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Title
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Permalink
https://escholarship.org/uc/item/4rv06108

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Publication Date
2006-02-19

Domestic and International Causes for the Rise of Pay Inequality:

Post Industrialism, Globalization and Labor Market Institutions

by

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February 19, 2006

Abstract

We study the determinants of wage inequality in 16 OECD countries in the last two decades of the twentieth century. We find that these are quite different in the 1980s than in the 1990s. In the 1980s, growing wage dispersion is due to changes in the institutions of the labor market. Declining unionization and declines in the level at which wages are bargained collectively both contribute to widening pay dispersion in the 1980s. In the 1990s, by contrast, increases in pay inequality are due to increasing trade with less developed nations. To the extent that low-pay workers have been protected from rising wage differentials in the 1990s, it has been because of government policy, in the form of social insurance, and not thanks to labor organizations. This is the first study to report that the causes for pay inequality differed between the 1980s and the 1990s.

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1   Introduction

Since 1980, there has been widespread concern regarding the increases in pay inequality that have affected the United States and other advanced industrial countries. While some countries have maintained stable levels of pay equality, the general trend has been towards greater inequality of labor market earnings in western Europe as well as in the United States, Canada, Japan and Australia.[1] The purpose of this paper is to identify the causes of the general trend towards greater inequality of pay for the period from 1980 to 2000, when we have good data on the distribution of pay in advanced industrial countries.

We examine three main hypotheses for the rise of pay inequality, which we label the post-industrial hypothesis, the globalization hypothesis, and the institutional hypothesis. These are not novel. Rather, our study introduces the idea that the determinants of wage inequality underwent considerable substantive change over the period we study. We break our analysis into two sub-periods, the 1980s and the 1990s. We report different substantive findings for each of two periods. In the 1980s, we find that variables related to labor market institutions are statistically significantly associated with changes in pay inequality. In the 1990s, by contrast, domestic labor market institutions no longer matter statistically in accounting for changes in wage dispersion. Instead, we find that trade with less developed countries drives wage inequality, whereas specific government policies mitigate it. In neither period, finally,

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[1]In this paper, we use the terms pay, wages and salaries, and labor market earnings interchangeably. These terms refer to remuneration for work performed, thereby excluding other types of income, such as income from investments. The determinants of different types of income may well differ (Beramendi and Cusack 2004). Most of the literature studying inequality (enumerated in (Atkinson and Brandolini 2003)) focuses on income inequality, not pay inequality. This study concerns the latter. Note as well that the determinants of household income, reflected in the Luxembourg Income Study (LIS) data, are different again. Rising inequality in pay may, for instance, impel greater employment and/or more hours worked, as households seek to compensate for greater pay relativities (Kenworthy and Pontusson 2005, p. 454). Studies of wage and of household income are therefore complementary.

do we find that post-industrialism plays a statistically significant role.

Our paper proceeds as follows. We first detail our hypotheses, drawing on existing literature from political science, economics, and sociology. A second section presents descriptive information regarding the rise pay inequality over the final two decades of the twentieth century, as well as information on the changing patterns of employment in industry, the increase in international trade, and the decline of union density and decentralization of pay-setting in this period. A third section explains our methodological approach and some of the technical issue that arise. A fourth section presents our key statistical results regarding the rise of the inequality of pay from 1980 to 2000, including results from a variety of robustness and sensitivity tests. A final section concludes with a discussion of the relationship between rising inequality in rich countries and the global inequality of incomes.

2   Literature and Hypotheses

We draw on existing social scientific literature on pay inequality to formulate three sets of hypotheses. Our first is that the shift of the workforce from industry to services has resulted in a more bifurcated distribution of earnings, in which jobs that pay very well and jobs pay badly replace jobs that pay in the middle (Bluestone and Harrison 1982; Iversen 1998; Alderson and Nielsen 2002; Wright and Dwyer 2003). The ultimate cause, with this explanation, is technological change. In industry, fewer workers are able to make as many as or even more goods than before. In many service sector jobs, productively gains are harder to obtain. The increase of the share of workers in the service sector, it is argued, means that there are both more high-pay lawyers and more low-pay janitors relative to semi-skilled jobs

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in manufacturing plants with pay around the median of the pay distribution.

A second explanation for rising pay inequality is the growth of trade with other countries. International trade may affect pay by a variety of channels. It increases the competitiveness of markets, and more competitive markets imply, in turn, greater sensitivity of employment to wages and, perhaps, a greater willingness of workers to accept lower wages to save jobs (Scheve and Slaughter 2001). Where unions are strong, union wage premiums may be reduced by the greater bargaining power of employers in the more competitive environment induced by the growth of international trade (Choi 2006).

