor force, employed and unemployed, in that industry in 1921 according to the 1931 *Census of England and Wales* Industry Report Table C. The estimates represent whether a decrease (increase) of employment in an industry coincided with a proportionate increase (decrease) of unemployment in the industry. Estimates near -1 indicate little to no adjustment across industries, as the entire change in employment is reflected in the change in unemployment in that industry. Estimates near 0 indicate almost perfect adjustment across industries.

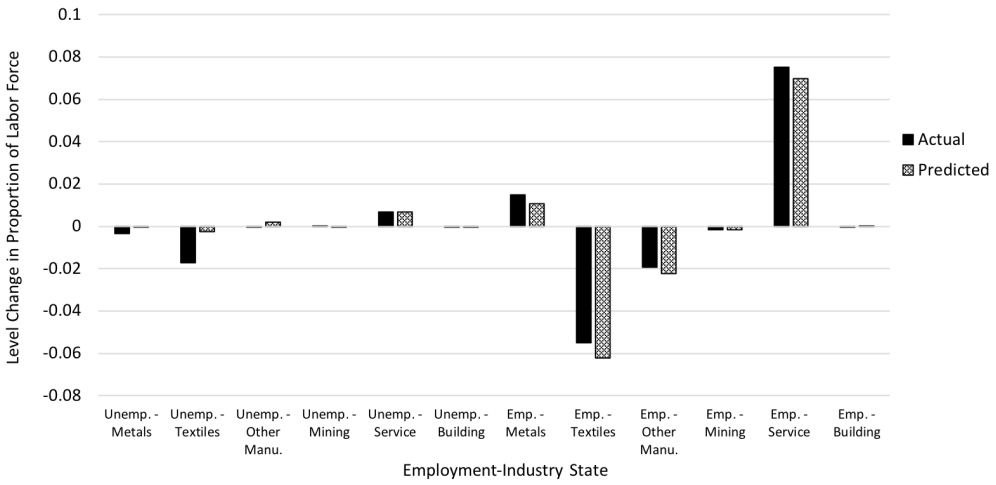
R Markov model analysis: validation of model for men only and for women only

Figure 8: Predicted vs. actual change in proportion of the labor force in each state, 1923–1936, men only



Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936, for men only. The actual figures give the level change in the proportion of the labor force in each employment-industry state in the raw data over the period. The predicted figures give the level change predicted by the Markov process described by Table 10 when the probabilities are projected forward by 13 steps.

Figure 9: Predicted vs. actual change in proportion of the labor force in each state, 1923–1936, women only



Analysis using employment and unemployment data from the Ministry of Labour *Gazette*, 1923–1936, for women only. The actual figures give the level change in the proportion of the labor force in each employment-industry state in the raw data over the period. The predicted figures give the level change predicted by the Markov process described by Table 11 when the probabilities are projected forward by 13 steps.

S Mapping of industries from the Ministry of Labour *Gazette* (1923–1936) to the *Census of Production* (1924, 1930)

The industry crosswalk is given in Table 34.

