

**The Impact of World War  
On Labour Market Inequality:  
Insights from the Building Industry**

by

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## Declaration

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This paper examines changes in skill premiums at the time of the two world wars. Using occupational pay data from surveys conducted by the *International Labour Office* and official national sources, it describes the effect of the wars on building industry skill premiums. Unlike the interwar period, both wars in general reduced skill premiums substantially, particularly World War I. They both also contributed to international convergence in premiums, especially World War II. Econometric models are then developed to explain observed changes. For World War I, military casualties and structural change away from agriculture are found to reduce premiums the most. For World War II, such structural change is associated with higher premiums. The greater the union density and the higher the premium post-WWI, the more the skill premium fell during the Second World War.

## Abstract

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## Summary

Starting by examining recent papers describing the US labour market during the first half of the 20th Century, this paper broadens the extent of research by looking at a wide cross-section of countries across three continents. In particular, it examines changes in the building industry skill premium in each country at the time of the two world wars. It addresses certain questions suggested by economic theory regarding the impact on skill premiums of military casualties, educational attainment, unionization, government control of the economy and structural changes. After reviewing the literature on the economic effects of the World Wars and on the history of labour markets during the period 1900-1950, the paper then sets out the primary sources of the data used. Using occupational pay data from surveys conducted by the *International Labour Office* and official national sources, it describes the effect of the wars on building industry skill premiums. Both wars in general reduced skill premiums substantially, particularly World War I. In World War I, warring countries saw larger falls in their premium than neutrals, while in World War II, warring countries experienced a wider range of changes than in neutral countries. Both wars also contributed to international convergence in premiums, especially World War II. This is in contrast to the interwar period, where increasing premiums were the norm rather than the exception. Econometric models are developed to explain observed changes. For World War I, military casualties and structural change away from agriculture are found to reduce premiums the most. Unions and changes in the cost-of-living are not systematically associated with larger falls in the premium. For World War II, the same model has little explanatory power. Structural change away from agriculture is associated with higher premiums, unlike World War I. Occupied countries had on average higher premiums than other belligerents or neutral countries. However, the greater the union density and the higher the premium post-WWI, the more the skill premium fell during the Second World War.

# Contents

<b>List of Tables</b>	<b>ix</b>
<b>List of Figures</b>	<b>x</b>
<b>1 Introduction</b>	<b>1</b>
<b>2 Theory &amp; Underlying Concepts</b>	<b>4</b>
2.1 Factors affecting Skill Premiums . . . . .	5
2.1.1 Supply-side . . . . .	5
2.1.2 Demand-side . . . . .	7
2.1.3 Institutional Factors . . . . .	8
2.2 Hypotheses . . . . .	9
<b>3 Literature Review</b>	<b>11</b>
3.1 The First World War . . . . .	12
3.1.1 The International Economy . . . . .	12
3.1.2 Case Studies . . . . .	14
3.2 The Second World War . . . . .	16
3.3 Developments in Labour Markets . . . . .	18
3.3.1 Global Perspectives . . . . .	18
3.3.2 National Perspectives . . . . .	19
3.3.3 International Perspectives . . . . .	22
<b>4 Data &amp; Sources</b>	<b>24</b>
4.1 Dependent Variable . . . . .	25
4.1.1 Measuring Changes in the Skill Premium . . . . .	25
4.1.2 World War I . . . . .	26
4.1.3 World War II . . . . .	27

4.2	Independent Variables . . . . .	28
4.2.1	War-related variables . . . . .	28
4.2.2	Education . . . . .	29
4.2.3	Organised Labour . . . . .	30
4.2.4	Industrialization & Industrial Production . . . . .	31
4.2.5	Government Expenditure . . . . .	32
4.2.6	Inflation . . . . .	32
4.3	Summary . . . . .	32
<b>5</b>	<b>Stylised Facts from the Two Wars</b>	<b>34</b>
5.1	Trends from the First World War . . . . .	35
5.2	Trends from the Second World War . . . . .	45
5.2.1	The Relationship Between the Wars . . . . .	57
5.3	Comparing the Effects of the Two Wars . . . . .	58
5.3.1	A Note on International Convergence . . . . .	60
5.3.2	A Note on the Interwar Period . . . . .	61
5.3.3	Comparing 1914 and 1946 . . . . .	63
5.4	Summary of Stylised Facts . . . . .	64
<b>6</b>	<b>Model &amp; Results</b>	<b>67</b>
6.1	The Role of War and Hosting War . . . . .	68
6.2	Explaining the Impact of War . . . . .	70
6.2.1	The First World War . . . . .	70
6.2.2	The Second World War . . . . .	74
6.3	The Role of World War One and the Strength of Social Insti- tutions . . . . .	75
6.4	Summary . . . . .	78
<b>7</b>	<b>Conclusions</b>	<b>80</b>
	<b>Bibliography</b>	<b>85</b>

# List of Tables

4.1	Summary of data sources . . . . .	33
5.1	WWI: dPrem by country groups . . . . .	37
5.2	WWII: dPrem by country groups . . . . .	47
5.3	International Convergence and the Wars . . . . .	61
6.1	World War One: the Impact of War and Hosting War . . . . .	68
6.2	World War Two: the Impact of War and Hosting War . . . . .	69
6.3	Model of World War One Effects . . . . .	71
6.4	Model of World War II Effects (1): The WWI Model . . . . .	74
6.5	Model of World War II Effects (2): Role of WWI and Unions . . . . .	76

# List of Figures

5-1	Proportional Change in Wage Ratio, World War I . . . . .	35
5-2	Proportional Change in Skill Premium, World War I . . . . .	36
5-3	Percentage Change in Skill Premium, World War I . . . . .	36
5-4	WWI: dPrem and Military Casualties . . . . .	38
5-5	WWI: dPrem and Mobilization . . . . .	39
5-6	WWI: dPrem and Inflation . . . . .	40
5-7	WWI: dPrem and Government Expenditure . . . . .	40
5-8	WWI: dPrem and Unionization . . . . .	41
5-9	WWI: dPrem and Changes in Enrolment . . . . .	42
5-10	WWI: dPrem and the Changing role of Agriculture . . . . .	43
5-11	WWI: dPrem and Industrial Output . . . . .	43
5-12	Proportional Change in Wage Ratio, World War II . . . . .	46
5-13	Proportional Change in Skill Premium, World War II . . . . .	46
5-14	Percentage Change in Skill Premium, World War II . . . . .	47
5-15	WWII: dPrem and Military Casualties . . . . .	48
5-16	WWII: dPrem and Civilian Casualties . . . . .	49
5-17	WWII: dPrem and Civilian-Military Casualty Ratio . . . . .	50
5-18	WWII: dPrem and Mobilization . . . . .	50
5-19	WWII: dPrem and Changes in the Price Level . . . . .	51
5-20	WWII: dPrem and Changes in Union Density . . . . .	52
5-21	WWII: dPrem and 1950 Union Density . . . . .	53
5-22	WWII: dPrem and Changes in Enrolment . . . . .	54
5-23	WWII: dPrem and the Changing Role of Agriculture . . . . .	55
5-24	WWII: dPrem and Manufacturing Production . . . . .	55
5-25	WWII: dPrem and the Change in Unemployment . . . . .	56
5-26	X-Y Scatter: dPrem from both Wars . . . . .	58
5-27	X-Y Scatter: dPrem2 & the Level of the Premium, 1920 . . . . .	59
5-28	Comparing the effects of the Wars in 18 Countries . . . . .	60

5-29 Comparing the Wars and the Interwar Period . . . . .	62
5-30 Building Industry Skill Premiums, 1914 to 1946 . . . . .	66

# Chapter 1

## Introduction

In recent times, there has been renewed interest in inequality and what drives it, both globally and within an economy. Internal labour market inequality is heavily associated with a number of differentials, namely regional, gender, inter-industry and, in particular, skill. What are the returns to skill and what drives changes in those returns? This paper addresses this question from the particular viewpoint of the effect of war. To what extent did the World Wars, and their economic consequences, affect skill premiums across countries, both belligerent and neutral, victorious and defeated? Was it war and casualties *per se* that drove these changes, or was it government intervention in labour markets, union strength, inflation, demand pressures, industrialization or some combination of these factors?

Goldin & Margo (1992), in their well known discussion of wage structure in the United States in the mid-20th Century, coined the term the “Great Compression” to describe the vastly reduced educational and skill premiums of the 1940s. They attributed the compression during the 1940s to a marriage of short-run factors, namely the impact of the World War on demand for unskilled labour, and longer-run trends, in particular the changes in supply and demand of skilled labour.

Goldin & Katz (1999) compare the compression of the wage structure in the US in 1890 and 1940, and find that two periods of falling differentials occurred, one before the early 1920s and the second in the 1940s. Only one compression, however, that of the 1940s, was long-lasting. Both compressions occurred at a time of “world war, inflation, tight labour markets, strong demand for manual workers, rising union strength and substantial government intervention in the labour market” (Goldin & Katz 1999, p.26).

This paper sets out to address some of the questions that follow on from this story of labour market inequality. To what extent are the findings about the United States generalizable to other economies in Europe and its offshoots? Did the compression in the labour market structure so noticeable

in the US occur elsewhere? If so, were the compressions relatively larger or smaller? What drove any changes that did occur?

The data used in this paper are from the *International Labour Office's* reports and publications, supplemented where necessary by official national or institutional statistics. They refer to the building industry, in particular to the ratio of bricklayers' hourly rates to unskilled labourers', for both World Wars.

The paper is structured as follows: in Chapter 2, the various relevant factors suggested by economic theory as affecting the skill premium are laid out, leading to four main hypotheses that the paper seeks to address. In Chapter 3, the existing literature, both of the economic effects of the World Wars and of the history of labour market inequality during the first half of the twentieth century, is reviewed, to establish the current findings and context of the research. Chapter 4 outlines the main economic variables used in the research and the sources relied upon for the data. Chapter 5 sets out the stylised facts of the data under consideration, comparing compressions across wars and across countries, and some basic relationships between the change in the premium and some important variables. Chapter 6 presents the models for both World Wars and the results, while Chapter 7 concludes.

## Chapter 2

# Theory & Underlying Concepts

The underlying theory of this paper is the economics of the markets for factors of production. The price of a factor of production, in labour's case known as a wage, is the value of the marginal product of that factor. Therefore, a more productive factor will, *ceteris paribus*, earn a higher return. The logic behind positive skill differentials, hereinafter referred to as skill premiums, follows directly from this, as skilled workers are, almost by definition, more productive than unskilled workers.<sup>1</sup>

## 2.1 Factors affecting Skill Premiums

Having established the economic logic behind a positive skill premium, the next step is to discuss the various factors affecting the skill premium. Many of these effects are peculiar, or at least particularly relevant, to the period under discussion, namely the first half of the twentieth Century.

### 2.1.1 Supply-side

#### Education

Firstly, the extent to which the labour force is educated will affect the relative supplies of skilled and unskilled labour. In an economy with few literate and numerate people, there is a smaller supply of skilled labour. To attract skilled labour, a firm will have to pay a larger premium, *ceteris paribus*. Similarly, in an economy where the costs of education are high, fewer people are likely to undertake that investment in their human capital to receive higher earnings in the future.

There are two channels of relevance here. Firstly, the first half of the 20th Century was one of increasing average educational attainment and access to school, and falling costs of education. This helped change the composition of

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<sup>1</sup>For the purposes of ease of exposition, and given the nature of the data under discussion, labour will be divided into two categories: skilled and unskilled.

the respective labour forces into increasingly skilled. Secondly, in addition to making skilled workers more plentiful, more widespread education may have made unskilled workers more productive.<sup>2</sup>

Another factor affecting the supply of skilled and unskilled labour is the variability in aptitude and training of workers (Bry 1960). While this holds, it is of diminishing importance during the period 1900-1950, as there was widespread increased homogeneity (and increasing quality) of basic education.

### **Trade Unions**

The period 1900-1950 is also one of widespread unionization of unskilled workers, particularly during the two World Wars. A perfect trade union acts like the textbook monopolist, reducing the consumer surplus of the employer, namely the surplus of the value of marginal product over the wage. Through strikes, collective bargaining and successful campaigns for minimum wages, unions could affect the returns for unskilled labour. This is particularly relevant, given that the craft unions of the 19th Century were predominantly unions of skilled workers, whereas trade unions of the early 20th Century were much more heavily weighted in favour of unskilled workers.

Furthermore, where trade unions exist, inflation in particular may be correlated with a falling skill premium (cf. Bry (1960), Dunlop & Rothbaum (1955)). Unions with a broad spectrum of representation across occupations may, and indeed did, push for incremental wage and cost-of-living increases across the board, thus narrowing the percentage (but not the monetary) differential between skilled and unskilled occupations.

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<sup>2</sup>It is also possible, however, that during the period under consideration, the supply of unskilled labour increased for such industries as building, as the economies covered continued the process of urbanisation, i.e. with agriculture playing an increasingly less important role in the economy.

## Migration and War

Depending on the relative compositions of the home and immigrant populations, immigration can affect the skill premium. For example, large-scale migration to an economy of unskilled workers would shift out that particular supply curve and thus drive up the skill premium by lowering the equilibrium wage of unskilled workers, all else equal. Similarly, if emigration drains a country of its unskilled labour, or at least to a greater extent than of its skilled labour, the skill premium should narrow.

War is not unlike emigration, in its expected effects. Large military and/or civilian casualties diminish the size of the labour force. The extent to which unskilled labour is more likely to die on the battle-field, due to its more plentiful supply or society's smaller opportunity cost of its mobilisation, will determine the impact of war on the skill premium. For a given (positive) value of that parameter, the greater the losses in war, the greater the impact on the differential.

There is at least one other main channel, however, for war to affect labour market outcomes. Hosts of war, particularly wars of such widespread destruction as the World Wars, have some of their infrastructure, and with it the framework necessary for a functioning economy, destroyed. As a consequence, the experience of hosts of war may differ from those who fought from a distance.

### 2.1.2 Demand-side

The early 20th Century saw, beginning in the USA, increased use of techniques of mass production and the assembly line. This style of production has the effect of breaking down a skilled job into a number of unskilled ones. As a consequence, firms demand less skilled labour and more unskilled labour, assuming that the output of the new technique is greater than the old one,

for a given level of costs. Related to this, the mechanisation of some unskilled jobs increased their productivity and further allowed the substitution of capital for skilled labour. Both these factors would place downward pressure on the premium enjoyed by skilled labour.

In times of full employment, there may be scarcities of particular types of labour. A widespread scarcity of unskilled labour, in many ways a corollary of full employment, would push down the skill premium. Similarly, during depressions or troughs of business activity, one may expect the premium to increase, as firms hoard skilled and productive workers while unemployment means intensified competition for jobs among unskilled workers.

### **2.1.3 Institutional Factors**

Over the course of the early twentieth Century, with the increasing organisation of labour, the extension of the franchise, the consolidation of industry, and the permeation of the government into all aspects of the economy, institutional factors are of potential significance. Guenter (1963) noted the increased use of collective bargaining and the tendency for centralisation of wage determination, with a side-effect of collective bargaining being the influencing of non-unionised industries within the same economy.<sup>3</sup> It is unclear whether the expected sign of this relationship is obvious, however. Separately, minimum wage regulations, which, by their very nature, have a greater positive effect on the well-being of the lower-paid than the better paid skilled workers, may also impact on the skill premium.

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<sup>3</sup>Earnings data reveal that the market can find ways of overcoming the rigidities imposed by agreed rates, while benefits and allowances can also have the same effect (Guenter 1963).

## 2.2 Hypotheses

In summation, then, there are four main hypotheses that it would be of relevance to test:

1. *Greater military and civilian casualties meant a larger fall in the skill premium in warring countries than in countries that escaped the effects of the war.* The World Wars contained a varied range of combatants and neutrals, with a wide range of different experiences, meaning that the periods under investigation should be able to shed valuable light on this relationship.
2. *Hosts of the war were affected in a different manner to other participants.* Again, capital destruction went hand in hand with the nature of the World Wars, especially given the aerial bombardments of the second World War.
3. *The stronger the unions, and the more rapidly they grew, meant greater falls in the skill premium.* Unions grew rapidly during the World Wars, particularly during the period 1914-20. Nonetheless, countries' levels of increased unionization differed greatly, allowing a cross-sectional approach to answering this question.
4. *Times of inflation, particularly when trade unions were strong, had an adverse effect on the skill premium.* Once again, inflation and rapid price change were heavily associated with the World Wars, so these periods are relevant ones in which to examine this relationship.

In addition to these main topics, there are further questions on which these periods may be able to shed light. These include:

5. *Increasing education enrolment rates diminished the returns to skill.*

6. *Industrialisation and structural change in an economy away from agriculture are associated with falling skill premiums.*
7. *Peaks of the business cycle are associated with troughs in the skill premium.*
8. *Changes in a country's skill premium during World War I affected how that premium changed in the same country over the course of World War II.*

Lastly, the available data should allow a direct comparison of the two World Wars themselves, to elucidate the relative economic effects on labour markets that each had.

# Chapter 3

## Literature Review

This paper in essence addresses a gap in the literature, as cliometric analyses of the impact of the world wars are a rarity, particularly cross-sectional ones. Nonetheless, works exist that are relevant when measuring and discussing the effect of the World Wars on labour markets. These works fall into two main categories: works detailing the economic consequences of one of the wars, and analyses of labour market inequality, usually long-term perspectives.

## **3.1 The First World War**

### **3.1.1 The International Economy**

Works on the effect of the first World War are numerous and vary significantly in the detail of their analysis. However, a good starting point of the analysis of the economic effects of this war is the succinct Feinstein, Temin & Toniolo (1997). They list four main effects of the war, the first two of which are of more direct relevance to this paper: shocks to production and consumption, a more rigid economic environment, a weaker financial structure and a more fragile international monetary system.

Feinstein et al. describe two distinct exogenous shocks to production and consumption (Feinstein et al. 1997). The first was during the war, particularly in relation to demand for increased capacity from war-related industries. As Wrigley (2000) notes, in belligerent countries especially, there were substantial switches of industrial resources, with metal trades in particular prospering. The second shock was after the war, when much of this capacity for engineering, ship-building, mining and steel became superfluous.