Although the effects of trade on the pay of workers in the advanced world is to reduce it, the impact on the inequality of wages and salaries is not clear. The first-order effect of international trade on pay inequality in advanced industrial countries, according to the Hecksher-Olin framework for analyzing the effects of international trade, depends on trade with less developed countries rather than on international trade in general. When developed countries with a relatively large endowment of skilled workers trade with less developed countries, the pay of workers in the advanced countries becomes more unequal. In effect, trade between poor and rich countries means that the rich countries have access to a larger supply of unskilled workers, driving down the pay of the unskilled in those countries. Conversely, trade with the less developed countries increases the value of skilled workers in advanced industrial countries, driving up their wages (Wood 1995). The impact of international trade on equality may be very different in the less developed countries, however, as we discuss later.

We do not view explanations focusing on the importance of trade as alternative to those focusing on the impact of technological progress. Trade grows as the costs of transportation

and communication fall. The channel by which technological progress affects the distribution of pay differs, but in general the relevant literature from economics concurs that both trade and technological progress negatively affect pay inequality in the world's wealthy countries (e.g. (Feenstra and Hanson 1999).[2]

The third explanation that we examine for rising pay inequality is changes in labor markets and associated regulatory institutions. This category includes such policies as the minimum wage and the level of unemployment benefits. But the main changes that we emphasize are the decline in the share of workers who belong to unions (union density) and the decentralization of the pay-setting process. In some countries, pay-setting decentralization has occurred because of a decentralization of collective bargaining from the national level to the industry-level (as in Sweden) or from industry-level to the plant-level (as in many of the English-speaking countries). In others, decentralization of pay-setting has occurred due to the greater reluctance of governments to regulate the distribution of pay by income policies, which had been a common response to the stagflation of the 1970s (Flanagan, Soskice, and Ulman 1983).[3]

Both powerful unions and centralized pay-setting have been shown to decrease the inequality of pay (Freeman and Gibbons 1995; Wallerstein 1999; Pontusson and Rueda 2000). There are multiple reasons why unions may exert an egalitarian effect on the distribution of pay. First, unions promote pay standardization, which reduces the extent to which observationally-equivalent workers receive different pay while also limiting managerial dis-

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[2]Closely related to trade is migration. Although we incorporate the impact of immigration into our analysis of the rise in pay inequality, the migration data are not as good as data for other variables.

[3]A third dimension of union organization, in addition to the number of members and the level of pay bargaining, is union concentration, or the extent to which unions are organized in a small number of large unions versus a large number of a small ones (Golden 1993). However, we currently lack data to examine the effects of changes in union concentration on pay inequality between 1980 and 2000.

cretion. Second, unions may empower low-pay workers relative to high-pay. Unions are democratic organizations, and workers who receive below-average pay constitute a majority given the typically skewed pay distribution. Unions are thus often observed to promote wage equality (Swenson 1989).

Third, workers may care about the inequality of pay because of shared norms of fairness (Kahneman, Knetsch, and Thaler 1986). In a decentralized labor market, workers have no chance to act on their preference for greater equality. But once the distribution of pay is a collective decision, one negotiated by organized representatives and perhaps public officials, preferences over the fairness of the distribution of pay may play a role.

The hypotheses that we examine are well established in the cross-national literature on pay inequality in OECD nations. Our paper is especially closely related to that of (Gustafsson and Johansson 1999), (Mahler 2004), and (Beramendi and Cusack 2004). The first uses OECD inequality data covering 1966 to 1996, and reports some evidence that occupational shifts to services and increasing trade with less developed countries augment inequality. (Mahler 2004) uses the Luxembourg Income Study's data on wage inequality to investigate the impact of various domestic and international factors on changes in the distribution of pay in advanced countries in the 1980s and 1990s. Mahler's main findings are that financial openness negatively affects earnings inequality, whereas wage centralization improves it. (Beramendi and Cusack 2004), finally, use the same OECD data that we do to study an array of interrelated measures of inequality. They report that union density and a history of government by the left compress wage inequality, which is the dependent variable they study that parallels ours. They do not find that international factors contribute significantly to changes in wage inequality.

The main difference between previous work and the current paper is that we break twenty years of data into two sub-periods, and identify substantial changes in the determinants of pay inequality between the two sub-periods. We believe that the reason that previous literature has not reported the same findings as our's is that other studies pool too many years of data to observe the period differences that we identify.

3 Trends in Inequality, Post-Industrialism, Globalization and Institutions

The data that this is study is based on, published periodically by the OECD (OECD 2004), comes in the form of different percentiles of the wage and salary distribution. From these, one can calculate ratios, such as the ratio of the average pay of a worker at the 90th percentile to that of a worker at the 10th percentile, or the ratio of a worker who receives the median pay to one at the 10th percentile. This is a standard measure of earnings inequality used in the literature (Atkinson and Brandolini 2003, table 2). Although the method differs from country to country, the OECD attempts to either exclude part-time workers or to adjust wages to what workers would earn if they were working fulltime.[4]

The OECD data on the distribution of wages and salaries is available for more countries for more years than any other data source we know, which is one reason we use it rather than the Luxembourg Income Study data. (Another is that we are interested in individual wage income, whereas the LIS's unit of observation is the household.) Even so, we were forced to