Table 34: Mapping of *Census of Production* industries to the *Labour Gazette*

1924 *Census of Production* Industries	1930 *Census of Production* Industries	*Labour Gazette* Industries
Textile Trades (vol. 1)		
Cotton	Cotton (Spinning); Cotton (Weaving)	Cotton Industry
Woolen and Worsted	Woolen and Worsted	Woolen and Worsted
Silk and Artificial Silk	Silk and Artificial Silk	Silk Industry
Jute	Jute	Jute
Hemp and Linen	Linen and Hemp	Linen; Hemp Spinning and Weaving, Rope, Cord
Hosiery	Hosiery	Hosiery
Textile Finishing	Textile Finishing	Textile Bleaching, Printing, Dyeing, etc
Lace	Lace	Lace
Rope, Twine, Net	Rope, Twine, and Net	Textile Industries Not Separately Specified
Elastic Webbing	Elastic Webbing	Textile Industries Not Separately Specified
Coconut Fiber, Ramie Fiber, Horsehair, Feather	Coir Fiber, Horsehair and Feather	Textile Industries Not Separately Specified
Flock and Rag	Flock and Rag	Textile Industries Not Separately Specified
Packing	Packing	Textile Industries Not Separately Specified
Food, Drink, and Tobacco Trades (vol. 2)		
Grain Milling	Grain Milling	Grain Milling
Bread and Biscuit	Bread and Biscuit	Bread, Biscuit, Cake, etc., Making
Cocoa and Sugar Confectionery	Cocoa and Sugar Confectionery	Cocoa, Chocolate and Sugar Confectionery
Bacon Curing and Sausage	Bacon Curing and Sausage	Food Industries Not Separately Specified
Preserved Meat, Fish, Fruit and Vegetables, etc	Preserved Foods	Food Industries Not Separately Specified
Butter, Cheese, Condensed Milk, Margarine	Butter, Cheese, Condensed Milk, and Margarine	Food Industries Not Separately Specified
Fish Curing	Fish Curing	Food Industries Not Separately Specified
Cattle, Dog, and Poultry Foods	Cattle, Dog and Poultry Foods	Food Industries Not Separately Specified
Ice	Ice	Food Industries Not Separately Specified
Sugar and Glucose	Sugar and Glucose	Food Industries Not Separately Specified
Brewing and Malting	Brewing and Malting	Drink Industries
Spirit Rectifying	Spirit Rectifying, Compounding and Methylating	Drink Industries
Wholesale Bottling	Wholesale Bottling	Drink Industries
Aerate Waters, Ciders, Vinegar, Wine, etc.	Aerate Waters, Cider, Vinegar and British Wine	Drink Industries
Spirit Distilling	Spirit Distilling	Drink Industries
Tobacco	Tobacco	Tobacco, Cigar, Cigarette and Snuff Man
Clothing Trades (vol. 2)		
Tailoring, Dressmaking, Millinery, etc.	Tailoring, Dressmaking, Millinery, etc.	Dress and Mantle Making and Millinery; Blouses, Shirts, etc.; Tailoring
Boot and Shoe	Boot and Shoe	Boot, Shoe, Slipper and Clog Trades
Hat, Bonnet, and Cap Making	Hat and Cap	Hat and Cap (Including Straw Plait) Manufacture
Glove Trade	Glove	Dress Industries Not Separately Specified
Umbrella and Walking Stick Trade	Umbrella and Walking Stick	Dress Industries Not Separately Specified
Fur Trade	Fur	Dress Industries Not Separately Specified
Artificial Flower and Ornamental Feather Trade	.	Dress Industries Not Separately Specified
Laundry, Cleaning, and Dyeing Trade	.	Laundries, Dyeing and Dry Cleaning
Iron and Steel Trades (vol. 3)		
Blast Furnaces, Smelting Works, and Rolling Mills	Blast Furnaces	Pig Iron Manufacture (Blast Furnaces)
Smelting , Rolling, Founding	Smelting and Rolling; Iron and Steel Foundries	Steel Melting, Iron Puddling Furnaces; Stove, Grate, Pipe, etc., and General Ironfounding
Tinplate Trade	Tinplate	Manufacture of Tin Plates
Light Castings Trade	.	Heating and Ventilating Apparatus
Wrought Iron and Steel Tube Trade	Wrought Iron and Steel Tubes	Iron and Steel Tube Making
Wire Drawing Trade	Wire	Wire, Wire Netting, Wire Rope Manufacture
Anchor, Chain, Nail, Screw, and Rivet Trades	Chain, Nail, Screw, and Miscellaneous Forgings	Bolts, Nuts, Screws, Rivets, Nails, Etc