The second main effect of the war was a more rigid economic environment generally. At a time when utmost flexibility was needed, due to the second shock to production in five years, the opposite occurred. War had strengthened the power and role of organised labour and trade unions, and

had also accelerated the growth of large corporations (and frequently large cartels). These led to the fixing of wages and prices, with the acceptance of and often encouragement by governments (James 2002).<sup>1</sup> Governments themselves experienced an upward shift in involvement in the economy, one of the most significant general outcomes of the war (Feinstein et al. 1997).

The other effects of the war that they outline are financial in nature: a weaker financial structure within most economies and a more fragile international monetary system. Retrospective financing of what had initially been envisaged as a short war and the inordinate reparations claims of the victors took their toll on capital markets (James 2002). The long period of currency readjustment that followed the war played a role in the relative economic performances for the whole interwar period (Wrigley 2000). Those that allowed their currencies to adjust earlier during the 1930s fared better in terms of economic growth than the gold standard adherents (Feinstein et al. 1997). On the global level, London was eclipsed as the financial centre of the world. In one sense, it was replaced by New York, as the new financial centre, yet in another by no-one, in the sense that New York was not prepared to act as lender-of-last-resort as London had during the previous era.

There are two other important aspects to the legacy of the war. Firstly, mention is often made of the effect of the war on economic growth in the countries involved in the war (Broadberry & Harrison 2005, e.g). Maddison (1976) makes the case that diminishing private capital formation during the war hindered countries' growth potential. Various studies done during the interwar period attempted to estimate the cost in economic growth, production and trade, with estimates of a four to five year cost usually accepted (Hardach 1977). Caution must be exercised with such statistics, however, as it is extremely difficult to develop a counterfactual of the period under

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<sup>1</sup>As the interwar years progressed, however, the influence of the organised labour movement waned (Galenson 1976).

consideration, leaving out just the effect of the war.

Lastly, the war crystallized the change from the liberal world of the pre-1914 era to the protectionist period of deglobalisation during the interwar years. For European countries, war had perversely shown the value of autarky, particularly in terms of food production, resulting in negligible growth in world trade during the period 1913-37, with Europe the big loser (Wrigley 2000). A liberal UK was replaced by a more protectionist USA, as the linch-pin of the international economy (Feinstein et al. 1997). Hostile trading blocs, protected by tariff walls, replaced a world of almost perfect factor mobility.

### **3.1.2 Case Studies**

Winter & Robert (1999) is a collection of papers on the impact of the war on the three main capital cities involved, Paris, Berlin and London. In particular, they look at labour markets in detail, from the outbreak of war, and the unemployment situation pre- and post-August 1914 through to the transition to peace in 1918-19.

During the first year of the war, after the sharp fall in economic activity in autumn 1914, there is a contrast between the experience of Berlin and London, which by summer 1915 are booming, and Paris which has severe unemployment (Lawrence 1999). For Paris, the total transition to military ends to prevent the loss of the capital to the Central Powers, plus the loss of raw materials in North France and Belgium, had a very different effect than in the “booming” war economies of London and Berlin, where increased government spending stimulated output. The mid-years of the war saw a reversal of fortunes for Paris and Berlin, with the former eliminating unemployment by early 1917 while the latter saw increasing labour market tensions from late 1916 (Bonzon 1999). London, meanwhile, continued to fare relatively better than either of its mainland counterparts.

The transition to peace included the challenge of re-absorbing the vast numbers mobilised in a short space of time and the reconversion of the war economy to peaceful ends (Cole 1999). Central questions to be answered included the extent to which organised labour and the government should have a role in the running of the peacetime economy (*ibid.*). Of the three economies, only in the UK was there a boom, and then only for a year (April 1919 to April 1920), with large increases in prices, wages and the money supply.

In France, despite inflation, production did not increase substantially in the postwar years, due to such factors as lack of investment confidence, labour militancy and a liquidity crisis in early 1919. Nonetheless, through forcing women and immigrants out of the labour force, and relocating rural workers who had been mobilised into munitions plants in Paris, unemployment in Paris was eliminated by May 1920. Germany faced even more severe problems, including revolution, a continuing blockade (until late 1919) and widespread strikes. In Berlin, large unemployment problems persisted, leading to legislation ordering people to return to their pre-war addresses.

In reference to wages in the construction industry itself, for all three capitals, Manning notes that the wartime munitions industry provided a very strong “lure for unskilled [building] labourers who could almost double their wages” by changing industry (Manning 1999, p.260). The outbreak of the war led to the virtual drying up of new private projects. This, combined with both a general shortage of unskilled labour and the nature of new building projects, such as fortifications, which did not require the more skilled trades in the industry, caused the skill premiums in all cities to diminish during the war.<sup>2</sup> Mention is also made, particularly in reference to London, of the militancy of workers, and the equalising effect this had on wages across trades

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<sup>2</sup>Of interest for this paper is the extent to which these were permanent shifts in the level of skill premiums, as opposed to temporary adjustments to war conditions, which would be reversed by 1920.

(Manning 1999).

## 3.2 The Second World War

Harrison (1998) discusses the contribution of economic factors to the outcome of the Second World War and the impact of the war on the economic development of the major belligerents. Economic factors were to the fore in the latter half of the war, as the advantages of the Allies over the Axis, in terms of population, territory and, where relevant, the level of economic development, helped grind out the victory for the Allies.

The war itself had peculiar effects on the labour markets of Europe (Milward 1987). Like the earlier World War, it had obvious effects on birth rates both during and after hostilities. However, in this case, the motivation behind the German offensive was to politically and racially restructure the continent. The devastating successes in this regard during the war led to permanent changes in the distribution of populations. The war witnessed a wave of intra-European migration even greater than the wave of migration during the late 19th Century (*ibid.*). The Europe of 1945 was one of far fewer ethnic minorities than before.

The war saw huge increases in employment in most countries, particularly through the entrance of women into the labour force, except in Germany, where young or old workers and foreigners made up the majority of the increase. Great Britain suffered the most serious problems of labour shortage during the war. However, in the USA, as elsewhere, there were many “difficulties in meeting the demand for skilled labour” (Milward 1987, p.235). This was particularly true in war-related industries such as ship-building, aircraft and electronics, which had relatively high ratios of skilled to unskilled labour.

Similar to the first World War, unskilled labour could use the full employment and the longer hours they were working to their advantage, by

agitating for substantial increases in earnings. In this context of increased union membership and higher strike activity, differentials became very important.<sup>3</sup> Unlike the earlier World War, however, the postwar period was one of “unprecedented growth and prosperity”, with much less prominence of inflation or controls on exchange rates, trade and payments (Munting & Holderness 1991, p.245). The war eradicated the unemployment which had seemed so endemic during the 1930s and helped bring about the culture, and expectation, of full employment in the postwar period.

Another important aspect of the second World War is its pervasive impact on the quality of life of all citizens, not just those mobilised. Whereas the first World War had perhaps only taken 100 000 civilian lives directly, the second world war was one of huge civilian casualties. Concomitant with the civilian casualties, given the nature of the air bombardments, was huge loss of capital stock, with Poland, Yugoslavia, the USSR and the UK the worst affected, according to some estimates (Maddison 1976).

There are interesting comparisons and contrasts between the two Wars and the economic environments they left in their wake. Both World Wars solidified the prime position of the USA at the centre of the world economy—by the end of the second World War, US manufacturing exports comprised four-fifths of the world total (James 2002). However, it was only after the second war that the USA appreciated the responsibilities of this role. In the design of the postwar world in the 1940s, the lesson had finally been learnt that the huge costs of war outweigh any benefits — a lesson sorely absent from the nationalist calls of the 1920s. It was then that the reconstruction of the “globally integrated world that existed before the Great War [could occur] . . . piece by piece” (James 2002, p.76). This new world, however, while appreciating the importance of inter-dependence and trade, was very

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<sup>3</sup>Milward (1987) sums up the impact of the war on labour markets by noting that it affected not the condition of labour so much as its aspirations.

different to the liberal order that existed prior to 1914: capital was restricted by exchange controls, while labour flows were even more restricted (Munting & Holderness 1991).

## 3.3 Developments in Labour Markets

### 3.3.1 Global Perspectives

O'Rourke & Williamson (1999) discuss the development of 19th-century globalisation, in particular between Europe and the “New World”, and the effects that this increased openness had on internal inequality. Their focus, when looking at internal inequality, is on wage-rent ratios. Nonetheless, they view the period 1914-1950 as “the dark middle ages”, where deglobalisation went hand in hand with divergence. This followed an era of prolonged convergence, where commodity market integration had driven factor price convergence (O'Rourke & Williamson 1999).

Milanovic (2003), using GDP per capita data for measures of inequality, concludes that any increased inequality between 1914 and 1945 is due to the two World Wars, rather than the deglobalisation of the interwar period. However, his data are GDP per capita figures, rather than hourly wage rates, precluding any analysis of internal labour market inequality from these findings. Bourguignon & Morrisson (2002), in their recent AER paper, look at world inequality generally, including both between and within-country inequality in their analysis. Their main finding of relevance here is that within-country inequality underwent a “substantial decline” between 1910 and 1950, so much so that it accounted for only half as much of global inequality in 1950 as it did in 1820 (Bourguignon & Morrisson 2002, p.734).<sup>4</sup>

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<sup>4</sup>At the same time, inequality between countries continued its persistent rise from 1820; this can be reconciled with O'Rourke & Williamson's results by noting that the scope of Bourguignon & Morrisson's dataset covers a wider set of economies.

### **3.3.2 National Perspectives**

#### **United Kingdom**

Knowles & Robertson (1951) discuss the skill premium in the UK over the period 1880-1950. They take the better paid occupations to be those reflecting greater skill required, as does this paper, and note that “in general, skill differentials have been narrowing for a long time” (Knowles & Robertson 1951, p.110). In particular, while the premium across the building, engineering and shipbuilding industries was stable before the first World War and from about 1922-1939, it narrowed both during the first World War/postwar boom and after the second World War.

The authors acknowledge the potential role for unemployment in affecting the premium, given that, firstly, the more skilled workers might be more closely married to industry and, secondly, a reserve “army” of unskilled labour might drive down the labourer’s wage when unemployment is high. However, they note that in practice unemployment rates seem unrelated to skill differentials or at least appear to be outweighed by other factors (*ibid.*). They also note that equal money increments and bonuses may have eroded the skill premium over time, particularly as unions for the unskilled grew stronger from the late 19th century on.

Looking at the skill premium in the engineering industry, Thomson & Hunter (1978) arrive at largely the same conclusions, with the fall in the skill premium during the second World War occurring earlier according to their data. As with Knowles & Robertson (1951), the differential was at its highest before the first World War.

#### **United States of America**

In the United States, the first World War coincided with a sharp fall in labour market inequality, as measured by Keat using the coefficient of variation

across skilled, semi-skilled and unskilled workers in twenty industries (Keat 1960). Galenson and Smith outline the stability of the skill differential in the period 1900-1940, except for a “temporary compression” during and after the first World War (Galenson & Smith 1978, p.62). An interesting contrast exists between the long-lasting effects of the second World War and the more temporary nature of the decline in skill premiums that occurred during the first World War (Goldin & Katz 1999).

Galenson & Smith (1978) note that the period 1940-1960 was one of “very substantial narrowing of skill differentials”, attributing this to the second World War and the consequent labour shortage (*ibid.*). This is consistent with the so-called “Great Compression”, as described by Goldin & Margo (1992), and mentioned earlier.

Writing just after the second World War, Ober (1948) highlights both World Wars and their immediate aftermaths as periods of declining labour market inequality, noting “there is good reason to conclude that much of the narrowing in the spread of wages occurred during the First World War and immediate postwar years” (Ober 1948, p.130). Using union scales to calculate the building skill premium, his data show that the period 1914-16 marks the peak in the premium (at just under 100%), while 1920 marks a low point in the premium, not breached until the falls during the Second World War.

Taking up Ober’s finding, Muntz (1955) searches for the reasons why the wage structure narrowed so consistently over the first half of the 20th Century. Although outlining the potential role for trade unions, industry and the government, he states that their influence can be easily overstated, believing instead that market forces drove the fall. In particular, increasing the educational attainment of the average worker, by incorporating increased vocational education and training and by promoting educational equality between genders and races, changed the relative supply schedules. Reinforcing

this was the drying up of immigration and with it, the ready supply of often illiterate, unskilled labourers from southern and eastern Europe (Muntz 1955).

### **France**

In France, data suggest that a large decline in income inequality (as measured by the income share of the top decile) occurred between 1914 and 1945, notwithstanding increasing inequality during the 1920s (Piketty 2003). Skill premiums fell from 1938 to 1952, from an average of 30% to 23% (Dunlop & Rothbaum 1955). During the first World War, when inequality began to fall, trade union membership doubled between 1913 and 1920, before falling back sharply by 1922; 1919-20 was a period of major strike activity, particularly over the length of the working week (Sellier 1978).

### **Germany**

In Germany, too, there was widespread unionisation, in particular between 1918 and 1922 (Guenter & Leminsky 1978). Once again, over the period 1913-24, the skill premium diminished rapidly, not only during the war but also during the hyperinflationary episode that followed (Bry 1960). During the war, civilian industries saw their skill premiums diminish, while war-related industries often saw theirs increase. During periods of inflation, on the other hand, differentials fell across all industries and regions. Indeed, by 1922, the building industry skill premium had almost disappeared. By the end of 1923, when wages were negotiated in terms of “gold marks”, the premium increased again, and was very stable from 1929 on to the fall of the Nazi regime. The Nazi’s wage-rate stabilisation programme meant there were few changes in rates, but earnings data compiled by Bry show a widening differential from 1936 on, due to the scarcity of skilled labour. He notes that the changes wrought by the first World War were more drastic than those that occurred during the second, “as would be expected in view of the [Nazi]

controls [on wages]” (Bry 1960, p.246).

### **3.3.3 International Perspectives**

Bry (1960) goes on to discuss the various factors affecting skill premiums, not only in Germany but also in the United States and in Great Britain, using building industry data for comparisons. His main finding is that there is a strong inverse relationship between the cost-of-living and the skill premium. In all three countries, the premium fell 1913-20, with a rebound until 1924, after which there was stability and a gentle fall until World War II. The premium was at its narrowest “at the close of each war and during the years immediately following, largely owing to inflationary price rises” (Bry 1960, p.285).

Other works comparing the occupational wage structure across countries include studies under the auspices of the International Labour Organisation, such as Dunlop & Rothbaum (1955) and Guenter (1963). The ILO itself, in the preamble to the October survey of 1952, briefly examines changes in skill differentials between 1924, 1938 and 1952 across 10 countries, but finds “no clearly identifiable trend of . . . skill differentials in the period covered” (ILO 1953, p.3).

Dunlop & Rothbaum (1955) lists four main questions framing comparisons of wage structures across countries. Firstly, the relationship between the wage structure and the stage (and speed) of economic development may be of note. Secondly, the wage structure may respond to situations of inflation, full employment or increasing productivity. Thirdly, there may be a significant impact on wage structures of various different wage-setting mechanisms. Lastly, one may observe that differentials across countries are related to the openness of countries to the world economy.

Choosing France, Italy and the USA for an international study, Dunlop & Rothbaum (1955) observe a significant fall in the skill differential in all

three countries, when comparing 1938 to 1952. In Italy, the premium reached a low just after the war, before increasing again, once prices stabilised. In France, differentials narrowed at the start and end of the period, widening only at the end of the war. In the USA, as discussed above, there was continual narrowing, with the rate of narrowing increasing in the postwar period. They note, much like Bry above, that the “size of the skill differential in percentage terms is closely related to the movement of the price level” (Dunlop & Rothbaum 1955, p.357). In support of this, they point to inflation in France from 1914 on, during World War II in Italy, and after the War in the USA.

Guenter (1963) is more reluctant to adhere to the contention that rising price levels eat away at skill premiums. Using October Inquiry data where possible, he also assesses the validity of the widely held belief that skill differentials had been narrowing over the period 1938-63. The data he used show that this is indeed the case for the majority of countries, particularly when the start date is pre-World War II, but that it is not true for all countries. Looking just at the 1950s, he notes that premiums were higher in developing countries, but were falling faster over the period. This suggests a  $\beta$ -convergence of skill premiums internationally, a theme touched upon again in Section 5.3.1. Of greatest relevance here is the fact that, across Europe and its offshoots, skill differentials “tended to decline sharply during the period 1938-46, but have since remained fairly stable” (Guenter 1963, p.138).

# Chapter 4

## Data & Sources

## 4.1 Dependent Variable

The dependent variable is the change in the building industry skill premium. The premium is based on the wages of bricklayers to unskilled labourers in the building industry. Four pieces of information are therefore needed for one observation: for the same prewar date, an hourly wage rate for bricklayers and one for labourers, and the same two occupational rates again for the same postwar date.

### 4.1.1 Measuring Changes in the Skill Premium

There are three different ways to look at the changes in wage structure between skilled and unskilled workers. Where  $w$  refers to wage rate, and the subscript  $it$  refers to skilled or unskilled in time period 1 or 2, these are:

1. the change in the wage *ratio*, as a proportion of the prewar ratio,  
$$\frac{(w_{s2}/w_{u2})-(w_{s1}/w_{u1})}{w_{s1}/w_{u1}}$$
2. the change in the skill *premium*, as a proportion of the prewar premium,  
$$\frac{((w_{s2}/w_{u2})-1)-((w_{s1}/w_{u1})-1)}{(w_{s1}/w_{u1})-1}$$
3. the (percentage) change in the skill premium,  $(w_{s2}/w_{u2}) - (w_{s1}/w_{u1})$

The preferred unit of change in the skill premium will be (1) above, i.e. the proportional change in the wage ratio, as it not only weights the size of the change (unlike 3), it also allows, by comparing ratios, for the theoretical possibility that a negative premium might exist. Hereinafter, references to changes in the skill premium will refer to this measure, except where otherwise stated, in particular during Sections 5.1 and 5.2, which use all three measures to outline the full nature of the changes in the premium.

## 4.1.2 World War I

The reference dates for World War I are 1914 and 1920 where possible, 1913 and one of 1921-24 otherwise (as outlined below). The majority of the dependent variable data are based on figures published by the *International Labour Office*. For World War I data, two series and one report were of particular use, *Wage Changes During Recent Months*<sup>1</sup>, *Recent Wage Changes In Various Countries*<sup>2</sup> and the report *Wage Changes in Various Countries, 1914-1925* (ILO 1926).<sup>3</sup> Despite the breadth of these statistics, not all the necessary information was available from ILO sources. Various national sources were used to complement the existing statistics.