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[4]See (OECD 2004) for the details of the adjustment for part-time workers. In a majority of countries, the data are what is called administrative data, based on tax or pension records. In other countries, the data are from surveys. Our method, as will be discussed below, captures such differences in country-specified intercepts.

limit our study to 16 countries.[5] Our sample was mainly limited by the absence of sufficient data on the distribution of pay in the OECD data set, which forced us to exclude Spain, Portugal, Ireland and Greece. In addition, we were unable to include New Zealand due to it absence from the dataset assembled by (Golden, Lange, and Wallerstein 2002) on wage-setting institutions. Nevertheless, our sample contains all of the large advanced industrial societies except Spain, as well as most small advanced industrial countries.

Between 1980 and 2000, the distribution of pay in our 16 countries became more unequal on average. While the rise in inequality was more pronounced in the United States than in any other country, the trend of growing inequality in pay was a general phenomenon. The average ratio of the worker at the 90th percentile to a worker at the 10th percentile increased from 2.90 to 3.07, a rise of 5.5 percent. We have micro-data over time for far fewer countries. The data that we have indicates that the increase of pay inequality is largely due to the rise of wage premiums associated with education, experience and an increase of variance of pay among seemingly-identical workers, as opposed to changes in the composition of the work force (Blau and Kahn 1996; Blau and Kahn 2002). In other words, the rise of pay inequality between 1980 and 2000 reflects a change in the price paid for different types of workers more than in the supply of different of types of workers. The only difference in pay that grew more equal between 1980 and 2000 was the difference between men and women.[6]

Pay inequality did not rise monotonically after 1980. As Figure 1 reveals, average pay inequality rose rapidly from 1980 through 1988 for the nine countries for we have the full

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[5]The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States.

[6]While not the subject of our study, which pools female and male workers, the convergence of the average pay of women to men is an important occurrence in the years since 1980. This is not to say that women's wages and men's wages are now equal. There is still a gender differential in all the countries in the OECD data set.

20 years of data.[7] Between 1988 and 1992, pay became more equal. This is a common phenomenon associated with recessions. As employers shed their least skilled workers, the distribution in pay of those who remain employed becomes more equal. Starting in 1992, the rise of pay inequality resumes, but at a slower rate than in the 1980s. By 2000, the average inequality of pay is higher than in 1980 or in any year in between.

Figure 1 about here

As interesting as the general trend of inequality is the difference between countries. The ratio of the average pay of a worker in the 90th percentile to a worker at the 10th percentile grew by approximately 20 percent between 1980 and 2000 in the United States, more than in any other country. But the 90-10 ratio grew by approximately 15 percent in Sweden, the Netherlands and the United Kingdom during the same period. In Austria, the 90-10 ratio grew by roughly 10 percent. In contrast, there were many countries for which the 90-10 ratio was essentially flat, including Norway, Finland, France, Germany, Japan, and Canada. On average, the variance of the 90-10 ratio for the 11 countries with data from 1980 to 1999 increased by 60 percent from 1980 to 1992, remaining high thereafter. This increase is due largely to the United States, however. If we exclude that country, the difference between countries falls over the period.

There is no obvious association between the starting level of pay inequality and changes in inequality for the period we examine. The United States began as the country with the most inequality of pay in 1980, and the growth of pay inequality there exceeded that of any other country. Yet the country with the second largest increase in the 90-10 ratio, in percent

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[7]We have two countries with data from 1980–1999 (Austria and the Netherlands), which does not change the figures much very much. The remaining countries range from 17 years of data (Germany) to 10 years of data (Belgium, Denmark, Italy and Switzerland). We did not include countries with less than 10 years of data on the distribution of pay.

terms, was Sweden, the country with the most egalitarian wage distribution in 1980. On the other end of the spectrum, there was little change for 20 years in the inequality of pay in countries that began with very egalitarian wage distributions (such as Norway), in countries in the middle (such as France or Japan), or countries similar to the United States in their levels of pay inequality (Canada).

Finally, while our study is focused on the change of inequality, cross-national differences in the *level* of pay inequality are much larger than cross-national differences in the *change* of pay equality, even after 20 years. Sweden still has one of the most egalitarian distributions of pay among the advanced industrial countries, despite the relatively large increase in inequality observed there. It takes a long time for cross-countries differences in the level of inequality of pay to be undone.

We turn now to describing the basic changes in occupational structure, trade dependence and wage-setting institutions that occurred in the period that we study. We review change over time in our key measures of post-industrialism, globalization, and labor market institutions.

During the years between 1980 and 2000, the sectoral composition of employment continued to follow the pattern established in the early postwar years: a decline of the share of the workforce employed in agriculture and industry, and an increase in the share of the workforce employed in services. As late as 1980, Finland and Italy still had 14 percent of their workforces engaged in agriculture. By 2000, the shares of the Finnish and Italian workforce doing agricultural work was roughly 5 percent in each country. The average share of the workforce in agriculture declined from 7 to 4 percent between 1980 and 2000 across our 16 countries overall. In addition, countries converged in the sense that those that began

with the largest agricultural workforces saw those workforces decline the most.