Hardware, Hollow-ware, and Bedstead Trades	Hardware, Hollow-ware, Metallic Furniture, and Sheet Metal	Metal Industries Not Separately Specified
Cutlery Trade	Cutlery	Hand Tool, Cutlery, Saw, File Making
Tool and Implements Trade	Tool and Implement	Hand Tool, Cutlery, Saw, File Making
Blacksmithing Trade	.	Metal Industries Not Separately Specified
Needle, Pin, Fish-hook and Button Trade	Needle, Pin, Fish-hook, and Metal Smallwares	Metal Industries Not Separately Specified
Small Arms Trade	Small Arms	Metal Industries Not Separately Specified
Engineering Trades (vol. 3)		
Mechanical Engineering	Mechanical Engineering	General Engineering; Marine Engineering; Constructional Engineering
Electrical Engineering	Electrical Engineering	Electrical Engineering; Wiring ; Cable, Wire, and Lamp Manu.
Shipbuilding Trade (Private Firms)	Shipbuilding	Shipbuilding and Ship Repairing
Motor, Cycle, and Aircraft Trades	Motor and Cycle; Aircraft	Construction and Repair of Motor Vehicles, Cycles, and Aircraft
Railway Carriage and Wagon Building Trades	Railway, Carriage, and Wagon	Railway Carriage, Wagon, and Tram-Car Building
Non-Ferrous Metal Trades (vol. 3)		
Copper and Brass (Smelting, Rolling, and Casting)	Copper and Brass (Smelting, Rolling, etc)	Manufacture of Brass, Cotton, Zinc, Tin
Lead, Tin, Zinc and other Metals	Lead, Tin, Aluminum, and Other Non-Ferrous Metals	Manufacture of Brass, Cotton, Zinc, Tin
Gold and Silver Refining	Gold and Silver Refining	
Finish Brass Trade	Finished Brass	Brass and Allied Metal Wares Manufacture
Jewelry, Gold, Silver, and Electro-Plate Trade	Plate and Jewelry	Watches, Clocks, Plate, Jewelry, etc.
Watch and Clock Trade	Watch and Clock	Watches, Clocks, Plate, Jewelry, etc.
Chemical and Allied Trades (vol. 4)		
Chemicals, Dyestuffs and Drugs Trade	Chemicals, Dyestuffs and Drugs	Chemicals Manufacture
Coke and By-Products Trade	Coke and By-Products and Manufactured Fuel	Coke Ovens and By-Product Works
Seed Crushing Trade	Seed Crushing	Oil, Grease, Glue, Soap, Ink, Match, etc
Oil and Tallow Trades	Oil and Tallow	Oil, Grease, Glue, Soap, Ink, Match, etc
Fertilizer, Glue, Sheep Dip, and Disinfectant Trades	Fertilizer, Disinfectant, Glue, and Allied Trades	Oil, Grease, Glue, Soap, Ink, Match, etc
Soap, Candle, and Perfumery Trades	Soap, Candle, and Perfumery	Oil, Grease, Glue, Soap, Ink, Match, etc
Match Trades	Match	Oil, Grease, Glue, Soap, Ink, Match, etc
Ink, Gum, and Sealing Wax Trades	Ink, Gum, and Sealing Wax	Oil, Grease, Glue, Soap, Ink, Match, etc
Starch, Blue and Polishes Trades	Starch and Polishes	Oil, Grease, Glue, Soap, Ink, Match, etc
Paints, Colors, and Varnish Trades	Paint, Color, and Varnish	Paint, Varnish, Japan, Red and White Lead
Explosives and Fireworks Trades	Explosives and Fireworks	Explosives Manufacture
Leather, Rubber and Canvas Goods Trades (vol. 4)		
Fellmongery Trade	Fellmongery	Tanning, Currying and Dressing
Leather Trade	Leather (Tanning and Dressing)	Tanning, Currying and Dressing
Saddlery, Harness, Traveling Bags and Leather Goods	Saddlery, Harness and Leather Goods	Saddlery, Harness and Other Leather Goods
Rubber	Rubber	Rubber Manufacture
Canvas Goods and Sack Trades	Canvas Goods and Sack	Textile Industries Not Separately Specified
Paper, Printing, and Allied Trades (vol. 4)		
Paper Trade	Paper	Paper and Paper Board Making
Manufactured Stationary Trade	Manufactured Stationery	Cardboard Boxes, Paper Bags, and Stationery
Wallpaper Trade	Wallpaper	Wall Paper Making and Paper Staining
Printing and Bookbinding Trade	Printing, Bookbinding, Stereotyping, Engraving	Printing, Publishing, and Bookbinding
Printing and Publishing of Newspapers and Periodicals	Printing and Publication of Newspapers and Periodicals	Printing, Publishing, and Bookbinding
Typefounding, Electrotyping, Stereotyping, etc.	.	Stationery and Typewriting Requisites
Cardboard Box Trade	Cardboard Box	Cardboard Boxes, Paper Bags, and Stationery
Miscellaneous Trades (vol. 4)		
Pens, Pencils, and Artists' Materials Trade	Pens, Pencils, and Artists' Materials	Stationery and Typewriting Requisites
Linoleum and Oilcloth Trade	Linoleum and Oilcloth	Oilcloth, Linoleum, etc., Manufacture
Musical Instruments Trade	Musical Instruments	Musical Instrument Making
Games and Toys Trade	Games and Toys	Toys, Games and Sports Requisites Manufacture