**Canada** The earliest postwar data for Canada in ILO sources were from 1924. To increase comparability of the wages with other countries, data from 1920 were taken from BLS (1921). Both the BLS and the ILO used data from the Canadian *Labour Gazette*, thus the two observations are comparable.

**France** The building industry in France was not covered by the ILO reports. Instead, data published by various issues of the *Bulletin du Ministère du Travail* were used, as tabulated in Manning (1999, p.263).

**Germany** The postwar ILO data for Germany started in 1922. Hence, the data were supplemented by those contained in Bry (1960), in particular Tables A-4 and A-14. These data are based on statistics from the yearbook of the *Allgemeiner Deutscher Gewerkschaftsbund*.

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<sup>1</sup>This series was published in ILO (1923a), ILO (1923b), ILO (1923c), ILO (1924a), ILO (1924b).

<sup>2</sup>This series, covering twenty countries in three continents, was published in ILO (1928g), ILO (1928c), ILO (1928b), ILO (1928f), ILO (1928e), ILO (1928d), ILO (1928a), ILO (1929c), ILO (1929e), ILO (1929a), ILO (1929d), ILO (1929b).

<sup>3</sup>A further article, Pap (1925), was of use for Hungarian wages.

**United States** Given the breadth of statistics available for the building industry in the Bureau of Labor Statistics' publications, and the relative dearth of such statistics in the ILO's reports, data for the US are from the former, in particular BLS (1937). The relevant data are available yearly and for a variety of cities, but a general average was taken for 1914 and 1920 as the particular data points.

**Further Notes** It has not been possible to have these two years for all 20 countries. Those with earlier start dates are Finland and Switzerland (both 1913). Those with later postwar entries are: France, the Netherlands and Switzerland (1921), Hungary and Romania (1923) and New Zealand (1924). It should also be noted that the ILO data for Finland and Italy are not from the building industry, the only available data being from the metal engineering industry and the motor car industry respectively (both skilled to unskilled workers). The data are from Helsinki and Milan, and so should reflect the prevailing general equilibrium tendencies of the larger cities. There were building data available for Italy; however, they were rates from Caserta, a provincial town in Southern Italy, whose ratio is marble-cutters (rather than bricklayers) to labourers and which dates from 1922.

### 4.1.3 World War II

For World War II, the equivalent dates are 1938 and 1946, where possible, and 1937/9 or 1947-49 otherwise. The majority of the data come, once again, from the *International Labour Office*, this time from its annual October Inquiry, *Hourly Wages of Adult Male Wage Earners in 30 Occupations*.<sup>4</sup> For two of the main protagonists of the war, France and Germany, further sources were required.

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<sup>4</sup>Specifically, the data come from ILO (1938), ILO (1939), ILO (1940), ILO (1946), ILO (1948), ILO (1951) and ILO (1952a).

**France** Postwar data from France are taken from ILO (1948), which is based on information contained in the *Annuaire Statistique de le France*. Prewar building industry data are not widely available for France, hence data contained in INSEE (1941) has been used to complement the ILO’s postwar data. Unfortunately, the only available ratio available in both time periods is an average of all towns apart from Paris, and for masons to common labourers (as opposed to specifically building labourers).

**Germany** Germany did not partake in the *October Survey* after 1932, when the National Socialist government came into office. For a prewar ratio, Bry (1960) (specifically Tables A-4 and A-14) were used. The postwar ILO data are for the Federal Republic of Germany and the earliest data published cover October 1951. Both series are based on generally prevailing wage rates.

**Note on years covered** Once again, it was not possible to have the years 1938 and 1946 for all 25 countries. Austria (1937) and Finland, Portugal and South Africa (1939) have different starting dates. Those with alternate post-war entries are: Palestine (1944), Argentina, Italy, New Zealand, Romania (all 1947), Austria and Norway (both 1949) and Germany (Federal Republic, 1951).

## 4.2 Independent Variables

### 4.2.1 War-related variables

Firstly, there are war-related variables, representing shocks to the labour supply curves or to the economy generally. In total, there are seven potential variables of relevance:

1. a categorical variable on whether the country was a host of the war or not (*host*), to capture some of the effects on capital stock of the

destruction of war

2. a categorical variable on whether the country was at war or not (*war*)
3. the number of months a country was at war (*ward*)
4. percentage of the labour force mobilised (*mob*)
5. percentage of the labour force killed in combat (*cas* in World War I and *mild*, military dead, for World War II)
6. percentage of the civilian population killed in war, World War II only (*civd*)
7. ratio of civilian to military deaths, another proxy for level of involvement of a particular country in World War II, and also proxying for capital stock destruction (*civmil*)

For World War I, death tolls were taken from White (2005), an online source surveying the most widely used reference materials for consensus figures on casualties. Other statistics, including numbers mobilised and duration of involvement in the war, come from Nicholson (2001, p.248).

For World War II, military and civilian death tolls are taken from Ellis (1993) as are the numbers mobilised. Duration of the war is taken from Ellis (1993) and History Place (2005). Labour force statistics, here and throughout, are taken from Mitchell (2003*a*), Mitchell (2003*b*), Mitchell (2003*c*) as well as Bureau of the Census (1961) and Leacy (1983) where appropriate.

### 4.2.2 Education

Secondly, as discussed in Section 2.1.1, educational attainment will affect the level of the skill premium. Increases in enrolment rates, lagged ten years to allow for passage through education, might be associated with downward

pressure on the skill premium. These data come from Mitchell (2003*a*), Mitchell (2003*b*), Mitchell (2003*c*) and Lindert (2005), with the latter taking precedence where relevant. The variable of relevance,  $dEdu$ , is the change in enrolment, expressed as a proportion of the pre-war enrolment rate, i.e. the relative expansion of supply of skilled labour. The totals for children of school-going age (4-19), by which aggregate enrolment totals are weighted, comes from census data contained in Mitchell's *International Historical Statistical* series [*op. cit.* and hereinafter, 'Mitchell'].

### 4.2.3 Organised Labour

Thirdly, the extent of the power of organised labour may affect the relative returns to skilled and unskilled labour. There are two channels for the effects of organised labour on labour market outcomes: latent power or union activity. The former can be measured by union membership, as a proportion of the labour force. For changes in union membership during World War I ( $dTU$ ), use was made both of ILO (1927), which gives union membership in 1913 and in 1920-26 in 45 countries. Labour force data, again from Mitchell's series, were used to give union density figures. Union activity for both wars, *strike*, is measured by the average annual number of strikes occurring in a country in the period between the end of the war and the postwar observation and is weighted per 100000 of population, according to population estimates which come from Mitchell.

The most widely cited data on union density for the second period come from Ebbinghaus & Visser (1998), who have data on union density in Western Europe from 1950, while Bureau of the Census (1961) and Leacy (1983) contain similar information for the US and Canada. A smaller dataset, given to the author by Michael Huberman, has unionization rates for 11 of the countries in 1938 and 1950. Another statistic, published in ILO (1948), and in ILO (1951) for Norway, is days lost per thousand persons employed in

mining, industry and transport, between 1945 and 1947. This covers 15 countries.

#### 4.2.4 Industrialization & Industrial Production

Next, the level of a country's industrialization and development may be important in determining the level of skill premium, as observed by Guenter (1963). Greater industrialization may mean greater demand for building projects or more generally unskilled labour. This is measured here by the change in the proportion of the labour force working in the agricultural sector, between 1910/11 and 1920/21, and again between 1937/38 and 1946-50.<sup>5</sup> Once again, the source used is Mitchell.

To capture the effect of aggregate demand in the economy, and thus demand for labour, three potential consumption proxies were explored for World War I. The first two come from Mitchell once again, and are per capita coal consumption (calculated as production plus net imports) and freight traffic on railways (metric ton per capita). The third is an index of manufacturing production, with 1913 as base. These data come from League of Nations (1945).

For World War II, indexed manufacturing production (with 1937 as base) was used [Mitchell]. Neither rail traffic nor coal consumption would be appropriate for the later war, as substitutes in the form of cars and oil were taking hold to varying degrees across the economies under consideration.

Lastly, to capture change in the demand for labour in 1946 over 1938, the change in the level of unemployment was used where possible, using ILO (1952*b*). Where figures given were percentages, no adjustment was made. Actual numbers registered as unemployed were adjusted by the rate of change

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<sup>5</sup>Territorial changes in the postwar settlements significantly altered the sectoral composition of Austria and Hungary (WWI) and Germany (WWII, taking the Federal Republic as postwar Germany).

in the labour force between the two periods.

#### **4.2.5 Government Expenditure**

As mentioned among the potential institutional factors, as well as one of the economic effects of the first World War, the role of the government during the war-time economy, particularly its upward shift in many economies, may have had a long term effect on the structure of the labour market. Government expenditure figures during the war are used as a proxy for government involvement in and control of the economy, and are deflated back to prewar prices and expressed as an annual average percentage of prewar national income. All expenditure totals, cost-of-living indices and national income accounts are from Mitchell.

No such equivalent information is available for government expenditure during the Second World War across a wide cross-section of countries. In many ways, this is perhaps not so problematic, as the first war was when the larger upward shift in government involvement in the economy occurred.

#### **4.2.6 Inflation**

One of the frequently mentioned factors in relation to diminishing skill premiums is inflation, in that across-the-board increases in wages to compensate for increased cost-of-living will diminish the percentage gap. Once again, the increase in the cost-of-living over the prewar figure is taken from Mitchell, for both Wars, apart from Bulgaria (in WWI) where data contained in ILO (1926) were used.

### **4.3 Summary**

In Table 4.1 are outlined, in brief, the main sources for the project. To summarize, standard sources are used where possible for independent vari-

ables, such as Mitchell, the League of Nations and Bureau of the Census (1961) (BofC). For war-related data, the sources used were referenced with each other and further sources to check their accuracy. For wage data, ILO reports are used whenever possible. National publications are used to fill in any gaps, while Bry (1960) was instrumental for German ratios.

Table 4.1: Summary of data sources

<b>Variable</b>	<b>Source</b>
Wages	ILO Reports & Series, Labour Gazette (CAN), Monthly Labor Review (USA), <i>Bulletin du Ministere du Travail</i> (FRA), Bry (GER), <i>Annuaire Statistique</i> (FRA)
Casualties, Mobilization, etc.	White, Nicholson, Ellis, History Place
Enrolment	Mitchell, Lindert
Labour Force (by Sector)	Mitchell, BofC, Leacy
Population by Age	Mitchell
Union Membership	ILO
Union Density	Ebbinghaus, Huberman
Strikes, Days Lost	ILO, BofC, Leacy
Index of Manufacturing Production	League of Nations, Mitchell
Government Expenditure	Mitchell
Price Indices	Mitchell, ILO

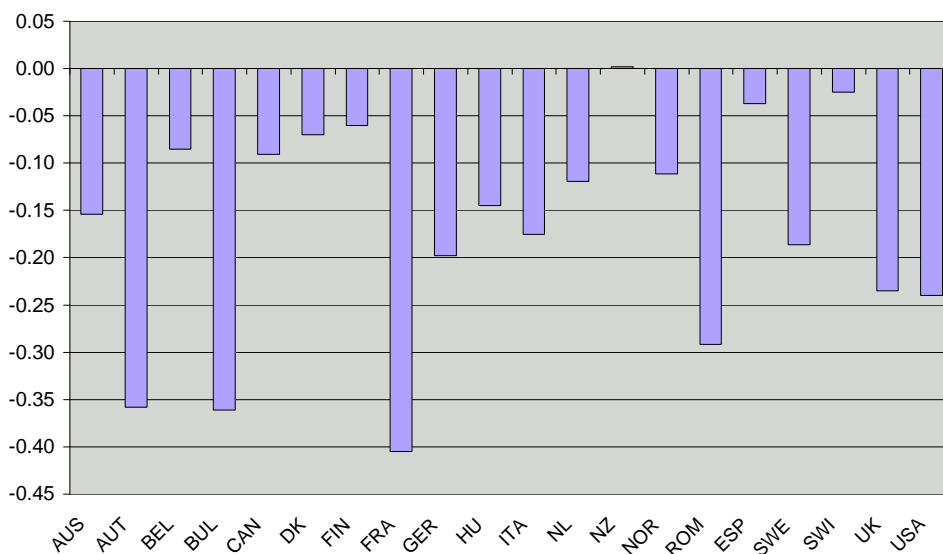
## Chapter 5

# Stylised Facts from the Two Wars

## 5.1 Trends from the First World War

Depicted in Figures 5-1 to 5-3 are the proportional changes in the wage ratio across countries between 1914 and 1920. As can be seen, the most striking aspect of the ratios in this period is that almost all the countries experienced a fall in the skill premium over the period, with the exception of New Zealand (whose postwar date is, unfortunately, 1924).

Figure 5-1: Proportional Change in Wage Ratio, World War I



Of the other countries, those with the largest proportional falls in the wage ratio (Measure 1 outlined in 4.1.1) are Austria, Bulgaria and France (more than 35%) with Romania, the UK and the USA the next largest (more than 20%). Looking at premiums (5-2), rather than ratios, Germany, the Netherlands, Norway and Sweden join the countries mentioned above in terms of dramatic reductions (more than 60%) in premiums. Looking at the percentage change, lastly (5-3), Romania, France and Bulgaria underwent the largest changes, followed by the USA and Austria.

Figure 5-2: Proportional Change in Skill Premium, World War I

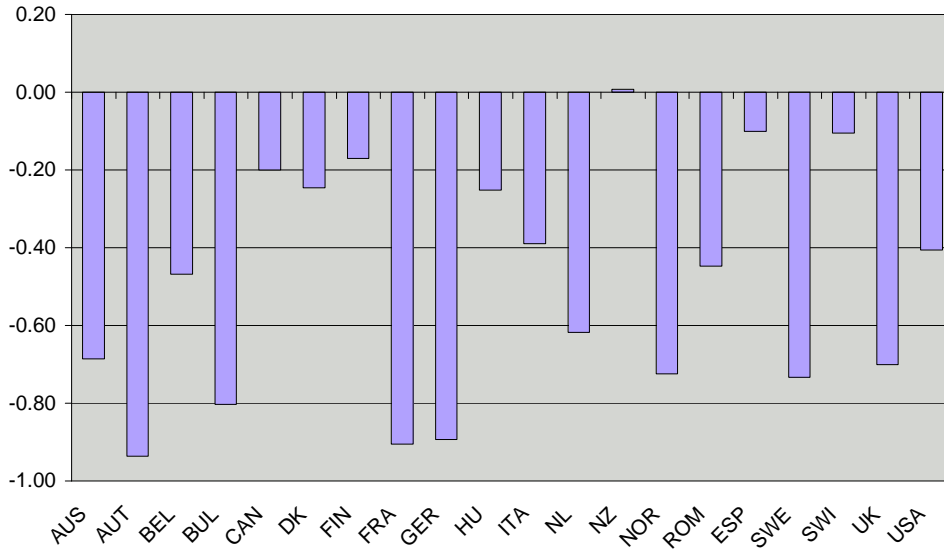


Figure 5-3: Percentage Change in Skill Premium, World War I

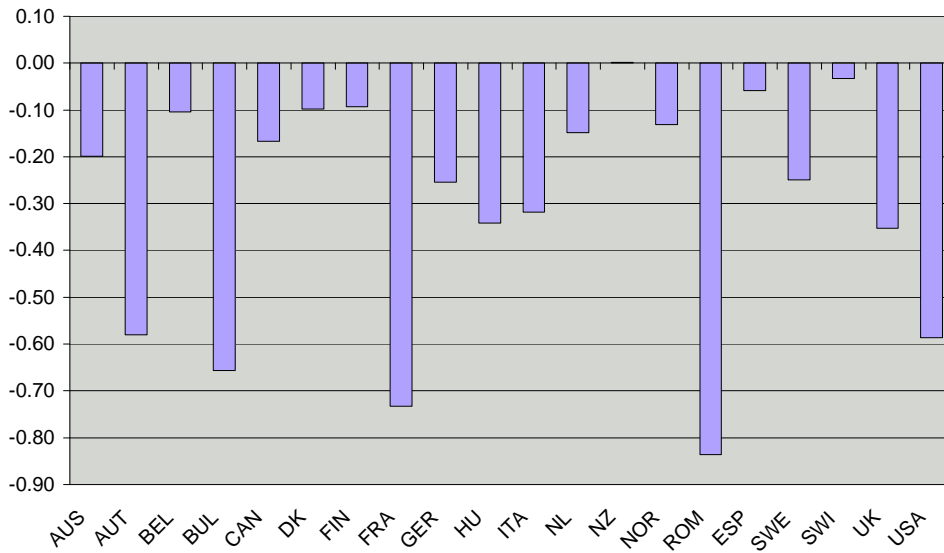


Table 5.1: WWI: dPrem by country groups

Victors		Defeated		Neutral	
France	-0.405	Bulgaria	-0.361	Sweden	-0.186
USA	-0.240	Austria	-0.358	Netherlands	-0.120
UK	-0.235	Romania	-0.291	Norway	-0.112
Italy	-0.175	Germany	-0.198	Denmark	-0.070
Australia	-0.154	Hungary	-0.145	Spain	-0.037
Canada	-0.091			Switzerland	-0.025
Belgium	-0.085				
New Zealand	0.002				
<b>Average</b>	-0.173		-0.271		-0.092
<b>St. Dev.</b>	0.124		0.097		0.060

Among those with the smallest proportional falls are neutral Denmark, Spain and Sweden (less than 10%).<sup>1</sup> Following on from this, Table 5.1 breaks countries down into three groups, victors, defeated and neutral countries. The simple unweighted averages show a difference in the changes between all three groups, with the defeated (whom one may expect to have had the most severe casualties) experiencing a significantly larger fall in their premium than the victors, and the neutral countries undergoing a smaller change than either of the other groups.<sup>2</sup> Omitting New Zealand, which is an outlier in terms of change and date, does not alter this ranking, with the unweighted average of the victors falling by a proportion of just under 20% (-0.198).