The decline in agricultural employment is, of course, a longterm trend that started with the Industrial Revolution. More pertinent for recent changes in pay inequality is the decline of the share of workers employed in industry and the shift to tertiary employment, trends we illustrate in Figure 2. Between 1980 and 2000, the average share of the workforce in industry declined from 35 percent to roughly one-quarter. Germany had the largest share of workers in industry, both in 1980 (44 percent) and in 2000 (34 per cent). The former English colonies — the United States, Canada and Australia — had the least (30-31 percent in 1980, and 22-23 percent in 2000). The decline of industrial employment was least in Japan (35 percent in 1980, 31 percent in 2000) and most in France (36 percent in 1980, 24 percent in 2000) and Switzerland (38 percent in 1980, 26 percent in 2000). As in agriculture, there was convergence across our countries in the share of the workforce in industry. In 1980, the share of employment in industry varied from 29 percent to 44 percent. In 2000, the range had fallen to a minimum of 22 percent and a maximum of 34 percent. Most notable of all, the decline of the share of workers in industry and the increase of the share of workers in services was a universal phenomenon among advanced industrial countries. In no advanced industrial country did the share of workers in industry grow between 1980 and 2000. By 2000, an average of 70 percent of employees in advanced industrial countries worked in the service sector.[8]

Figure 2 about here

Unlike the monotonic time trends of occupational shares, the importance of international

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[8]The decline of the share of employment in industry does not imply a decline in share of industrial goods in GDP. Productivity gains in industry mean that a smaller share of workers can produce goods with equal or greater value.

trade, as measured by the ratio of imports plus exports over GDP, has fluctuated, as illustrated in Figure 3. Between 1980 and 1995, the importance of international trade remained roughly constant, before rising sharply in the second half of the 1990s. Trade with less developed countries, by contrast, followed a U-shaped pattern over the two decades we examine. Between 1980 and 1986, the share of GDP going to trade with less developed countries was roughly constant. After 1986, trade with less developed countries fell by one third before reviving in 1992. By 2000, trade with less developed countries was more or less where it had been in 1980.

<center>Figure 3 about here</center>

In sheer scale, trade among advanced industrial countries is far more important than trade between advanced industrial countries and the less developed world. On average, imports and exports equal 80 percent of GDP in 2000. The figure for imports and exports from less developed countries is only 16 percent in 2000. Yet trade with less developed countries may be more consequential for the distribution of pay than trade in general. The Low Countries, which includes Belgium (whose imports and exports equal 167 percent of GDP in 2000) and the Netherlands (whose imports and exports equal 130 percent of GDP in 2000), are the world's relatively largest traders, including with less developed countries. The large countries, which includes the US (imports and exports equal to 26 percent of GDP in 2000) and Japan (whose imports and exports equal 21 percent of GDP in 2000), are the most autarchic countries, and trade the least. While a majority of the countries in our sample experienced a growth of trade between 1980 and 2000, a few experienced a decline. Japan stands out in this regard. Imports and exports as a share of GDP in Japan declined from 28 percent in 1980 by 33 percent over the subsequent 20 years. The western European countries

<center>11</center>

are on average more dependent on trade than the non-European countries, but more of their trade is among similar countries. The countries with the highest proportion of trade with the less developed countries are the United States, Japan and Australia.

The period between 1980 and 2000 was not an easy one for union movements. The basic story is told in Figure 4 and Figure 5, illustrating the dramatic and almost continuous decline in union membership country by country and on average for the 16 nations we study.[9] Average union density declined from 47 percent to 39 percent of the workforce. Looking at union density weighted by size of the dependent workforce, which we include in Figure 5, the decline is even worse, because unionization is less in the larger countries (Wallerstein 1989). In 1980, one third of workers in advanced industrial countries were union members. In 2000, only 22 percent belonged to a union, a decline of one third over two decades. Only the Nordic countries plus Belgium maintained stable levels of union density between 1980 and 2000. It is notable that four of the five countries with high and stable levels of union density have what is called the Ghent system, where the unemployment insurance system is administered by the unions (Rothstein 1992).

Figures 4 and 5 about here

Another measure of the influence of organized labor on wages is the level at which wages are set. In a competitive labor market, wages are either set by the employer or by individual bargaining between employer and the employee. With plant or firm bargaining, wages are set at the level of the firm or plant. With industry-bargaining, which is common in western Europe, wages are set at the level of the industry, which may be very broadly defined. Alternatively, the basic parameters of the distribution of pay may be set nationally.

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[9]The data on union membership that we use exclude retired and unemployed union members. Including retired union members would present an exaggerated picture of union strength in some countries.