Billiard Table and Sports Requisites Trades	Sports Requisites	Toys, Games and Sports Requisites Manufacture
Scientific Instruments, Appliances, and Apparatus Trades	Scientific Instruments, Appliances, and Apparatus	Scientific and Photographic Instrument
Film Printing Trade	Cinematograph Film Printing	Scientific and Photographic Instrument
Ivory, Horn, Picture Frame, and Fancy Articles Trade	Fancy Articles	.
Mines and Quarries (vol. 5)		
Coal Mines	Coal Mines	Coal Mining
Manufactured Fuel	Petroleum Refining	Mining and Quarrying Not Separately Specified
Salt Mines, Brine Pits, and Salt Works	Salt Mines, Brine Pits and Salt Works	Mining and Quarrying Not Separately Specified
Metalliferous Mines and Quarries (including Oil Shale Mines)	Metalliferous Mines and Quarries	Lead, Tin, and Copper Mining; Iron Ore Mining and Quarrying
Slate Mines and Quarries	Slate Mines and Quarries	Slate Quarrying and Mining
Non-Metalliferous (Other than Slate) Quarries	Non-Metalliferous (Except Slate) Mines and Quarries	Stone Quarrying; Clay, Sand, Gravel, and Chalk Pit Digging
Timber Trades (vol. 5)		
Timber Trade (e.g. Sawmilling, etc.)	Timber (Sawmilling, Etc)	Sawmilling and Machined Woodwork
Furniture, Cabinet-Making, and Upholstery Trade	Furniture and Upholstery	Furniture Making, Upholstering, etc.
Wooden Crates, Cases, Boxes, and Trunks Trades	Wooden Crates, Cases, Boxes, and Trunks	Wood Box and Packing Case Making
Carriage, Cart and Wagon Trades	Carriage, Cart, and Wagon	Construction and Repair of Carriages, Carts, etc.
Brush Trades	Brush	Brush and Broom Making
Coopering Trade	Coopering	Woodworking Not Separately Specified
Basket and Wicker Work Trade	Cane and Wicker Furniture and Basketware	Woodworking Not Separately Specified
Manufactures of Clay, Stone, etc., and the Building and Contracting Trades (vol. 5)		
Brick and Fireclay Trades	Brick and Fireclay	Brick, Tile, etc., Making
China and Earthenware Trades	China and Earthenware	Pottery, Earthenware, etc.
Cement Trade	Cement	Cement, Limekilns and Whiting Works
Glass Trade	Glass	Glass (excluding Bottles); Glass Bottle Making
Building Materials and Monumental Masonry Trades	Building Materials	Artificial Stone and Concrete Manufacture
Roofing Felts Trades	Roofing Felts	Textile Industries Not Separately Specified
Engine and Boiler Packing and Asbestos Trades	Asbestos Goods and Engine and Boiler Packing	Textile Industries Not Separately Specified
Manufactured Abrasives Trades	Manufactured Abrasives	.
Building and Contracting Trades	Building and Contracting	Building; Public Works Contracting, etc.
Public Utility Services and Government Departments (vol. 5)		
Gas Undertakings	Gas Undertakings	Gas, Water and Electricity Supply Industry
Electricity Undertakings	Electricity Undertakings	Gas, Water and Electricity Supply Industry
Waterworks Undertakings	Water Undertakings	Gas, Water and Electricity Supply Industry
Railway Companies	Railway Companies	Railway Service
Tramway and Light Railway Companies	Tramway and Light Railway Companies	Tramway and Omnibus Service
Canal, Dock, and Harbor Companies	Canal, Dock and Harbor Companies	Canal, River, Dock and Harbor Service
Local Authorities	Local Authorities	Local Government
Government Departments	Government Departments	National Government