Neutral countries also had the least dispersed experiences of the War, followed by the defeated. The victors show the greatest variance. This suggests that the defeated as a group suffered sharp falls in the premium, while neutral countries as a group experienced less significant wage compression. The victors were more varied, with the largest fall and the only increase occurring

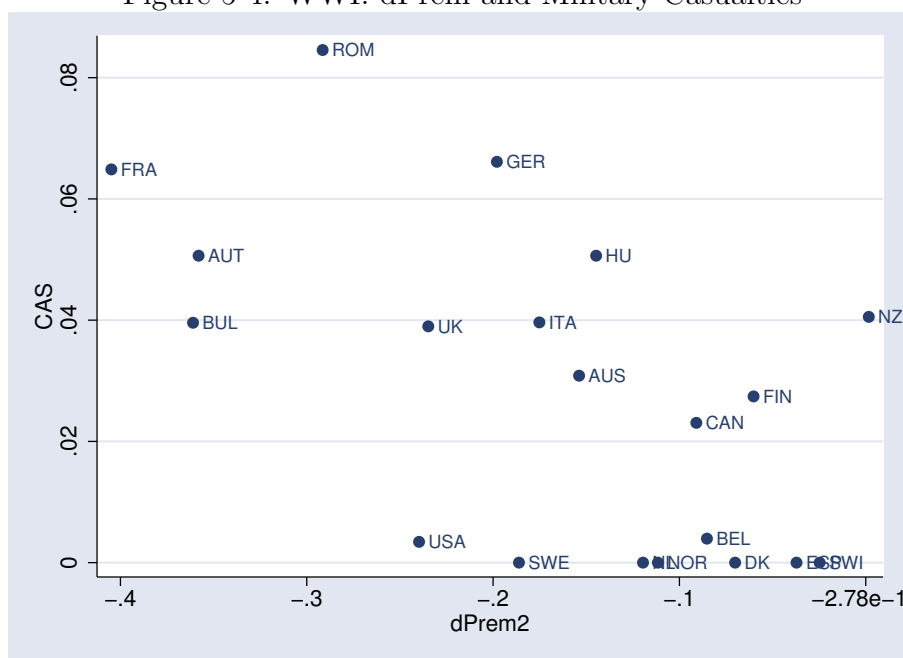
<sup>1</sup>As mentioned earlier, the main focus will be on proportional changes in wage ratios.

<sup>2</sup>Due to its colonial role in the first World War, and ongoing fighting during the Russian Civil War, Finland has been omitted.

within this group.

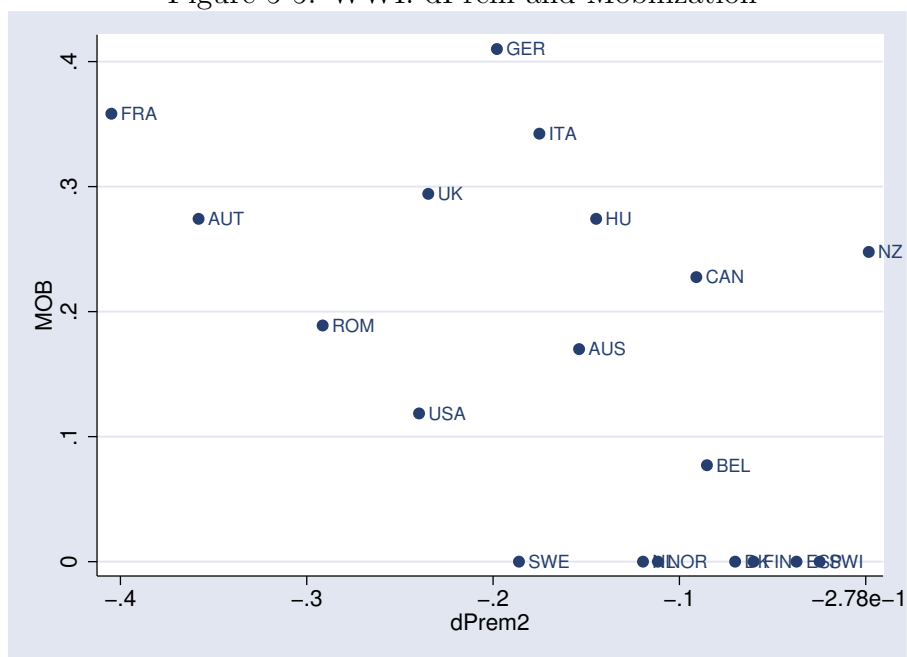
## Casualties & Mobilization

Figure 5-4: WWI:  $dPrem$  and Military Casualties



Examining the relationship between casualties and the change in the premium closer, as in done in Figure 5-4, there is a strong negative relationship between  $CAS$ , the proportion of the labour force killed during World War I, and  $dPrem$ . Greater casualties in World War I are associated with a larger proportional fall in the BISP. This relationship is shown in Figure 5-4. A simple linear regression of  $dPrem$  on casualties as a proportion of the prewar labour force yields a downward slope. This coincides with theoretical expectations that the war casualties, reflecting an inward shift in the supply curve of unskilled labour, would bring about a smaller BISP. A similar, but slightly weaker, inverse relationship is exhibited between  $dPrem$  and the proportion of the prewar labour force mobilized ( $MOB$ ), as shown in Figure 5-5.

Figure 5-5: WWI:  $dPrem$  and Mobilization



### Inflation, the Government & Unionization

One may question, however, the extent to which these falls are reflecting the actual effect of war casualties, or are merely collinear with some other effect of war, such as inflation, government intervention or unionization. These three are shown in Figures 5-6, 5-7 and 5-8. Given the heavy inflations experienced by some countries, the relationship between  $dPrem$  and the change in the cost of living is not as straight-forward as suggested by Bry (1960) and Dunlop & Rothbaum (1955). Taking the log of price changes  $[\ln(dp)]$ , as is shown in Figure 5-6, there exists a negative relationship, i.e. the greater the rate of change in prices (over 1914), the greater the fall in  $dPrem$ .

A similar, although somewhat stronger, negative relationship exists between a proxy for government control of the economy, i.e. average real annual government expenditure as a proportion of the pre-war national income

Figure 5-6: WWI: dPrem and Inflation

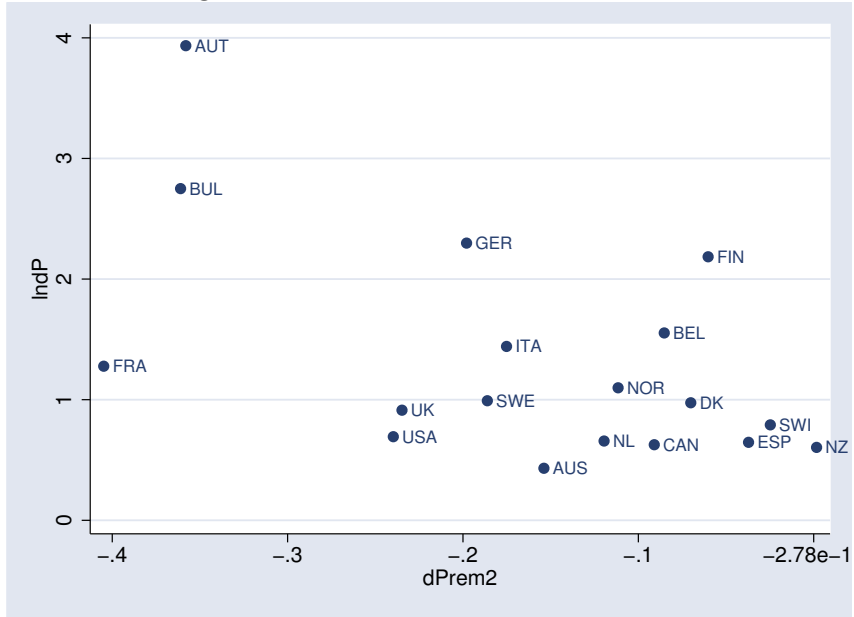
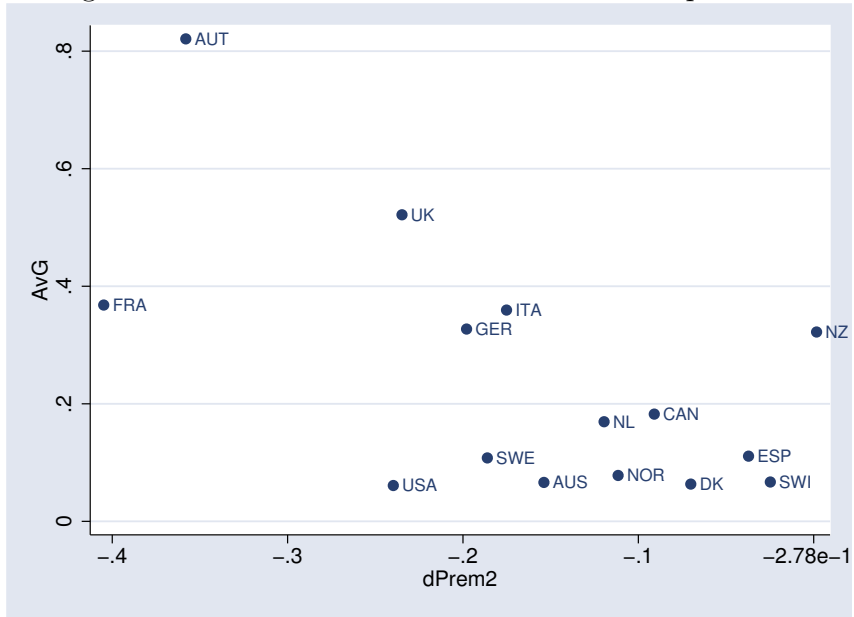


Figure 5-7: WWI: dPrem and Government Expenditure



(*AvG*). An aside is that Austria is a significant outlier, which may perhaps be a function of the imprecision of cost-of-living changes from year to year in that country.

Figure 5-8: WWI: dPrem and Unionization

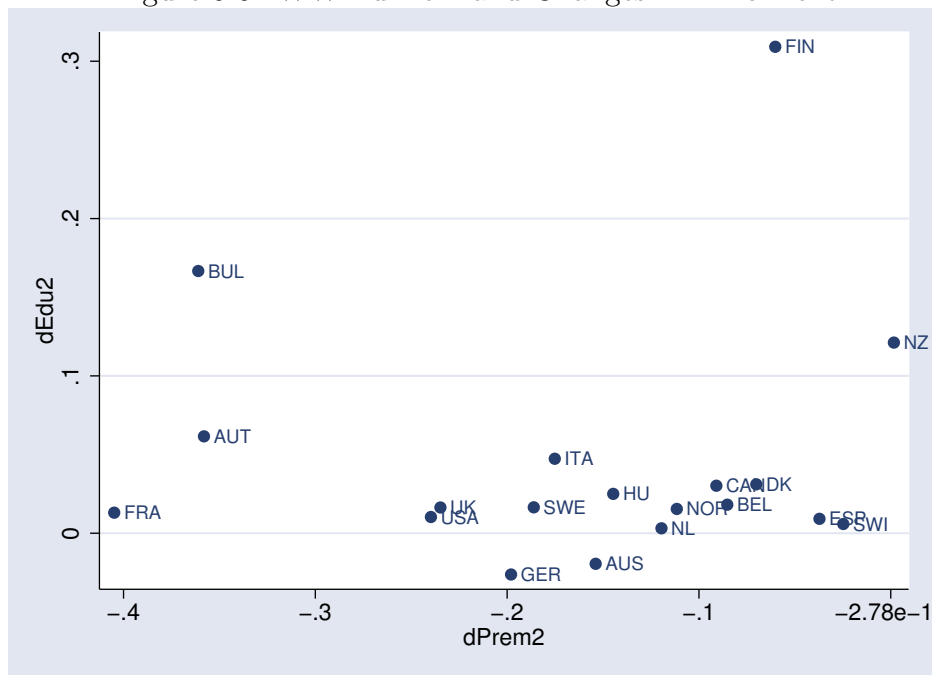


Lastly, regarding union strength, using the proportion of the labour force that are members of unions to measure that strength throws up some interesting results. Despite the prominence of trade unions in the literature, and the theoretical expectation that their strength might reduce skill premiums, there is no convincing evidence from a first look at the data. Growth in unions is measured as the change in unionization as a proportion of the prewar level of unionization. A very weak upward linear relationship exists, contrary to such expectations as outlined above, suggesting indeed that greater union growth might lead to smaller changes in the premium.<sup>3</sup>

<sup>3</sup>It is possible that this is due to more unionized countries (in 1913) being unable to

## Education

Figure 5-9: WWI: dPrem and Changes in Enrolment



Plotting changes in the premium and lagged changes in enrolment rates, as is done in 5-9, shows a couple of significant outliers, notably Finland, Bulgaria and New Zealand, all of whom have very different labour market experiences over the period covered. For the bulk of countries, there is little to suggest a strong relationship between higher enrolment increases and larger proportional falls in the premium.

Figure 5-10: WWI: dPrem and the Changing role of Agriculture

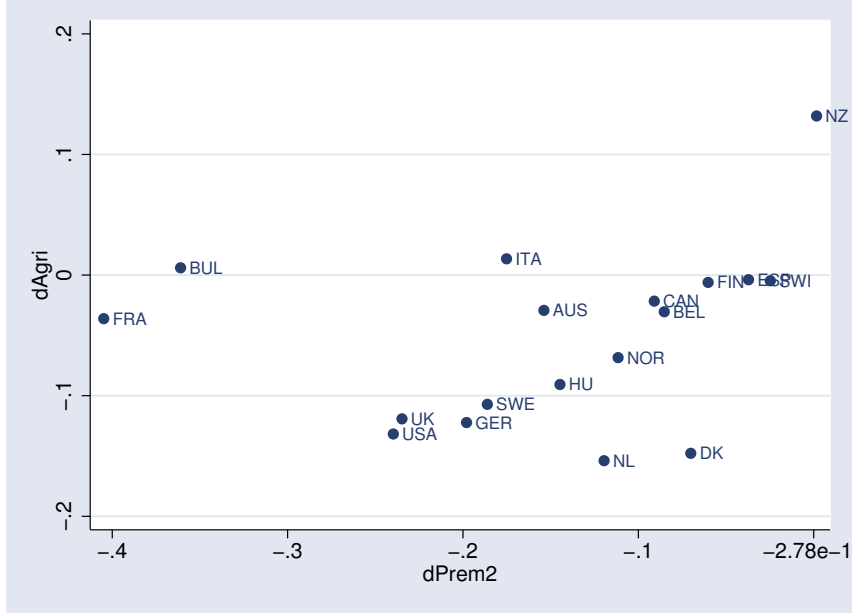
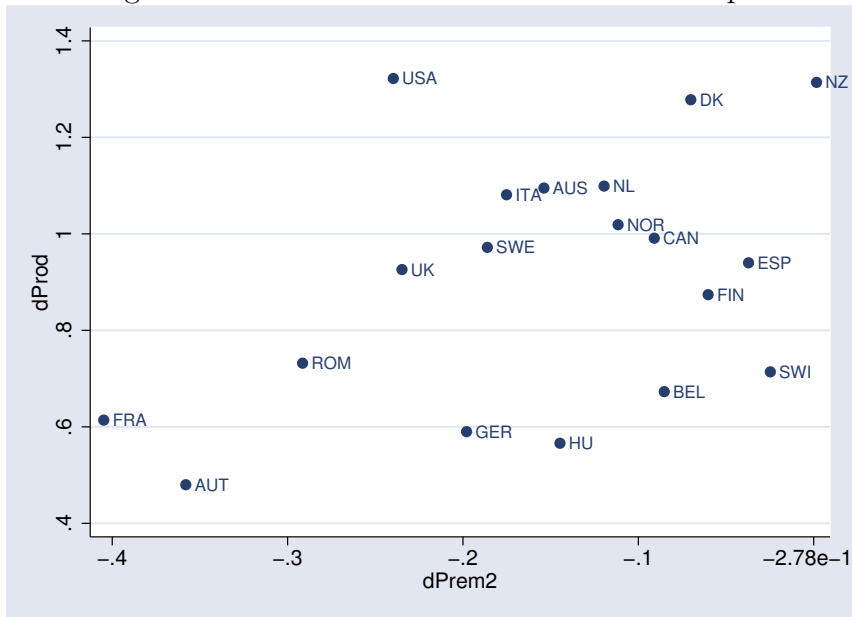


Figure 5-11: WWI: dPrem and Industrial Output



## Industrialisation & Aggregate Demand

Other factors that may affect changes in the skill premium include the structure and industrialisation of an economy and the demand side of an economy. Higher proportions of the labour force in the agricultural sector are associated with lower levels of development, themselves associated with greater skill premiums. Therefore, a shift out of agriculture may be associated with a large fall in the skill premium. This relationship is explored in Figure 5-10, where  $dAgri$  represents the proportional change in the percentage of the labour force engaged in agriculture. The result is a clear positive relationship, indicating the more an economy moved away from agriculture in the period, the more its premium fell.<sup>4</sup>

Lastly, turning to the demand-side of the economy, a theoretical expectation may be that times of increasing demand, associated with full employment, would be correlated with lower skill premiums, as firms have to pay higher wages to attract unskilled labour. However, as is shown in Figure 5-11, an opposite relationship appears to be the case over this time period. It could be argued that manufacturing indices may not be capturing demand, as much as they are changes in the structure of the economy. Using per capita rail freight, however, reveals a similar (if slightly weaker) trend. This would appear to suggest that in the postwar period, perhaps after years of slack demand for more skilled workers such as bricklayers as private building projects ground to a halt (cf. Manning (1999)), the resumption of regular economic activity stimulated demand for traditional building skills.

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show the same proportional growth and yet still agitating for change successfully. Taking the raw percentage increases in unionization does change the slope; however, the  $R^2$  is less than 0.5%. Using the number of strikes during 1919 and 1920 (weighted by 100,000 of population) instead, lastly, also reveals an upward slope. Thus, the expected successes of trade unions in achieving lower BISP is hard to show.

<sup>4</sup>Omitting France, whose agriculture sector was quite resilient in the period 1911-1921, and Bulgaria, which appears to be in the same situation, more than doubles the  $R^2$  of a simple linear regression to 40%.