National pay-setting occurs in two distinct ways. In some countries, the association of employers and the confederation of unions bargain at the national level, concluding a pay agreement that covers the entire private-sector workforce. A second form of national pay-setting is via parliamentary intervention, or incomes policies. There are also "hard" and "soft" forms of national pay-setting, a distinction that cuts across the site of national bargaining. In collective bargaining, the key distinction is between wage contracts which prohibit strikes and lockouts during the life of the contract and those that do not. In government regulation of private-sector wages, the key distinction is between regulations that are mandatory and those that are voluntary. On the basis of these distinctions, we use a four-category scale, which is coded annually: (1) pay-setting at the level of the enterprise or lower; (2) pay-setting at the level of the industry; (3) pay-setting at the national level without sanctions; and (4) pay-setting at the national level with sanctions (Golden, Lange, and Wallerstein 2002).

The average level of pay-setting declined slightly between 1980 and 2000, as illustrated in Figure 6. But raw numbers can be deceiving. (Wallerstein and Western 2000) estimate a model based on the idea that the centralization of bargaining or incomes policies is a response to macroeconomic difficulties, conditional on the prior history of centralization. Their study found a significant reduction in the likelihood of centralization after 1980 that could not be explained by current macroeconomic conditions, relative to the 1960s and 1970s. Similarly, (Wallerstein and Western 2000) estimate a hierarchical model of union density that combines cross-countries variables — the existence of the Ghent system of union administered unemployment insurance, social-democratic government, bargaining centralization and the size of the countries — with times series variables such as unemployment and inflation. Again,

they find the decline in union density cannot be explained by the variables that statistically account for union density prior to 1980. Since 1980, the political and the economic environment has become more hostile for unions in every way.

Figure 6 about here

It is nonetheless premature to conclude that unions became irrelevant. Coverage, the share of workforce covered by a union contract, has not declined outside of the United States, Japan, Canada and the UK, at least since 1990, the last year for which we have data. In western Europe (except for the UK), 80 percent of workers were covered by a union contract in 1990 in spite of the decline of union density.[10] In addition, systems of industrial relations are more likely to change incrementally than discontinuously. Margaret Thatcher, when British Prime Minister, tried to reduce the power of unions to prevent workers' organizations exercising influence in either the labor market or in politics. At the same time, the Dutch revived a soft form of centralized bargaining to confront similar macroeconomic difficulties, and experienced equal success in reducing unemployment (Nickell and van Ours 2000). The fact that pay inequality also rose substantially in both countries means that alternative pay-setting institutions may not longer matter for the growth of inequality.

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[10]The reasons for the differences between coverage rates and density are varied. In all European countries, union and non-union members who work side-by-side in the same plants receive the same wage. (Closed and union shops are rare in Europe.) In Germany, the terms of wage agreements negotiated between a union and an industry-level employers' association are binding on all firms that belong to the employers' association, whether or not their workers belong to the union. In France, union-negotiated contracts are regularly extended by government act to cover all workers in the industry.

4 Methodological Approach

Our purpose is to study the effects of the declines in industrial employment, increases in international trade, and changes in labor-market institutions on the rise of wage dispersion since 1980. Our approach is to specify a statistical model using first differences over five-year periods. In other word, we estimate a model of the form

$$\Delta y_{it} = \beta_1 \Delta x_{1it} + \beta_2 \Delta x_{2it} + \ldots + u_{it}$$

where $\Delta x_{kit} = x_{ki(t+1)} - x_{kit}$. (Note that, as we explain below, $t = 1980$, 1985, 1990, 1995 and 2000, so $t+1$ means t plus a five-year increment.) By specifying the model in first differences, the intercept vanishes. The differences in variables that are constant over time fall out of the analysis.

Rather than work with annual data, as is common, we chose to work with periods of five years, where our measures are the differences between the first and last year within each period. As a result, there are, at most, four periods for each country: 1980–1985, 1985–1990, 1990–1995 and 1995–2000. The loss of information that occurs with period differencing is less than appears. The distribution of pay and many of our explanatory variables change only incrementally, and there is not a lot of variation from one year to the next.

The limited annual variation is not a sufficient reason to use five-year period differences instead of annual (or averaged annual) data since we could have five times the sample size with annual data. The most important reason for working with five-years periods rather than annual data is that we do not think the effects of the explanatory variables are instantaneous. We do not expect the parameters of pay distribution to immediately reflect the impacts of

the various causes of increased inequality that we examine. Pay agreements frequently have a lifetime of two years, and sometimes more. A new government committed to changes in public policy takes time to prepare legislation, and it is even longer before the legislation is implemented. The determinants of the inequality of pay are characterized by "variable and unknown lags."[11] Rather than impose an arbitrary lag structure on the data, we chose to be agnostic about the timing of the effects within the five-year periods. By using five-year differences, we are in effect allowing a change in x to affect our dependent variable, y, any time over the next five years; our measure is created to pick up any possible effect after five years. We believe that the results of this setup are more credible and robust, even though the size of the sample we use is correspondingly smaller.[12]