First column contains industries and categories from the 1924 *Census of Production*. The second column contains industries from the 1930 *Census of Production*. The final column contains industries from the Ministry of Labour *Gazette*.

T Determinants of industry-level unemployment: robustness checks

Table 35: Determinants of industry-level unemployment rates, 1924 and 1931: robustness to industry group clustered standard errors and industry category fixed effects

	Industry Clustered Std. Errors			Category Fixed Effects		
	Total (1)	Men (2)	Women (3)	Total (4)	Men (5)	Women (6)
% of output exported	0.122*	0.119*	-0.005	0.103*	0.103*	-0.013
	(0.050)	(0.053)	(0.033)	(0.046)	(0.047)	(0.034)
Output growth during WW1	0.074*	0.081*	0.063	0.080**	0.089**	0.046
	(0.033)	(0.032)	(0.040)	(0.030)	(0.032)	(0.031)
Year=1931	16.033***	15.467***	12.456***	15.855***	15.318***	12.408***
	(1.501)	(1.490)	(1.994)	(1.961)	(1.948)	(1.686)
Year=1931 × Output growth during WW1	-0.113*	-0.125*	0.047	-0.110*	-0.123*	0.037
	(0.053)	(0.051)	(0.041)	(0.047)	(0.048)	(0.047)
Real wage level	-0.031**	-0.025*	-0.034*	-0.037**	-0.030**	-0.026*
	(0.009)	(0.009)	(0.012)	(0.011)	(0.011)	(0.011)
Total wage bill as a % of net output	0.194**	0.218**	0.040	0.140*	0.167**	0.048
	(0.064)	(0.062)	(0.074)	(0.062)	(0.059)	(0.062)
Trade union density	1.835	0.646	4.492	2.072	1.137	2.371
	(4.893)	(4.090)	(4.244)	(3.739)	(3.123)	(3.434)
% of all employees that are female	-0.123**	-0.094**	0.020	-0.108**	-0.070*	0.017
	(0.031)	(0.028)	(0.037)	(0.039)	(0.035)	(0.039)
% administrative, technical, and clerical staff	-0.148	-0.091	-0.422**	-0.265	-0.185	-0.441***
	(0.112)	(0.124)	(0.131)	(0.158)	(0.165)	(0.126)
% of all employees under 18 years old	-0.100	-0.074	-0.136	-0.182	-0.131	-0.147
	(0.096)	(0.104)	(0.126)	(0.127)	(0.124)	(0.123)
Short-time hours per employee	1.256***	1.432***	0.542	1.315**	1.533**	0.265
	(0.309)	(0.302)	(0.530)	(0.439)	(0.464)	(0.453)
Constant	27.485***	22.472***	27.857**	34.928***	28.774**	26.775***
	(5.337)	(5.277)	(7.299)	(9.554)	(10.280)	(7.306)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Category Fixed Effects	No	No	No	Yes	Yes	Yes
Num. of observations	156	156	156	156	156	156
Num. of industries	19	19	19	79	79	79
Adj. R2	0.659	0.660	0.538	0.670	0.671	0.553

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors given in parentheses. Standard errors are clustered at the industry group level $n = 19$ in the first three models and at the industry level in the final three models. The coefficient estimates are for the model described by Equation (5), where the dependent variable is the industry-level unemployment rate. Controls include number insured in the industry and lagged output. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.