## Summary

The overwhelming majority of countries experienced compression in the wage structure, often considerable, as measured by the building industry skill premium, during the period 1914-1920. On average, neutral countries experienced a smaller proportional decline in the premium than warring countries, and among warring countries, defeated countries experienced greater proportional falls.

There exist inverse relationships between the proportional change in the premium and the extent of government expenditure, war casualties, mobilization and inflation (with those relationships progressively weakening). There appears to exist no definite relationship between change in union strength and the premium, contrary to expectations, while there is strong evidence to suggest a positive relationship between changes in the premium and industrialization and aggregate demand.

## 5.2 Trends from the Second World War

Figures 5-12 to 5-14 outline the change in the skill premium, as according to the three different measures, and are the counterparts to Figures 5-1 to 5-3. Figure 5-12 outlines the proportional change in the skill premium between 1938 and 1946, expressed in terms of the prewar premium, for all countries. The most noticeable difference from the equivalent figure from the first World War is that increases in the premium are more common — more than a quarter (7) of all skill premiums rose during the period, as opposed to the single negligible case after the earlier war.

There is greater variability among the three different measures for World War II than World War I. In particular, going by proportional changes in the premium, as is done in Figure 5-13, the increase in the Finnish premium from 6% to 28% presents a major outlier in the series. Similarly, the high

Figure 5-12: Proportional Change in Wage Ratio, World War II

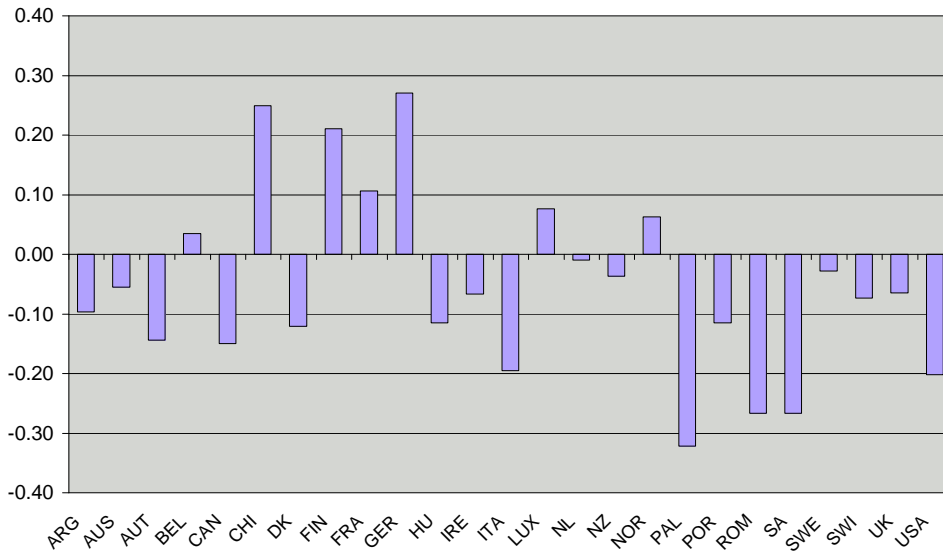
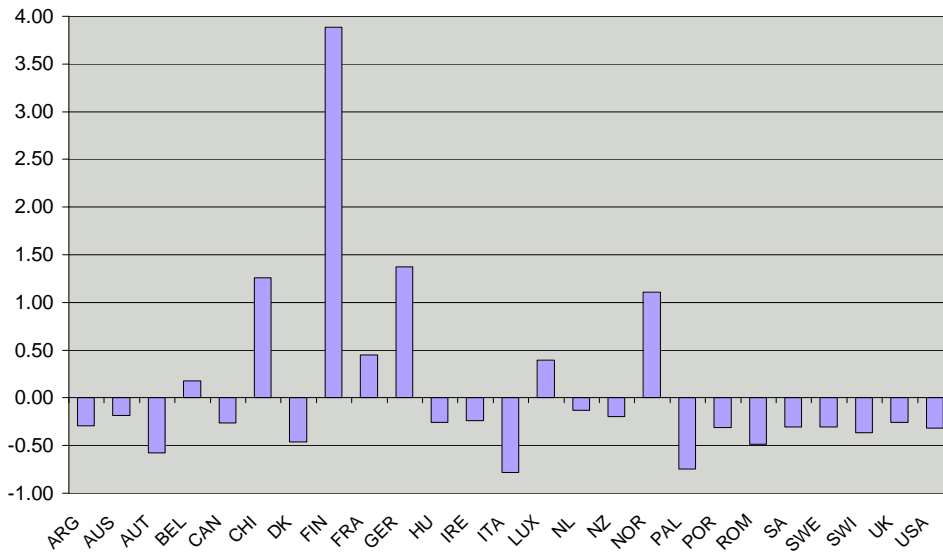


Figure 5-13: Proportional Change in Skill Premium, World War II



level of the South African premium in 1939 means a large range for possible decreases. Even though the proportional fall was not huge, the percentage fall dwarves the others.

Figure 5-14: Percentage Change in Skill Premium, World War II

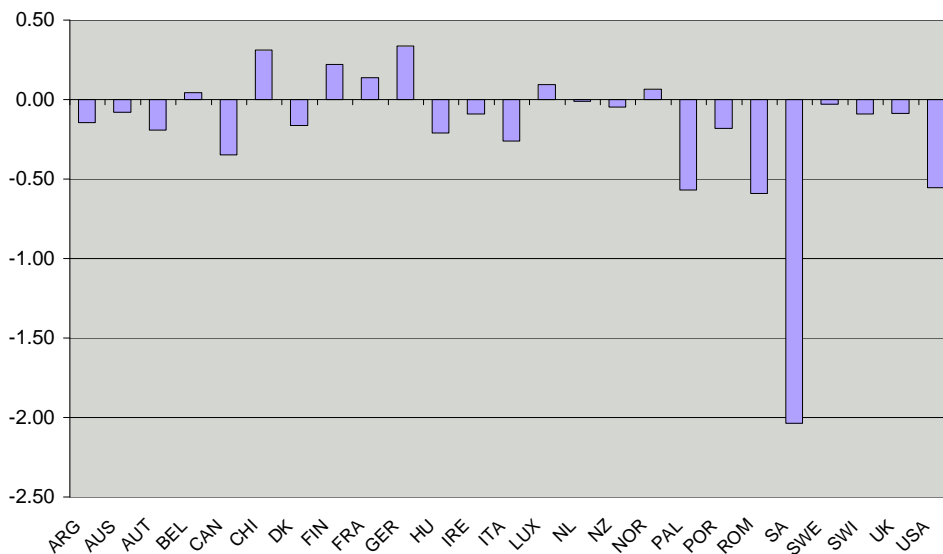


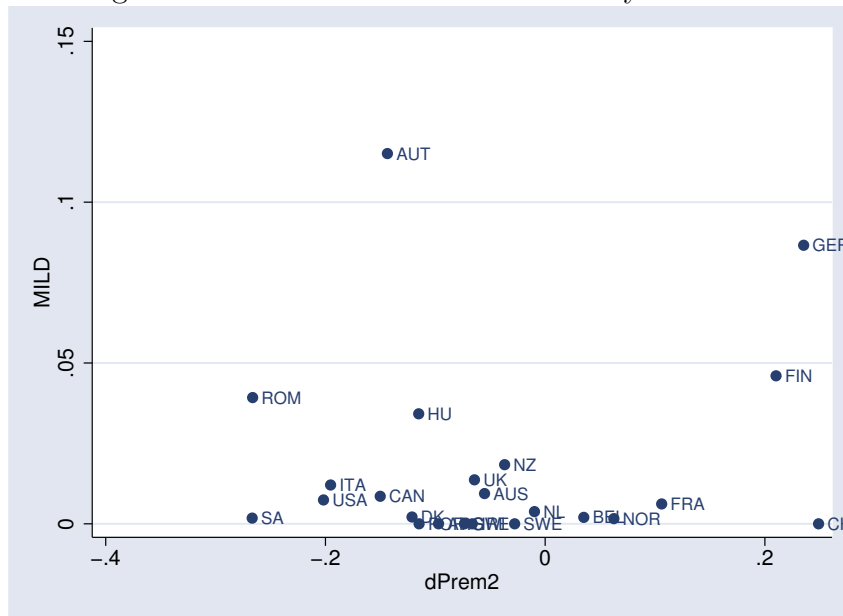
Table 5.2: WWII: dPrem by country groups

Victors		Occupied		Defeated		Neutral	
Palestine	-0.322	Denmark	-0.121	Romania	-0.266	Portugal	-0.115
S. Africa	-0.267	N/lands	-0.010	Italy	-0.195	Argentina	-0.097
USA	-0.202	Belgium	0.035	Austria	-0.144	Switz.	-0.074
Canada	-0.150	Norway	0.063	Hungary	-0.115	Ireland	-0.066
UK	-0.064	Lux.	0.076	Finland	0.210	Sweden	-0.028
Australia	-0.055	France	0.106	Germany	0.235	Chile	0.249
New Z'd	-0.037						
<b>Average</b>	-0.157		0.025		-0.040		-0.022
<b>St.Dev.</b>	0.112		0.082		0.224		0.136

Table 5.2 is the counterpart to Table 5.1, and gives the average proportional change in the skill premium of four groups: victors, occupied countries, defeated powers and neutral countries.<sup>5</sup> Firstly, the variances of the four groups differ substantially. Of the Axis powers, Germany and Finland [not even an Axis power as such] underwent large increases, while other defeated countries underwent large falls. Chile is a similar outlier among non-aligned countries. Omitting Chile yields a standard deviation among neutral countries that is significantly smaller than all other groups (0.033). Occupied countries saw their premium on average increase, while non-occupied victors underwent the largest falls on average.

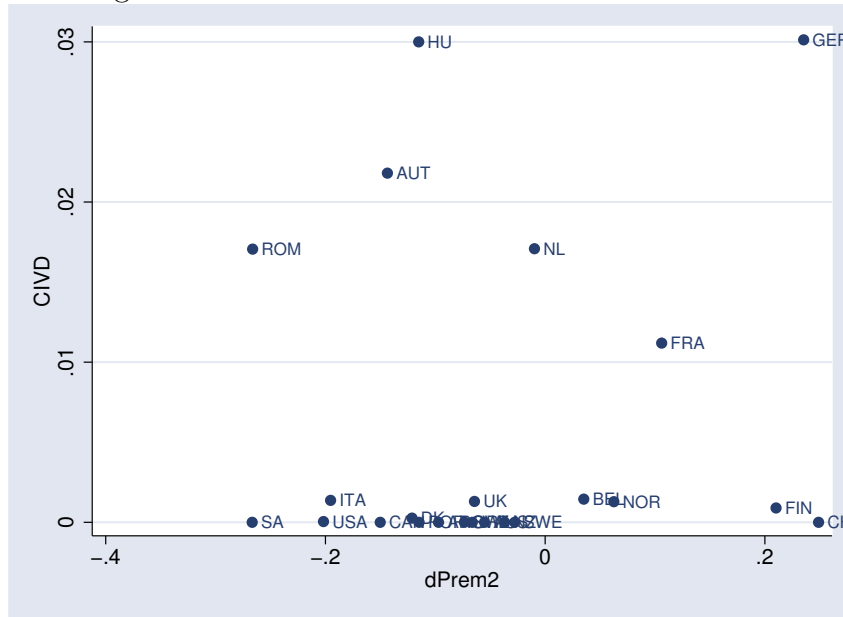
### Casualties & Mobilization

Figure 5-15: WWII: dPrem and Military Casualties



<sup>5</sup>Technically, not all countries fought on one side for the whole war, however countries' primary role has been used here.

Figure 5-16: WWII:  $dPrem$  and Civilian Casualties



In Figure 5-15, the change in the premium is shown against the numbers of military deaths as a proportion of the labour force. Unlike the trends from the earlier war, there is little in the way of definite trends. There are also significant outliers, but even omitting these reveals little of interest. The same is true for a scatter of  $dPrem$  on the proportion of the population recorded as civilian deaths, which might be expected not only to capture labour supply effects, but also destruction of capital stock, infrastructure, etc.

Looking at the ratio of civilian to military casualties, which may also capture this effect, suggests some weak evidence for a smaller reduction (or larger increase) in the premium, the higher the ratio. Finally, looking at the proportion of the labour force mobilized into the military, it seems that neutral countries' changes occur within a much more narrow band than those involved in the war. Also, countries such as South Africa and Canada are at

Figure 5-17: WWII: dPrem and Civilian-Military Casualty Ratio

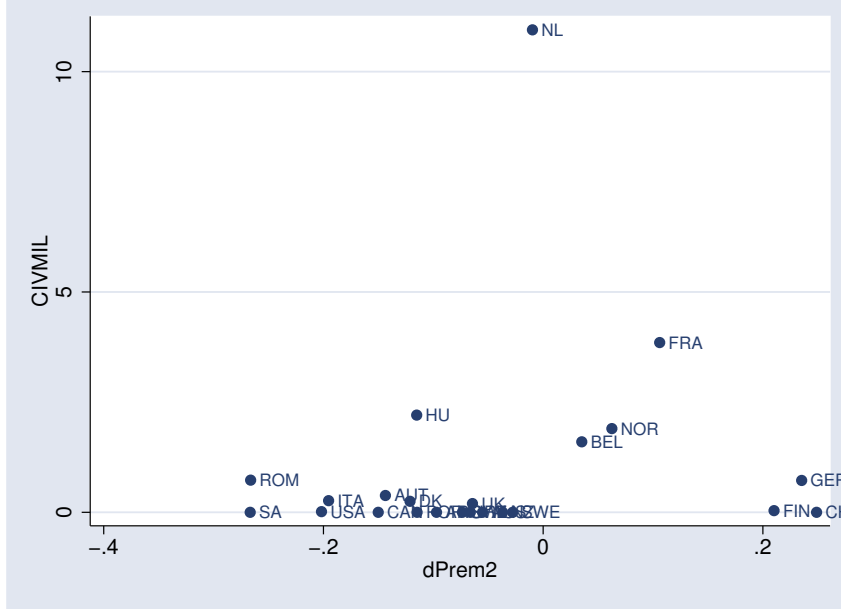
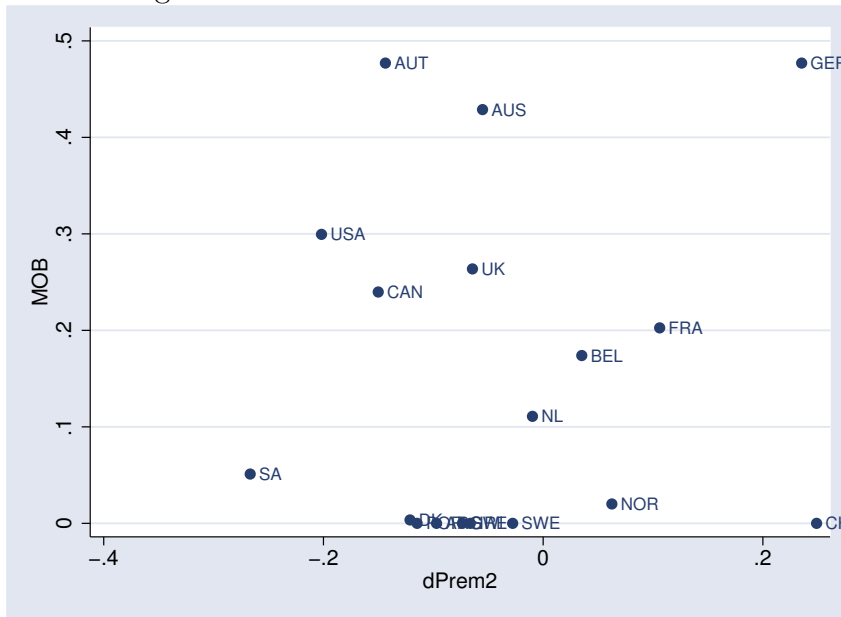


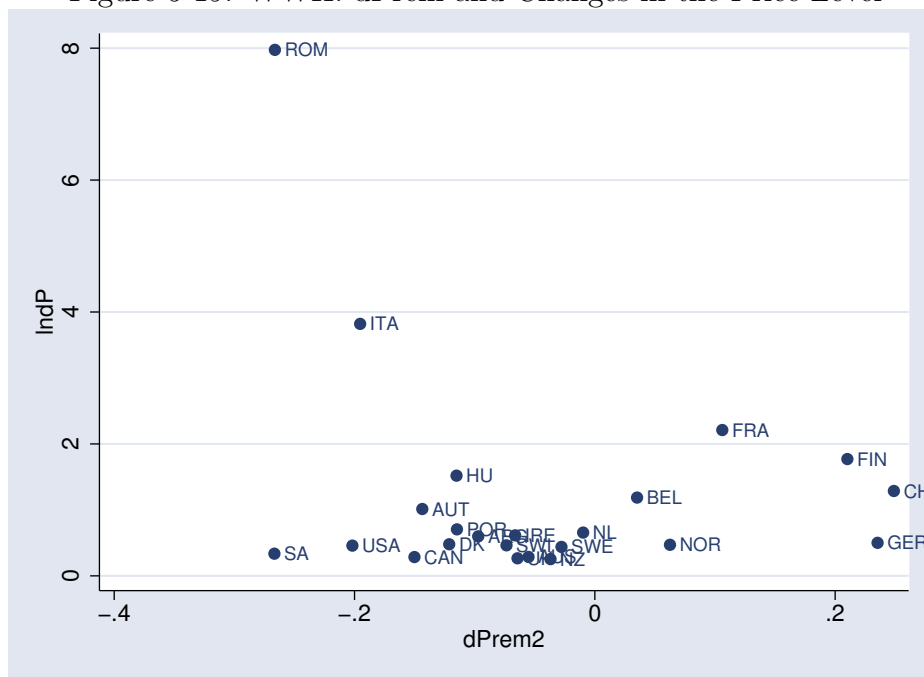
Figure 5-18: WWII: dPrem and Mobilization



one end of the spectrum, while hosts of the war, such as France and Germany, are at the other. This issue of destruction of infrastructure and the change in premium is explored in more detail when looking at war and war hosts, in Section 6.1.