The measure that we use of the inequality of wages and salaries is

$$y = \ln\left(\frac{p90}{p10} - 1\right) = \ln\left(\frac{p90 - p10}{p10}\right)$$

where $p90$ is the wage at the 90th percentile and $p10$ is the wage at the 10th percentile of the pay distribution. It is common to take the log of the $\ln(p90/p10)$ instead the $p90/p10$ as the dependent variable. By taking the log, it is assumed that people care more about proportional differences in pay than about absolute differences. We chose the variable $\ln((p90/p10) - 1)$ over $\ln(p90/p10)$ for theoretical reasons. The variable $\ln((p90/p10) - 1)$

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[11]The phrase was originally used by Milton Friedman to describe the relationship between the money supply and inflation (Friedman 1968).

[12]While most of the periods we use are five years long, a few are four years due to an absence of wage data. We used weighted less squares (WLS) to adjust the variance in the error term to account for the five versus four year periods. The four year periods are Austria 1995–99, Italy 1986–90, the Netherlands 1995–99 and Switzerland 1991–1995. In addition, we are missing wage data for Belgium 1980–84 and 1996–00, Denmark 1991–00, Germany 1980–84, Italy 1980–85 and 1996–00 and Switzerland 1980–90. Finally, wage data for Germany refer to West Germany, even after unification.

goes to negative infinity as the pay distribution approaches perfect equality ($p10 = p90$), which is the proper lower bound. Thus, $p90$ cannot be less than the $p10$. The difference between $\ln(p90/p10)$ and the $\ln((p90/p10) - 1)$ is minor with regard to statistical results. Throughout, we use the pay distributions for both men and women combined.

In addition to the explanatory variables that are the focus of our study, we include the following controls:

- Migrants as a share of the population. That immigration could significantly change the pay distribution is a major theme in the literature on the causes of the increase of pay inequality in the United States (Borjas and Freeman 1992). Unfortunately, cross-national data on migration are hard to find. The data we have are far from ideal; for one thing, they include children and the elderly, whereas it would be better to examine the possible impact of migrants on wage distribution including only those migrants in the labor force. Additionally, the data are available only at ten year intervals. However, these are the best we have.

- The right parties' share of parliamentary seats held by all parties in government. The right includes both right Christian and right secular parties.[13] There are a variety of policies that might a have an impact on pay distributions, from the minimum wage to employment protection regulations (DiNardo, Fortin, and Lemieux 1996; Rueda 2005). Like the literature on social insurance expenditures (Castles 1982; Huber and Stephens 2001), we find that the difference with regard to policies that affect pay equality is greater between the left-center and right parties than between the left and

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[13]For the coding of parties, see (Swank Nd).

left-center parties.[14]

- Social insurance expenditures as a share of GDP. A generous system of social insurance may reduce or prevent a rise in pay inequality that would have occurred otherwise. In particular, unemployment insurance and other benefits typically are progressive, in that the benefits replace a higher share of the labor-market earnings of the low-paid than high-paid workers. A generous systems of social insurance raises the outside option for low-pay workers more than high-pay workers.

- Unemployment rate. As noted earlier, the wage distribution tends to become more equal with high unemployment. Low-wage workers are more likely to be unemployed, which implies that the distribution of pay of those who remain employed becomes more equal.

- Female share of the workforce. Although the gender gap in pay has fallen in almost all advanced industrial countries, it has not fallen to zero. It is possible that the percentage of women in the workforce has an impact on pay equality.

- Initial level of pay inequality. It is possible that the change in inequality is affected by the initial level of pay inequality observed in the first year (1980) for which we have data. In the long run, the initial level of pay inequality must affect the change in pay inequality. Otherwise, the variance of cross-national differences in the level of pay inequality would increase without limit. But it is not clear whether the initial level of pay inequality would affect changes in the distribution of pay during the 20 years from 1980 and 2000.

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[14]We experimented with left, center and right parties entered separately. In all cases, the impact by the left and the center was indistinguishable.

The determinants of changes in pay inequality are commonly modeled as if they were invariant over time. Both theory and our knowledge of the world suggests this is unlikely to be true, however. Even over the relatively short period that we study, average total trade for our 16 countries increased from 61 percent in 1980 to 77 percent in 2000; average (unweighted) density fell from 47 percent to 38 percent; and the share of employment in the service sector rose from 58 percent to 70 percent. The sheer scale of these transformations suggest that threshold effects may be in play; that is, the impact of our independent variables on inequality may be non-linear. For instance, once union strength, proxied by density, falls below a certain level, the ability of unions, even in highly centralized bargaining environments, to protect wage equality may be compromised. In this paper, we handle these potentially complex methodological issues using the simple strategy of dividing our twenty years of data into two sub-periods, and we examine whether the determinants of wage inequality are similar in the two.