Table 36: Determinants of industry-level unemployment rates, 1924 and 1931: robustness to no lagged output control and to different measure of unemployment as the dependent variable

	No Lagged Output			Diff. from National Unemp. Rate		
	Total (1)	Men (2)	Women (3)	Total (4)	Men (5)	Women (6)
% of output exported	0.153**	0.146*	0.015	0.122*	0.119*	-0.005
	(0.054)	(0.059)	(0.029)	(0.052)	(0.056)	(0.030)
Output growth during WW1	0.077*	0.085**	0.064	0.074**	0.081**	0.063
	(0.029)	(0.031)	(0.036)	(0.028)	(0.030)	(0.033)
Year=1931	13.011***	12.702***	10.325***	5.071**	3.868*	3.002*
	(1.244)	(1.225)	(1.050)	(1.748)	(1.746)	(1.492)
Year=1931 × Output growth during WW1	-0.136*	-0.146*	0.034	-0.113*	-0.125*	0.047
	(0.055)	(0.056)	(0.055)	(0.047)	(0.048)	(0.047)
Real wage level	-0.034**	-0.027*	-0.035**	-0.031**	-0.025*	-0.034**
	(0.010)	(0.012)	(0.011)	(0.010)	(0.012)	(0.011)
Total wage bill as a % of net output	0.220***	0.239***	0.059	0.194***	0.218***	0.040
	(0.057)	(0.053)	(0.064)	(0.054)	(0.052)	(0.060)
Trade union density	2.902	1.769	4.479	1.835	0.646	4.492
	(3.603)	(3.038)	(4.389)	(3.247)	(2.851)	(3.928)
% of all employees that are female	-0.091**	-0.063*	0.042	-0.123***	-0.094**	0.020
	(0.034)	(0.030)	(0.037)	(0.034)	(0.029)	(0.035)
% administrative, technical, and clerical staff	-0.152	-0.095	-0.427**	-0.148	-0.091	-0.422**
	(0.153)	(0.158)	(0.130)	(0.150)	(0.156)	(0.125)
% of all employees under 18 years old	-0.238	-0.200	-0.221	-0.100	-0.074	-0.136
	(0.135)	(0.130)	(0.127)	(0.123)	(0.122)	(0.132)
Short-time hours per employee	1.204*	1.381**	0.519	1.256**	1.432**	0.542
	(0.526)	(0.520)	(0.472)	(0.455)	(0.463)	(0.467)
Number insured	-0.000*	-0.000**	0.000	-0.000*	-0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged output				-0.154***	-0.140***	-0.104*
				(0.041)	(0.041)	(0.046)
Constant	13.058	9.611	17.745**	17.098	11.452	19.242**
	(7.095)	(7.911)	(6.109)	(9.074)	(9.985)	(7.114)
Num. of observations	156	156	156	156	156	156
Num. of industries	79	79	79	79	79	79
Adj. R2	0.631	0.638	0.520	0.465	0.465	0.273

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Robust standard errors, clustered at the industry level, given in parentheses. The first three models omit lagged output as a control. The coefficient estimates are for the model described by Equation (5), where the dependent variable is the industry-level unemployment rate. The final three models estimate Equation (5) with a different dependent variable: the difference between the industry unemployment rate and the national unemployment rate. Analysis using gender-disaggregated employment and unemployment data from the Ministry of Labour *Gazette*, 1924–1936.