### Inflation & Unionization

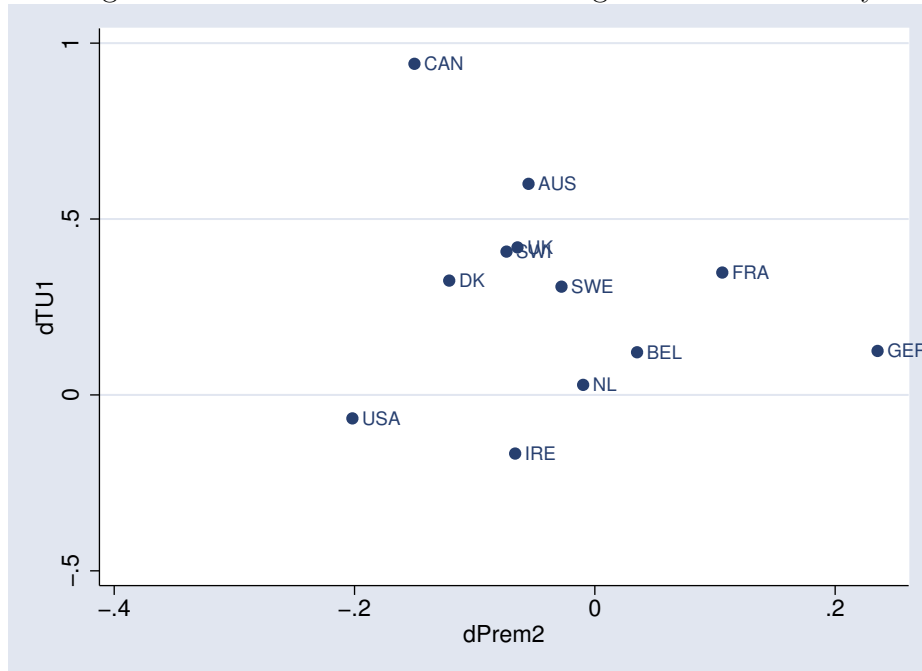
Figure 5-19: WWII: dPrem and Changes in the Price Level



There are no apparent trends related to price changes and changes in skill premiums. While it is true that countries with large inflationary periods, such as Romania and Italy, experienced significant relative falls in the premium, others with significant inflation, such as France, Finland and Chile, actually exhibit some of the largest increases.

Regarding changes in union density, it will be recalled that there appeared to be no significant relationship between changes in union density and the

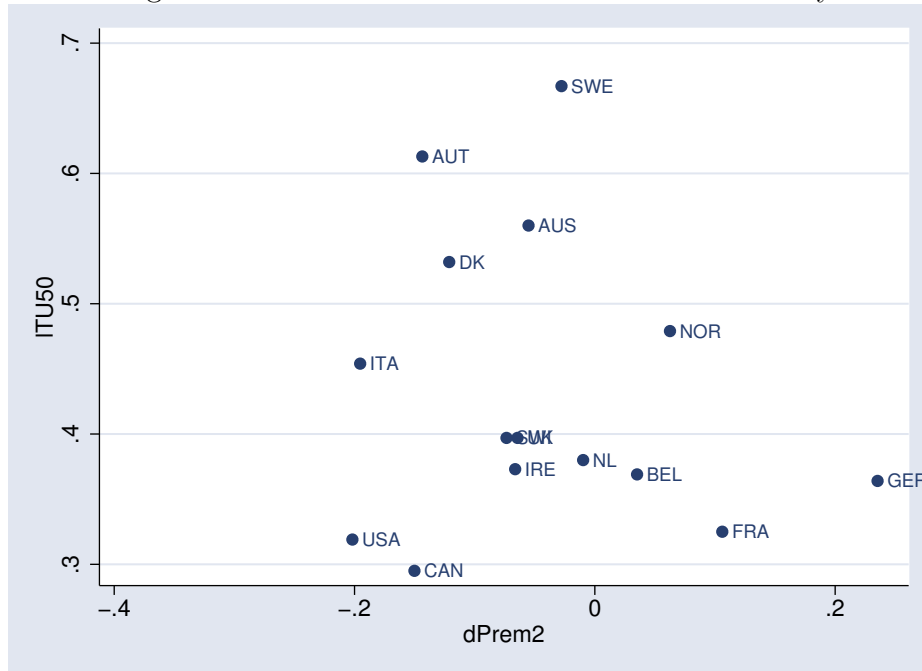
Figure 5-20: WWII: dPrem and Changes in Union Density



skill premium during World War I. For World War II, data are only available for twelve countries. Disregarding the USA and Ireland, it would seem that for World War II, greater growth in unions was indeed correlated with larger falls in the skill premium, as suggested by comparing the experiences of Canada and Australia to those of Belgium and Germany.

Evidence from number of strikes per hundred thousand of the labour force and from days lost per thousand persons employed in mining, industry and transport yields little in the way of further insight. However, looking at the *level* of union density across 13 countries, as an indicator of the strength of social bargaining institutions, as is done in Figure 5-21, seems to confirm that the greater the union density, the larger the fall in the skill premium. Interestingly, Canada has the lowest density, suggesting that the increases from a lower level may be correlated with larger falls. The issue of unions

Figure 5-21: WWII: dPrem and 1950 Union Density



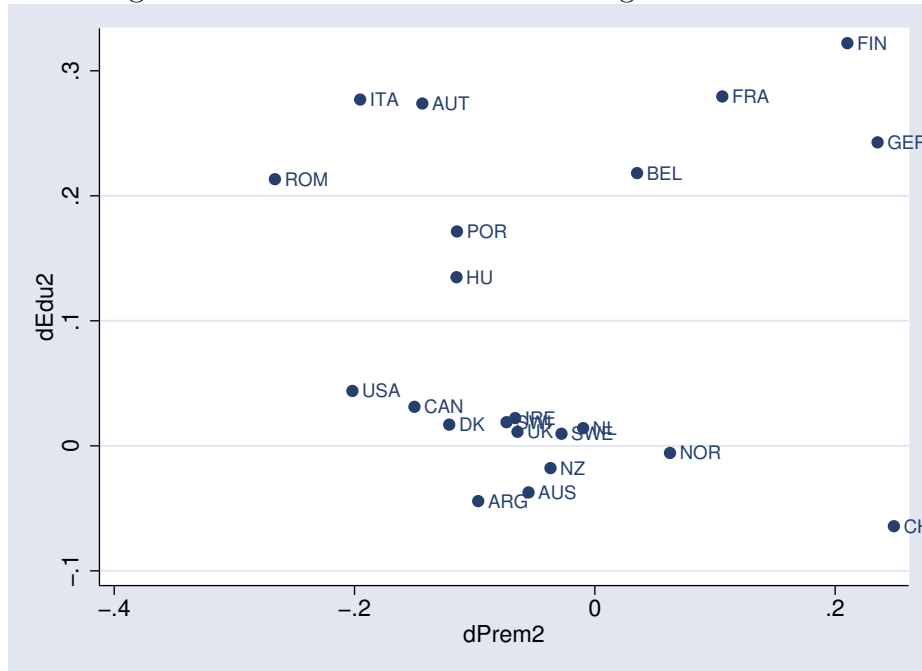
and of the strength of wage-setting institutions is returned to in Section 6.3.

## Education

In most countries, lagged educational enrolment on average rose, comparing 1938 and 1946.<sup>6</sup> For the majority (13) of the countries, educational enrolment rose while the premium fell, and for 2 countries, the opposite occurred, suggesting at least mild support for the hypothesis that increased educational attainment on average lowers the skill premium. However, the overall picture is far from clear, with some countries, particularly war hosts, bucking the trend.

<sup>6</sup>Where possible, educational enrolment rates are lagged 10 years to capture the delayed effects on the labour supply curves. This was not possible for Argentina and Chile. Changes between prewar and postwar enrolment rates were used instead.

Figure 5-22: WWII: dPrem and Changes in Enrolment



### Industrialisation & Aggregate Demand

Omitting the US, Sweden and New Zealand as outliers, there appears to be a negative relationship between the change in the role of agriculture in an economy and the change in the skill premium. This goes contrary to the findings from the First World War, where the larger the fall in those employed in agriculture in an economy, the larger the fall in the premium. Theoretically, however, there appears to be no theoretically solid reason to omit these three countries, and the broader picture reveals very little in the way of an overall correlation. The upward slope on the line of best fit has an  $R^2$  of just 2%.

The relationship between manufacturing output and the change in the premium is also far from obvious. Firstly, it is interesting to note that the countries with the highest increases in output include the four American

Figure 5-23: WWII: dPrem and the Changing Role of Agriculture

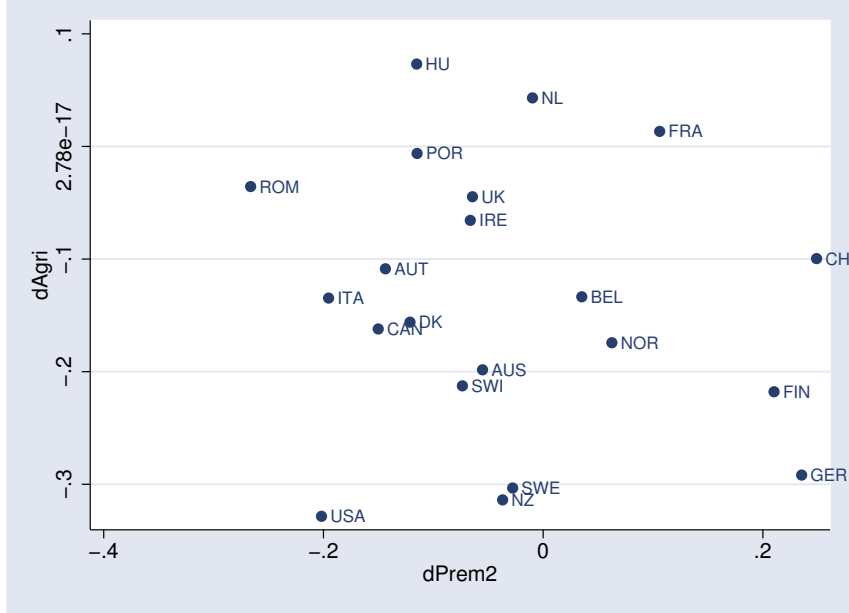
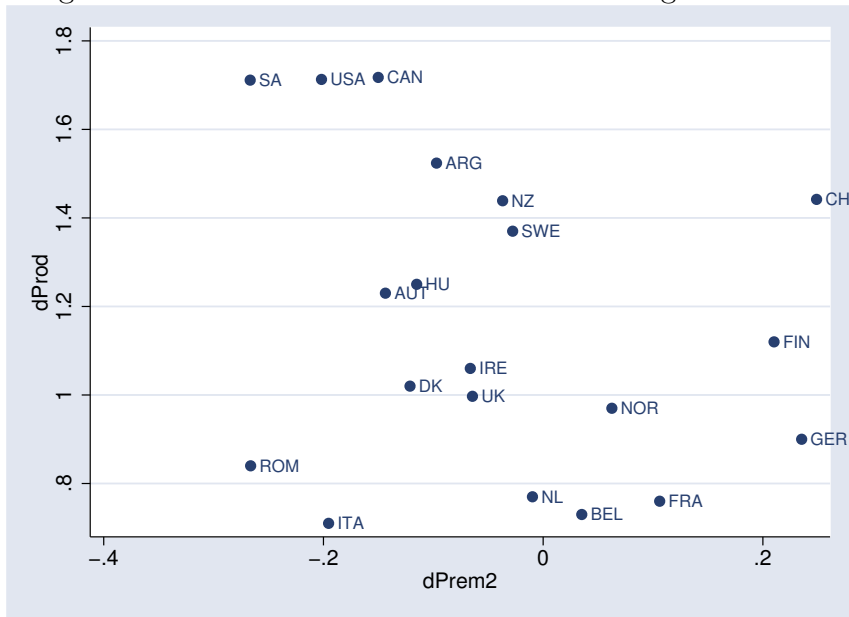
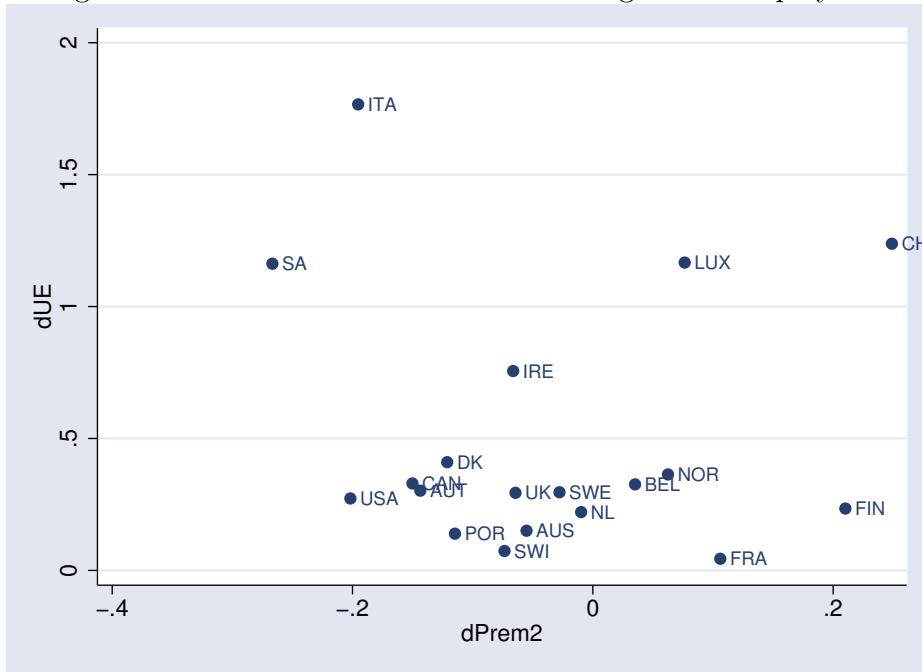


Figure 5-24: WWII: dPrem and Manufacturing Production



countries, South Africa and New Zealand. Three of these experienced large falls in their premium. Theory suggests that at times of high output and full employment, the premium will diminish. Both in an overall sense, and just looking at European countries, there appears to be only at best a gentle negative relationship between output and the premium, to confirm this.

Figure 5-25: WWII: dPrem and the Change in Unemployment



Data on unemployment were still less than complete at the time of the second World War. However, that said, the situation had vastly improved compared to unemployment statistics available in 1914 and 1920. Outlined in Figure 5-25 is the correlation between proportional changes in the premium and changes in unemployment, 1937 and 1946 (or later where relevant). Once again, however, no obvious relationship emerges from the data available.

## Summary

Overall, the breadth of experiences during World War II appears to preclude any straightforward observations regarding relationships between skill premiums and the suggested variables. Neutral countries appear to have undergone less dramatic changes than belligerents, while war hosts and occupied countries fared differently to those who fought from a distance. Inflation, strike activity and enrolment in education have no systematic relationship with changing premiums from 1938 to 1946. The same is true for the role of agriculture, manufacturing output and unemployment. However, stronger levels of union density does appear to be associated with larger falls in the premium.

### 5.2.1 The Relationship Between the Wars

To what extent were falls in the premium during the second World War related to those in the First World War? That is, if a country had undergone a large transformation during the 1914-20 period, might that have reduced its capacity to adapt during the second World War. This is explored in Figures 5-26 and 5-27, the first of which shows a scatter of the change in premiums from both wars.<sup>7</sup> It is obvious that there is a general upward relationship, apart from two outliers, France and Germany (both hosts to World War). The  $R^2$  of a simple linear regression improves from barely above zero (all countries) to 27% (less France and Germany). This suggests similar ordinal experiences for a country across wars — i.e. those countries experiencing a relatively larger fall in their premium in World War One were in general in the same ranking in World War Two.

Another way of looking at this is examining whether “room for manoeuvre” is a factor. A country with a relatively high skill premium has a large

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<sup>7</sup>Countries covered are the sixteen for which building industry data are available for both World Wars.

Figure 5-26: X-Y Scatter: dPrem from both Wars



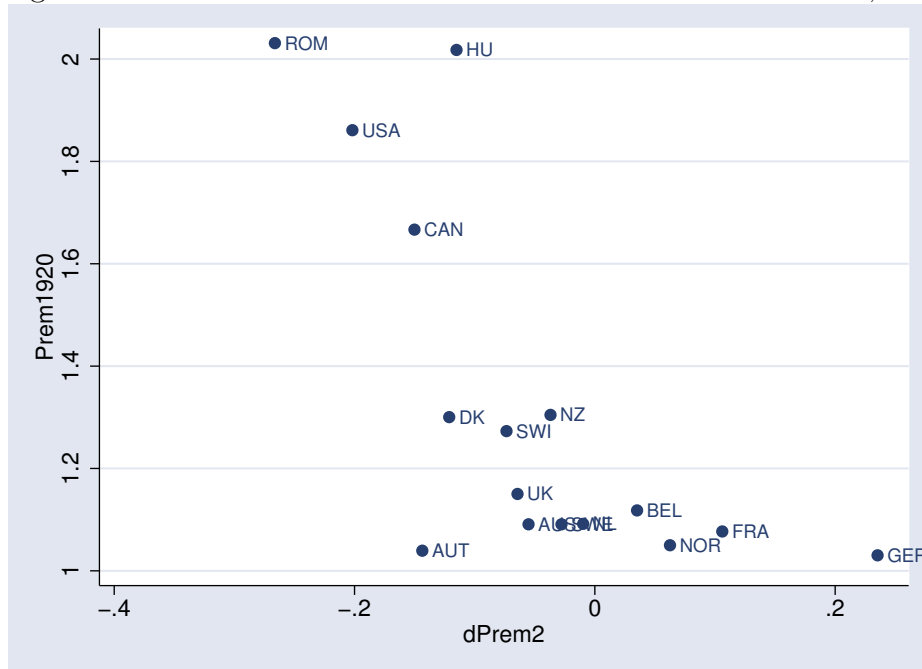
range of potential lower values, while countries with relatively compressed wage structures cannot undergo a similar change, even in proportion, as it has already “bottomed out”.<sup>8</sup> This relationship is shown in Figure 5-27. There is a strong downward slope (with an  $R^2$  of 47.9%), suggesting that countries with higher premiums in 1920 did indeed experience larger proportional falls during the Second World War. Removing Germany, once again an outlier, improves the fit of the line to 55%.