In fact, period differences jumped out as we analyzed the data, indicating substantial differences in the determinants of wage distributions in the 1980s and the 1990s. To document this, we estimate separate regression models for the 1980s and the 1990s. We regard our finding that there are differences in the determinants of changes in pay inequality in the 1980s and 1990s as a core and novel result of this study. Our confirmation of period effects suggests that more sophisticated non-linear statistical techniques of analysis may be warranted in future work.

A final methodological issue worth discussion before we turn to our results is the problem of endogenous explanatory variables.[15] Three of our independent variables may be poten-

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[15]For a recent general overview of the problem in comparative politics, see (Przeworski 2006).

tially endogenous, meaning that they may be caused by the distribution of pay while also contributing to changes in wage distribution. The first of these is the share of employees in industry compared with the service sector. We have already discussed the decline of the share of employment in industry as a possible cause of the rise of pay inequality. However, it is equally possible that countries that maintain unchanged levels of pay inequality by other means thereby reduce the change in the share of employment in industry. The occupational structure is affected by the distribution of pay, just as the distribution of pay is affected by the occupational structure. For example, the egalitarian pay distribution in Sweden, produced by the centralized system of bargaining, may have led to a specialization in industries where a relatively egalitarian distribution in pay was efficient (Davis and Henrekson 2005). Occupational structures evolve in part in response to institutions determining wage distribution.

Two other variables stand out as potentially endogenous. Many scholars view the "rigidities" in the wage-setting systems in Europe that keep the distribution of pay relatively egalitarian as also largely responsible for the high levels of unemployment in countries such as Germany, France and Italy. Where pay differentials are small, and even workers at the bottom of the pay scale receive relatively "good" wages, firms have a disincentive to hire new workers, thereby inducing higher levels of unemployment. Thus, the rate of unemployment may be both cause and effect of pay equality. In addition, there is a literature on the impact of the distribution of pay on the political support for social insurance (Moene and Wallerstein 2001; Moene and Wallerstein 2003; Iversen and Soskice 2001). Social insurance benefits may decrease with greater inequality, for instance, as voters are loathe to support redistribution to those who have lost market income through job loss.

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Our solution to the problem of endogeneity is to use instrumental variables. We estimate the share of employment in industry, the rate of unemployment, and social insurance expenditures as a share of GDP by two-stage least squares (2SLS). We use spending on pensions and health care as a share of GDP as instruments for social insurance. (Moene and Wallerstein 2003) show that expenditures on pensions and health care is not correlated with pay equality. When the unemployment rate is not included in the set of controls, we include the unemployment rate as another instrument for social insurance. We use the average replacement rate of the unemployment benefit as the instrument for the unemployment rate. When social insurance is not included among the set of controls, we include pensions and health expenditures as additional instruments. Finally, we use the log of the area of each country (in square kilometers) as the instrument for the share of workers in industry. This is highly correlated with the share of workers in industry and is otherwise not correlated with pay equality.[16]

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[16]Although we are able to handle the potential endogeneity of these three variables, our study treats trade openness and key labor market institution measures — union density and the level of wage-setting — as exogenous. Some have argued that compensation for the losers from free trade is necessary for free trade to be politically sustainable (Rodrik 1997; Garrett and Mitchell 2001; Adsera' and Boix 2002). While the emphasis in the literature involves compensation via social insurance or job retraining, the same polices might keep the wages of low-wage workers from falling. Wage-setting institutions might be endogenous because labor market actors or governments might seek changes in the face of perceived failures in macroeconomic performance. If governments, employers or even unions view current wage-setting institutions as barriers to the achievement of full employment, for example, there will be pressures to change them, as is the case in Germany today. Or too much equality of pay may provoke a backlash by higher-pay workers, as was part of the story of the decentralization of wage setting institutions in Sweden (Huber and Stephens 1998; Pontusson and Rueda 2000; Wallerstein and Golden 2000). Our defense is that to treat trade policy and wage-setting institutions as endogenous requires a separate study.

5 The 1980s: The Importance of Labor Market Institutions on the Distribution of Pay

During the 1980s, the most prominent determinants of the rise in the inequality of wages and salaries was the decline of union membership as a share of the labor force and the decentralization of the system of wage setting. The best fitting regression, presented in Table 1, has only these two explanatory variables measuring the change of wage setting institutions. In the 1980s, changes in the domestic labor market institutions mattered for the change of pay equality. Of course, the changes that occurred in wage setting institutions may be explained by more fundamental changes, such as the character of technological change that occurred. Those countries that kept their wage setting institutions intact, however, did not experience increases in wage inequality in spite of technological change or other fundamental changes that might have caused pay inequality to increase. In this way, the results for the rise in pay inequality in the 1980s match the determinants of cross-country differences in the levels of pay inequality (Wallerstein 1999). The large cross-country differences in the level of pay inequality that existed in 1980 and the smaller changes in pay inequality that occurred between 1980 and 1990 are best explained by cross-country differences in wage setting institutions, in particular, union density and the extent of the centralization of wage setting.