### 5.3 Comparing the Effects of the Two Wars

Looking just at countries for which data are available for both wars, of which there are 18, there are three interesting conclusions. Firstly, of the 18, there are only four countries (Hungary, Italy, Romania and the US) that experience

<sup>8</sup>This holds true moreso with the measurement of ratios than with of strict premiums.

Figure 5-27: X-Y Scatter: dPrem2 & the Level of the Premium, 1920

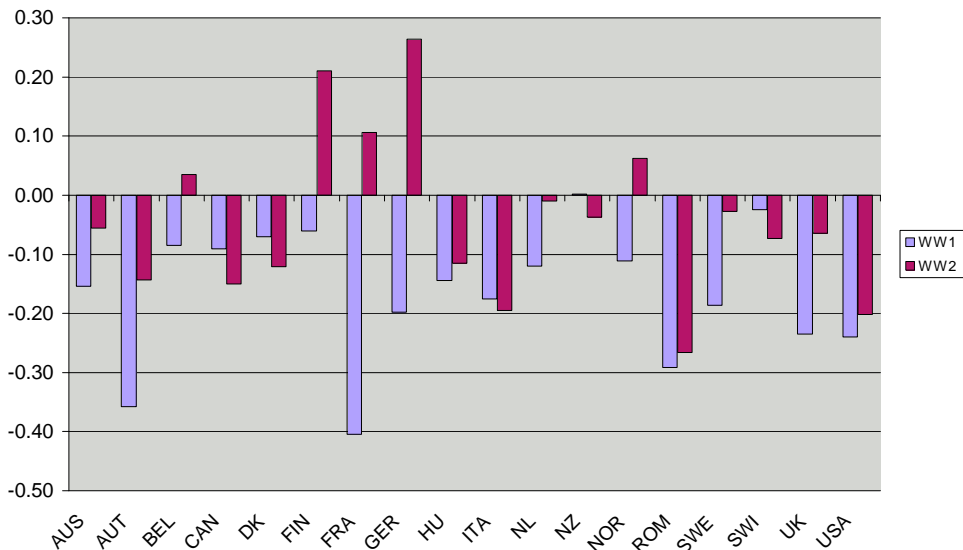


similar effects in both wars, in terms of both sign and size. This is reconciled with the finding from Figure 5-26 by noting that, for the group as a whole, the range of values has changed and new axes have been added.

Secondly, only the Second World War was associated with increasing labour market inequality (as measured by the skill premium) in an economy. For some of the European core (Belgium, France, Germany) and some of Scandinavia (Finland, Norway), the latter war increased the skill premium, unlike World War I. Only in New Zealand, and then just barely, did the premium increase in the earlier period and then decrease in the latter.

Lastly, and following on from this, the First World War produced the greater proportional compression. For two-thirds of the countries, there was either an increase in the skill premium during the Second World War, or else a smaller proportional compression. In only three countries (Canada, Denmark

Figure 5-28: Comparing the effects of the Wars in 18 Countries



and Switzerland) did the second World War have a significantly greater effect in compressing the skill premium. In countries such as Australia, Austria and the UK, for example, the first World War reduced the skill premium by a greater proportion.

### 5.3.1 A Note on International Convergence

An interesting question is the extent to which, if at all, the wars helped bring about international convergence in the skill premium. Did the wars hasten the development of an international lower bound to skill premiums to which economies converge as they develop, and if so, which had the greater effect?<sup>9</sup>

Insights into answering this question are shown in Table 5.3, which is based on the 18 countries available for both wars. As can be seen, the (unweighted) average premium is at its highest before World War I and at

<sup>9</sup>Recent ILO October survey data show large convergence of OECD economies around a building industry skill premium of about 10%.

Table 5.3: International Convergence and the Wars

	World War I		World War II	
<i>Measure</i>	Prewar	Postwar	Prewar	Postwar
<i>Average premium</i>	1.632	1.342	1.470	1.365
<i>Coeff of variation</i>	0.296	0.254	0.329	0.233

its lowest in 1920. By 1938, it had risen again, but had not returned to pre-WWI levels. Its fall during World War II was significant, but still did not reduce the mean premium to the levels of 1920.

Looking at the variance however, as measured by the coefficient of variation (CV), the highest CV for the 18 countries was actually in 1938. In 1914, the average premium was higher and it was also less spread out (proportionately, as is measured by the CV, which weights by the mean). In 1938, the average was lower and more spread out, meaning a greater likelihood that some countries had low skill premiums. The CV for 1946 is the lowest, below that of 1920, meaning that the spread of premiums was at its lowest then of the four dates under investigation. Both wars lowered the average skill premium across economies, in particular the First World War, and both wars brought convergence in the international spread of premiums, in particular the Second World War.<sup>10</sup>

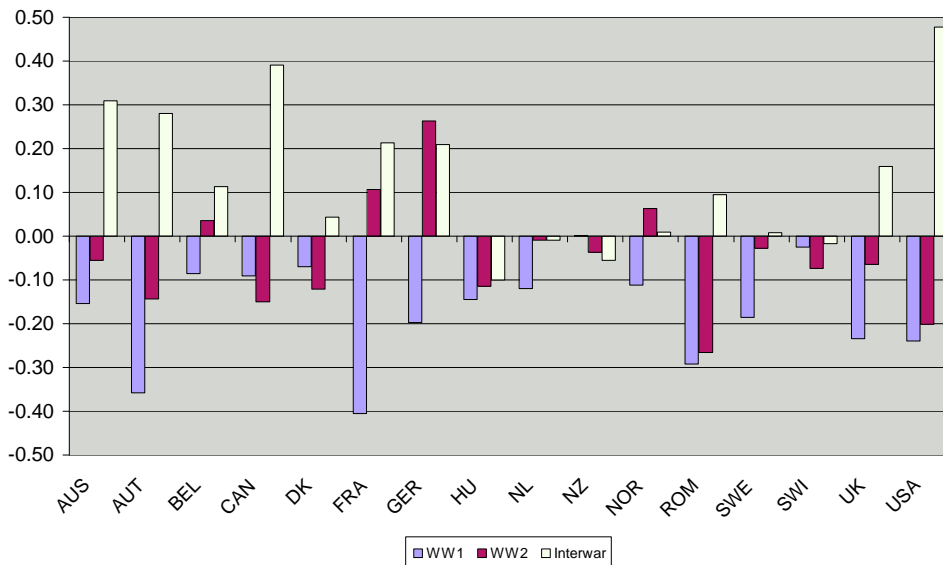
### 5.3.2 A Note on the Interwar Period

With the four data points available, an initial exploration can be made regarding the impact on labour markets of the interwar period, and how it compares to the effects of the two World Wars. This is done in Figure 5-29, omitting Finland and Italy, whose 1920 figures, as discussed, are of a different nature to their 1938 figures. Three conclusions emerge.

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<sup>10</sup>These findings are also valid if the latter dataset is expanded to include all 25 countries available for World War II.

Figure 5-29: Comparing the Wars and the Interwar Period



Firstly, the interwar period differs from the two wars in that increasing premiums were the rule, rather than the exception. The premium increased in three-quarters of the countries. Indeed, for twelve of the sixteen countries, the interwar period was one of least pressure for labour market compression.<sup>11</sup>

Secondly, the whole period 1914-1946 was one of much change in the labour market structures, if building industry data are valid indicators. Only New Zealand, and to a lesser extent the Netherlands and Switzerland, show very little change over the period under examination, in sharp contrast to the majority of countries.

Thirdly, in terms of the typical effect of the three periods, a definite ordinal ranking emerges. The First World War placed the greatest downward pressure on the skill premium (an unweighted average fall of 16.9%,

<sup>11</sup>That is to say, the only period of increasing premiums (8 of the 12 countries), the period with greatest upward change in the premium (2 countries), or the period with the smallest proportional fall (2).

proportionately). The Second World War is next in rank, with an average proportional fall of just 5.2%. The interwar period, on the other hand, was witness to an average increase, proportionately, of 13.3%. These figures, albeit limited indicators of internal inequality, are in sharp contrast to the findings of Milanovic (2003). Basing his results on *between-country* inequality measures, he concluded that war fuelled inequality, while the interwar period was actually one of convergence. These preliminary findings on within-country inequality suggest the opposite to be the case.

### 5.3.3 Comparing 1914 and 1946

The four data points also allow a comparison of skill premiums in the building industry in 1914 and 1946, after 32 years of unprecedented economic turmoil. The percentage change in the wage ratio, as a proportion of the 1914 ratio, is shown in Figure 5-30. As can be seen, by far the largest fall occurs in Romania, followed by Hungary and Austria. Over the whole period, the premium fell in the majority of countries, but rose in two of the European core, Belgium and Germany, who had second and fourth lowest premiums in 1914 but only the seventh and ninth lowest in 1946. In both Belgium and Germany, of the three periods outlined in Section 5.3.2, only World War I was associated with a fall in the premium.

Comparing 1914 and 1946, the premium also rose in Australia and Canada, entirely a product of interwar growth in the premium. Another European offshoot, the USA, also saw falls in the premium during the Wars mostly undone by large interwar growth of the premium. Overall, across countries, the unweighted average change in the premium was a fall of over one-ninth (11.6%).

## 5.4 Summary of Stylised Facts

Both World Wars were times of widespread compression of labour markets structures, as measured by the ratio of wages of bricklayers to labourers in the building industry. Of the two wars, the First World War had the greater downward pressure on the skill premium, on average, with no country showing a substantial increase in the premium after the war. The Second World War typically also decreased the premium. However, there was greater variation in the changes in the latter period, with seven countries experiencing an increase in the premium.

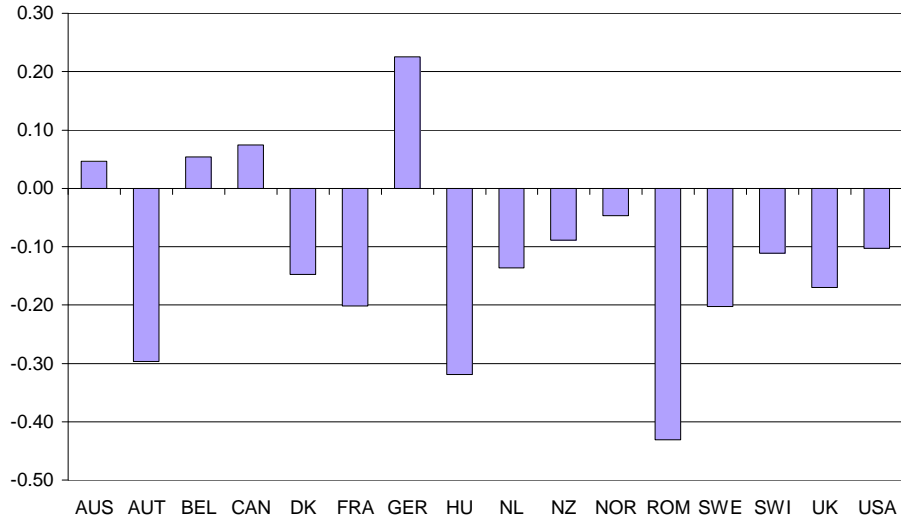
In terms of relationships, the First World War suggests a range of potential relationships. Countries that lost more soldiers in war, whose governments played a larger role in the economy, that experienced greater increases in the cost of living and that mobilized more troops experienced larger falls in their skill premiums, as a general rule. Similarly, the more a country industrialized, the greater its fall in the premium. On the other hand, looking across all twenty countries, unions appear to have played no systematic role in the determination of changes in the skill premium. Lastly, an upswing in industrial output is associated with lesser, not greater, falls in the premium.

The Second World War, however, shows little in the way of clear relationships between these variables and the change in the skill premium. Neutral countries underwent less dramatic changes than belligerents, while of those at war, hosts often saw their premium increase, while the larger falls tended to be in countries far away from the conflict. The postwar strength of unions also seems to be positively related to the fall in premiums.

While the unweighted average skill premium was lower after the First World War, the spread of skill premiums was tighter in the late 1940s than in 1920, suggesting some international convergence in premiums. Lastly, comparing the World Wars with the interwar period shows that the two wars

have much in common. The interwar period saw increasing skill premiums, as a general rule, unlike both World Wars. These increases between 1920 and 1938 meant that the premium was actually higher in 1946 than in 1914 in Canada and Australia, and (coupled with increases in World War II) in Belgium and Germany. Overall, though, the premium across the sixteen countries fell between 1914 and 1946, by on average 11.6%.

Figure 5-30: Building Industry Skill Premiums, 1914 to 1946



# Chapter 6

## Model & Results

## 6.1 The Role of War and Hosting War

Outlined in 2.2 are various hypotheses regarding the potential impact of the wars. The first hypothesis concerns the effect of being part of a war, of greater military or civilian casualties, etc. The second is whether hosts of the war were affected in a different manner to other participants. In this section, the role of war and hosting war is explored, across both World Wars.

For the First World War, a simple regression of  $dprem$  on two categorical variables, whether the country was at war or not, and whether it hosted the war (for World War I, only France and Belgium were deemed to have “hosted” the war) is shown in Table 6.1. As both the Breusch-Pagan and White tests advised rejecting the null of constant variance, robust standard errors are presented. This elementary regression indicates that war did indeed have a significant downward effect on skills premiums. On the other hand, although the coefficient is also negative, hosting the war does not appear to have had a statistically significant effect on skill premiums.

Table 6.1: World War One: the Impact of War and Hosting War

Source	SS	df	MS	Number of obs	=	20
—	—	—	—	F( 2, 17)	=	2.20
Model	.053966868	2	.026983434	Prob > F	=	0.1411
Residual	.20833207	17	.012254828	R-squared	=	0.2057
—	—	—	—	Adj R-squared	=	0.1123
Total	.262298938	19	.013805207	Root MSE	=	.11070

$dprem$	<i>Coeff.</i>	<i>Std.Err.</i>	<i>t</i>	<i>P&gt;t</i>	95% Conf. Int.	
host	−.0528627	.1271288	−0.42	0.683	−.321081	.2153556
war	−.1006547	.0415458	−2.42	0.027	−.1883088	−.0130007
c	−.0915253	.0451937	−2.03	0.059	−.1868757	.003825

For the Second World War, the two hypotheses outlined above are explored through the same elementary regression of  $dPrem$  on two categorical variables,  $war$  and  $host$ , this time for the twenty-five countries available for

that war, outlined in 6.2. With a constant of zero, or very close thereto, taking part in the war means a bigger fall (or smaller increase) in the premium than was the case for neutral countries. Secondly, being a host to World War II, in addition to just taking part, meant a *higher* premium than would otherwise be the case. This suggests two potential explanations. Firstly, it could be that there is a degree of substitutability between capital and skilled labour, with higher relative demand for skilled trades where capital destruction was greater. This would tie in with the literature on changing management structures during the period 1900-1950, where capital and unskilled labour in tandem made many traditional skilled trades more obsolete. Secondly, it could be that host countries were in greatest need of physical reconstruction and thus had greatest demand for skilled building trades.

Table 6.2: World War Two: the Impact of War and Hosting War

Source	SS	df	MS	Number of obs	=	25
—	—	—	—	F( 2, 22)	=	3.01
Model	.117660590	2	.058830295	Prob > F	=	0.0700
Residual	.430252003	22	.019556909	R-squared	=	0.2147
—	—	—	—	Adj R-squared	=	0.1434
Total	.547912593	24	.022829691	Root MSE	=	.13985
<i>dprem</i>	<i>Coeff.</i>	<i>Std.Err.</i>	<i>t</i>	<i>P&gt;t</i>	95% Conf. Int.	
host	.1493033	.0655608	2.28	0.033	.0133384	.2852681
war	-.1607543	.0818854	-1.96	0.062	-.3305743	.0090657
c	-.0031586	.062541	-0.05	0.960	-.1328607	.1265436

In terms of regression diagnostics, the residuals for both regressions are distributed close to the normal distribution, but for World War I the distribution has fatter tails. For World War II, the distribution peaks earlier and has a fatter end tail. Sample size must be borne in mind also, though. Tests indicate that multicollinearity is not an issue, while heteroscedasticity is not present in the World War II regression.

The regressions suggest the following narrative. Belligerents experienced

a greater proportional fall in the premium than neutrals. This holds true for both wars. Hosts to the war, however, fared differently in both wars. In World War I, to the extent to which the effect is significant, hosts' premiums fell by an even more. In World War II, however, hosts had a smaller fall or greater increase in the premium than other warring countries. This difference in effects of hosting war suggests the importance of distinguishing between the nature of the wars. The First World War was a more conventional war with fronts, while the later war was one of widespread capital destruction and civilian casualties, the first of its kind. In labour market terms, economies destroyed by World War II and rebuilding themselves in the early postwar period needed to attract skill moreso than mere partakers in war from a distance.

As mentioned, though, belligerents experienced on average greater falls. This leads to the question as to the channels through which this worked. Was it through greater government control of the economy, through military and civilian casualties, through inflation, structural changes in the economy, or some combination of these factors?

## 6.2 Explaining the Impact of War

### 6.2.1 The First World War

The cross-section for the first World War consists of twenty countries<sup>1</sup>, with missing observations for certain variables a problem for Bulgaria and Romania in particular, but also with the number of strikes and average government expenditure unavailable for three countries each.

Outlined in 6.3 is a fuller model of the effects of World War I on the skill premium.  $pr1914$  is the size of the skill premium in 1914, while  $cas$  is the

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<sup>1</sup>These are: Australia, Austria, Belgium, Bulgaria, Canada, Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, New Zealand, Norway, Romania, Spain, Sweden, Switzerland, the UK and the USA.

proportion of the 1911 labour force killed in the War. *dagri* is the the change in the proportion of the labour force in the agricultural sector, capturing structural change in the economy; a positive value of *dagri* means that the agricultural sector grew over the period. *ln dp* is the log of the change in the price level over 1914, *dprod* is the growth in manufacturing production, and *host* is the same categorical variables as before.

Once again, the distribution of residuals is close to normal, but peaks later. Heteroscedasticity is not present in the data, as measured by the Breusch-Pagan and White tests, while multicollinearity does not appear to be an issue, except perhaps for *ln dp* and *dprod*. Despite the small number of observations, the *F*-stat is quite strong, with about a one-in-two-hundred chance that the model has no explanatory power. Furthermore, two variables in particular appear strongly statistically significant, as measured by low *t*-stats.

Table 6.3: Model of World War One Effects

Source	SS	df	MS	Number of obs	=	16
—	—	—	—	F( 6, 9)	=	7.07
Model	.130067523	6	.02167792	Prob > F	=	0.0052
Residual	.055915796	9	.003065208	R-squared	=	0.8250
—	—	—	—	Adj R-squared	=	0.7084
Total	.157654391	15	.010510293	Root MSE	=	.05536

<i>dprem</i>	<i>Coeff.</i>	<i>Std.Err.</i>	<i>t</i>	<i>P&gt;t</i>	95% Conf. Int.	
pr1914	−.099353	.0468572	−2.12	0.063	−.2053513	.0066454
cas	−2.678177	.7310338	−3.66	0.005	−4.33189	−1.024464
dagri	.7996297	.2026547	3.95	0.003	.3411929	1.258067
ln dp	.0461982	.0338216	1.37	0.205	−.0303115	.1227079
dprod	.0394821	.0925433	0.43	0.680	−.1698653	.2488296
host	−.1028349	.0514667	−2.00	0.077	−.2192605	.0135908
C	.0363765	.1174023	0.31	0.764	−.2292059	.3019589

As expected, casualties in World War I is negatively related to the change in the premium: the greater the casualties, as a proportion of the labour

force, the larger the proportional fall in the premium. On the other hand, industrialization, as measured by *dagri*, is positively correlated with the premium; i.e. a fall in the weighting of agriculture in the composition of the labour force is correlated with a fall in the building industry skill premium. Both of these effects are large, with 1% of the labour force killed on the front being associated with a proportional fall of 2.68% in the skill premium. Similarly, for every 1% of the labour force to switch away from agriculture, the premium fell 0.8%.

At the 10% level of statistical significance, both the level of the premium in 1914 and the categorical variable, *host*, are negatively related to the change in the skill premium. The higher the premium in 1914, the greater it fell over the course of the war (by a factor of approximately one-tenth). Secondly, hosts of the war saw larger falls (once again, by about 10% proportionally) in their premium than other economies. After controlling for the specific channels through which war affects economies, it seems that hosting the war did have a (statistically) significant downward effect on the premium.

The two remaining variables reveal further effects, albeit not statistically significant at the 10% level, due to the small size of the coefficients. A rise in production is actually positively related to the premium, after controlling for other effects such as casualties. Instead of capturing lower unemployment, and thus greater demand for unskilled labour, it is perhaps capturing some of the structural changes in economies occurring at this time. Another possibility, suggested in such works as Manning (1999), is that this reflects an increased demand for skilled building labour in boom-times or periods of reconstruction, which outweighs the increase in demand for unskilled labour.

Similarly, while controlling for such variables as casualties and industrialization, greater inflation is associated with a higher premium, contrary to theoretical expectations. This does indeed go contrary to the findings of Bry (1960) and Dunlop & Rothbaum (1955) regarding price levels and premiums

(in the USA, Germany, France, Italy and the UK).<sup>2</sup>

Including either or both of two further variables suggested by economic theory and the literature results in no improvement in the model. These variables are the proportional change in enrolment rates and the increase in unionization. When included (individually) into the model above, they increase the  $R^2$  by 0.002% and 0.02% respectively and significantly decrease the  $\bar{R}^2$ . The coefficient on  $dTU$  is next to zero (-0.004) while the standard error of  $dEdu$  is so large as to render the  $p$ -value close to 1.<sup>3</sup> Interacting the change in the price level (or log thereof) and the growth in unions, to test the hypothesis that unions were effective during times of inflation, also weakens the strength of the model. The evidence suggests, then, that neither educational attainment nor trade union power had a systematic effect across the countries under investigation during World War I.

Of the hypotheses laid out earlier, it seems then that there is little in particular to support either the hypothesis that unions drove falling skill premiums (*Hypothesis 3*) or that the observed changes between 1914 and 1920 are due to increased education enrolment rates (*Hypothesis 5*). Inflation also appears not to have eroded premiums in a systematic way (*Hypothesis 4*). There is strong evidence, however, to suggest the explanation for falling premiums during World War I lies in the main with the extent of military casualties (*Hypothesis 1*) and of structural change in the economy (*Hypothesis 6*) and, to a lesser degree, with whether the country was a host to war or not (*Hypothesis 2*) and with the level of the premium before the war.

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<sup>2</sup>As observed, multicollinearity does not appear to be a problem with the data. If it is a problem at all, it is between these latter two insignificant variables and it could be this that gives signs that run contrary to expectation. Nonetheless, the correlation coefficient is not large, and the VIFs are low.

<sup>3</sup>Using activity of unions, measured by *strikes*, rather than latent power, does not alter these findings. In fact, the coefficient is even smaller (0.00005). Using postwar levels of union density also substantially lowers the adjusted  $R^2$ .

## 6.2.2 The Second World War

A natural starting point, for a more complete analysis of the Second World War's effect on the skill premium, is to apply the model derived above for the First World War. This is done in Table 6.4. The most striking aspect of the model is that its ability to explain the changes observed in World War II appears to be very poor. The overall strength of the model is quite weak, with the  $p$ -value associated with the  $F$ -statistic is approximately 0.3. The variance on the equivalent variable to *cas*, namely *mild*, is very large. The sign is also reversed. For all the other variables, the coefficients are small and insignificant.

Table 6.4: Model of World War II Effects (1): The WWI Model

Source	SS	df	MS	Number of obs	=	18
—	—	—	—	F( 6, 11)	=	1.40
Model	.171439047	6	.028573174	Prob > F	=	0.2963
Residual	.224138664	11	.020376242	R-squared	=	0.4334
—	—	—	—	Adj R-squared	=	0.1243
Total	.395577711	17	.023269277	Root MSE	=	.14275

<i>dprem</i>	<i>Coeff.</i>	<i>Std.Err.</i>	<i>t</i>	<i>P&gt;t</i>	95% Conf. Int.	
pr1938	-.2066701	.1076482	-1.92	0.081	-.4436023	.0302621
mild	.1965742	1.371073	0.14	0.889	-2.821136	3.214285
dagri	-.0982092	.3426071	-0.29	0.780	-.8522824	.6558639
lndp	-.0077328	.0260954	-0.30	0.772	-.0651683	.0497027
dprod	.056054	.2554649	0.22	0.830	-.5062205	.6183286
host	-.001264	.1459938	-0.01	0.993	-.3225942	.3200663
C	.2071245	.3071634	0.67	0.514	-.4689376	.8831867

It is also possible to include the change in the unemployment rate for this later sample. While ostensibly allowing examination of *Hypothesis 7*, that peaks in the business cycle are associated with troughs in the premium, in reality, given the nature of the data points and the disruption of normal economic activity during the Wars, comparing unemployment rates may not

actually be equivalent to comparing points in the business cycle. Indeed, inclusion of the variable *due*, the change in unemployment from 1938 to 1946 does little to improve the fit of the model, and the coefficient is not statistically significant from zero at the 15% level. Furthermore, the sample size is reduced from 18 to 14.

Given the extent of aerial bombardment and civilian losses during World War II, it is possible that greater civilian casualties, through capturing shocks to labour supply, physical or human capital stocks, or the infrastructure of a particular economy, may have a systematic relationship with changes in the premium. However, this does not appear to be the case given the available data. The same is true if one uses instead the ratio of civilian to military losses as a measure of the same effects.

It seems from this evidence that the two World Wars worked in different ways in how they affected the building industry skill premium. Whereas structural changes and military casualties clearly had a downward effect on the premium in the period 1914-1920, the same cannot be said according to this specification.

### **6.3 The Role of World War One and the Strength of Social Institutions**

So if military casualties, changes in the price level, manufacturing output and such factors do not explain the observed changes in the building industry skill premium, what does?

Unfortunately data limitations, particularly on union density, considerably restrict the sample size and thus the analysis. Nonetheless, outlined in Table 6.5 are the results of the regression of  $dPrem$  on four variables, namely the level of the building industry skill premium in 1920 (*prem1920*), the level of union density in 1950 (*ltu50*), industrialization over the period (*dagri*) and

whether or not the country was occupied (*occ*).

Table 6.5: Model of World War II Effects (2): Role of WWI and Unions

Source	SS	df	MS	Number of obs	=	13
—	—	—	—	F( 2, 10)	=	22.15
Model	.156796299	4	.039199075	Prob > F	=	0.0002
Residual	.014156973	8	.001769622	R-squared	=	0.9172
—	—	—	—	Adj R-squared	=	0.8758
Total	.170953272	12	.014246106	Root MSE	=	.04207

<i>dprem</i>	<i>Coeff.</i>	<i>Std.Err.</i>	<i>t</i>	<i>P&gt;t</i>	95% Conf. Int.	
prem1920	-.5539274	.0633937	-8.74	0.000	-.7001135	-.4077413
ltu50	-.8062501	.1291453	-6.24	0.000	-1.10406	-.5084405
dagri	-.6491703	.1402301	-4.63	0.002	-.9725415	-.3257991
occ	.0459659	.029134	1.58	0.153	-.0212172	.113149
C	.876424	.1162228	7.54	0.000	.6084138	1.144434

Firstly, it must be noted that the sample size is a mere thirteen countries, thus results are far from conclusive. Indeed, it may be argued that the sample is self-selecting, in that it represents those countries of the 25 that had the stronger social institutions (with which the availability and perhaps level of such variables as union density might be correlated).<sup>4</sup> Nonetheless, the results are suprisingly strong, as measured by *t*-statistics, *F*-statistics, and the *R*<sup>2</sup>.

The variables chosen do not appear to be multicollinear, with low VIFs. The residuals are distributed quite closely to the normal distribution, only again with slightly fatter tails. Lastly, results for both the Breusch-Pagan and White tests for heteroscedasticity mean that one cannot reject the null hypothesis of constant variance.<sup>5</sup>

<sup>4</sup>The thirteen countries are: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Netherlands, Norway, Sweden, Switzerland, the UK and the USA.

<sup>5</sup>If one were to reject the null based on respective *p*-values of 0.23 (BP) and 0.37 (White), the only noteworthy change would be to reduce the *p*-value associated with the variable *occ*, making it significant at the 10% level.

The  $F$ -statistic shows that this simple model is certainly explaining a degree of the observed changes, while the  $R^2$  and adjusted  $R^2$  indicate that the model explains quite a lot of the variance. Both  $prem1920$  and  $ltu1950$  have a negative coefficient. This suggests, firstly, that the higher a country's skill premium in 1920, the more it fell during the period 1938-46 — supporting the suggestion in Section 5.2.1 of “room for manoeuvre”, i.e. the level of a country's premium after the first World War affected how its premium changed during World War II. The 1920 premium set the tone for the following two decades, while World War II marked another shock to the labour market. Countries with higher premiums after World War I, such as the United States, Romania and Hungary, still had some distance to fall, compared to those with lower 1920 premiums. Therefore, on average they experienced larger proportional falls than those with lower 1920 premiums, such as Switzerland, the UK and Australia.

Secondly, it indicates that the strength of unions, and by proxy the strength of social institutions relevant to the wage-setting process, was also an important determinant of how much wages fell during the war. The greater union density, the larger the proportional fall in the premium. This could be capturing solely the direct effects of unions or, as mentioned above, in a broader sense the strength of the various institutions involved in the wage-setting process.<sup>6</sup>

Structural change and industrialization, as measured again by  $dagri$ , is also negatively associated with the skill premium. This is the opposite finding to that for the First World War. Structural changes in the economy away from agriculture were associated with larger skill premiums, suggesting perhaps an increased pool of unskilled urban labour as the process of urbanization continued. It is also possible that war dislocated skilled labour, while

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<sup>6</sup>These conclusions are robust to choice of union density dataset. A regression using data provided by Michael Huberman, covering 11 countries, also produced the same results.

also hurrying industrialization, resulting in higher premiums being associated with the faster industrializers.

Lastly, countries occupied by the Nazis during the Second World War, controlling for other factors, emerged with a higher premium than other countries in the sample. This result, significant at the 10% level, may perhaps be a function of the nature of society and economy under Nazi control. Such control may have discouraged skill or skilled workers, forcing up the premium.

## 6.4 Summary

In both wars, belligerents saw their premium fall more than neutral countries. In the Second World War, though, unlike the First, being a host to war was associated with a higher premium (or smaller proportional fall) than otherwise. It is likely that this is because of the more destructive nature of the later War, in terms of infrastructure and capital stock, both human and physical.

In particular, for World War I, over 80% of the variance in changes in skill premium can be explained by the model described above. The change in premium was inversely related to its starting level in 1914, whether the country was a host of the war and in particular the proportion of the labour force killed in the war. It was positively related to manufacturing output, the log of change in the price level and in particular the change in the proportion of the labour force involved in agriculture.

For the Second World War, however, the same model does not apply. Regardless of specification, military casualties are not associated with larger falls in the premium; if anything, they are associated with rises in the premium. None of the variables used, with the possible exception of the level of the premium before the war, are in any way statistically significant. Turning to a model that focusses instead on the Western European countries and

their offshoots, the role of unions becomes clearer. Bearing in mind the small sample size, the data indicate that the level of the premium in 1920 and the strength of unions in 1950 are both negatively related to the proportional change in the skill premium. Unlike World War I, structural changes in the economy were negatively related to the premium, while being occupied during World War II meant a higher premium than in other countries.

# Chapter 7

## Conclusions

This paper has examined the effect on labour markets of the two World Wars, as measured by changes in the skill premium of the building industry. Having reviewed the literature regarding both the effect of the wars on economies and long run histories of labour market inequality, it set out the stylised facts of the changes, as measured by official data published in ILO sources. Cross-sectional econometric models were also developed to explain the changes observed. Of the hypotheses outlined earlier, what can be said of their validity?

**Did greater military and civilian casualties mean a larger fall in the skill premium in warring countries than in countries that escaped the effects of the war?** The evidence suggests that greater military casualties were associated with larger falls in the building industry skill premium, for the First World War only. For the second World War, neither military casualties as a proportion of the labour nor civilian casualties weighted by population were related in a systematic way to changes in the skill premium.

**Were hosts of the war affected in a different manner to other participants?** For both wars, the answer appears to be yes, but the sign of the coefficient is different. Whereas the hosts of World War I saw their premium fall by even more than others at war, those in World War II actually had a substantially higher premium than other warring countries. Looking specifically at countries occupied by the Nazis, there is evidence to suggest that, controlling for structural changes and union density, as well as premium level in 1920, occupied countries had a higher premium after the war than non-occupied countries.

**Did stronger unions, and or more rapidly growing unions, mean greater falls in the skill premium?** From the first World War, the

answer appears to be a sound no. There is no evidence to suggest a systematic relationship between union growth (or levels) and changes in the premium between 1914 and 1920. For World War II, though, one of the strongly significant determinants of premium changes was the postwar level of union density, at least among Western European economies and their offshoots. The stronger the unions in a particular country in 1950, the greater the proportional fall in the skill premium over the previous decade.

**Did times of inflation, particularly when trade unions were strong, lead to an adverse effect on the skill premium?** There is little evidence to suggest that inflation systematically drove down skill premiums across the sample of countries. For World War I, the data suggest that if anything changes in the cost of living increase the skill premium. A suggestion for future research would be an analysis specifically of skill premiums during hyperinflationary episodes to examine the relationship in greater detail. For World War II, again there appears to be little in the way of a systematic relationship between changes in the price level and in the skill premium.

**Did increasing education enrolment rates diminish the returns to skill?** While education enrolment rates are undoubtedly linked with the supply curve of skilled labour in an economy, it does not appear to be the case that changes observed in the skill premium across the two periods were related to changes in enrolment. It would appear that education levels are in the main more long-run determinants of skill premiums, while the short-run changes here need more short-run explanations.

**Are the processes of industrialisation and structural change in an economy away from agriculture associated with falling skill pre-**

**miums?** For World War I, this hypothesis holds at a strongly statistically significant level. Greater structural changes, reflected in less of the labour force working in agriculture, were associated with larger falls in the skill premium. During the period 1938-1946, however, the opposite appears to be the case. World War II may have dislocated labour, while also bringing about an upward shift in the process of industrialization, resulting in larger premiums.

**Are peaks of the business cycle associated with troughs in the skill premium?** Due to the nature of the periods under consideration, and also due to the quality of unemployment data available at all periods, it is not possible to produce any results regarding this hypothesis. The only indications, which come from a reduced sample during World War II, reinforce the finding of Knowles & Robertson (1951) that there appears to be little relationship between premiums and unemployment.

**Did changes in a country's skill premium during World War I affect how that premium changed over the course of World War II?** It does indeed appear to be the case that the level of the postwar premium after World War I affected the change in that premium during World War II. The higher the premium in 1920, the greater the rate of fall during the period 1938-46. This is coupled with the finding that the overall ranking of countries did not alter substantially across the wars, even though the range and axes shifted.

**Concluding Remarks** In conclusion, both World Wars were times of compression in labour markets, as measured by the building industry skill premium. This is particularly so for the First World War, where no country covered recorded a significant increase in the premium. There was greater variability of experiences during the Second World War, meaning on average

a lower proportional fall than during World War I, but by 1946 the spread of premiums internationally was at its lowest, compared with 1914, 1920 and 1938. Neutral countries saw a smaller fall in the premium during World War I and a smaller range of experiences during World War II, while the experiences of hosts differ between wars.

As noted in the introduction, the changes wrought by World War II appear to have had more long-run effects than those brought about by World War I, at least in the United States. This paper suggests that this may be due to the underlying causes of the changes, with changes in the period 1914-20 attributable to military casualties and structural changes, while changes in the premium over the period 1938-46 appear to be more due to union density rather than casualties. The more permanent nature of union density, as opposed to one-off shocks to the labour supply curves, suggests an intuitive reason for the different nature of the effects. This is perhaps an issue for future research to address, using more observations from both postwar periods.

Contrasting the World Wars with the interwar period reveals that the period 1920-1938 was one of increasing labour market inequality generally across the sample, as opposed to the wars. This is particularly true in the USA, Australia and Canada, with the premium higher in Canada and Australia in 1946 than 1914 as a result. On average, though, building industry skill premiums fell between 1914 and 1946, a stylised fact attributable more to military casualties and structural changes wrought by World War I and union density during World War II than any interwar convergence.

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