Table 1 about here

The coefficient on union density implies that a one percentage point decline in density is associated with a three-fourths rise in the proportional difference between pay at the 90th percentile and pay at the 10th percentile. In more intuitive terms, a one percentage point

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decline in density is associated with an approximately 0.5 percentage point rise in the 90/10 ratio ($.5 \approx \exp[-.75]$). For example, union density fell from 51 percent to 39 percent of the work force in Great Britain between 1980 and 1990, while the 90/10 ratio rose from 2.98 to 3.41. The point estimate would have predicted a rise from 2.98 to 3.58. In the United States, union density declined from 22 percent to 15 percent between 1980 and 1990, while the 90/10 ratio increased from 3.83 to 4.34. The point estimate would have predicted an increase from 3.83 to 4.18.

To understand the impact of the estimated change in the centralization of wage setting, recall that the scale goes from 1 (wage setting at the level of the firm) to 4 (wage setting at the level of the nation with sanctions against strikes). A decline of $\exp[-.044]$ in one unit of the scale, or $\exp[-.0044 * 3] \approx -.88$ of the difference from the most to least centralized wage setting, was associated with a 12 percentage point rise in the 90/10 ratio. For example, the level of wage setting in Sweden between 1980 and 1990 declined, roughly, from centralized wage setting at the national level with sanctions to centralized wage setting at the national level without sanctions. During the same time period, the 90/10 ratio increased in Sweden from 2.03 to 2.11, an increase of 8 percentage points, although the Swedish pay distribution remains among the most egalitarian in the world. Norway and Finland, in contrast, whose systems of centralized wage setting did not change fundamentally, experienced reductions of wage inequality between 1980 and 1990 (2.07 to 2.03 in the case of Norway and 2.47 to 2.43 in the case of Finland).[17]

How much does the addition of other variables to the model contribute to or diminish the impact of density and the level of wage setting on the rise of pay inequality in the 1980s?

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[17]The other countries that did not follow the trend of increased pay inequality in 1980s were Australia, Belgium, and Germany.

The short answer is very little. Table 2 presents a summary of the results of running sets of regressions with every possible combination of control variables, always including density and the level of wage setting, that was not obviously wrong. The rule for an incorrect specification was that the sign of the regression coefficient did not fit the logic of being a cause of pay inequality. In such cases, we assumed the true coefficient was zero. In contrast, we included all of the variables that met the criterion of possibly causing pay inequality regardless of significance level.[18]

<div align="center">Table 2 about here</div>

Regardless of the combination of controls included in the regressions, the coefficient for the centralization of wage setting remains relatively unchanged. Table 2 reveals that the point estimate for the level of wage setting ranges from a minimum of $-.048$ to a maximum of $-.039$, with associated t-statistics of 3.22 and 2.83. No matter which other variables are included in the regression equation, the coefficient on the level of wage setting is substantially important and statistically significant at all conventional levels.

Almost the same is true for the coefficient on union density. The coefficient on density has a minimum of $-.92$ (with a t-statistic of 3.10) and a maximum of $-.56$ (with a t-statistic of 1.20). The coefficient on density is not as robust as that on the centralization of wage setting. The coefficient on density, however, only loses magnitude and statistical significance when the number of other variables included in the regression is large relative to sample size. Using all combinations of the control variables, the coefficient on density is significant at the

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[18]The procedure we followed is a example of extreme bounds analysis, developed by (Leamer 1998), under a particular set of priors, namely the priors that the control variables is centered at zero and that we attach zero probability to the possibility of a regression coefficient with the wrong sign. We ran 256 regressions in all, but our rule for dropping variables that were incompatible with being a cause of the rise of pay inequality meant that only 32 separate regressions had to be considered.

95 level, using a one-tailed test, 25 out 32 times.

We turn now to other control variables. The proportion of migrants in the population and the female share of the work force never exhibit the "right" signs as potential causes of pay inequality. A high female share of the work force, for example, is always positively associated with pay equality. One interpretation is that a high female share of the work force is a product of similar labor market regulations that keep wage inequality from rising, rather than functioning as an independent cause of pay inequality. All the other control variables we use explain some of the variance in combination with some subset of other variables, but none attain statistical significant at the 95 level using the one-tailed test. While it is possible to explain the rise of pay inequality by a large number of variables, none of them, other than the level of wage setting and density, is individually significant. The parsimonious model that includes only the change in density and the change in the centralization of wage setting displayed in Table 1 is the most compelling story.

Another test of robustness consists of deleting each individual country from the sample to check whether any single country is particularly influential in the results we report. The results after removing each country, one-by-one, are presented in Table 3. The coefficient on the level of wage setting remains robust no matter what country is removed. The coefficient on union density, however, depends specifically on the inclusion of Britain and the United States. If we remove both Britain and the United States from the sample, the coefficient on density falls to half. In the 1980s, the decline in union members in Britain and the United States was particularly important in explaining the rise of pay inequality in the OECD countries.

We interpret these findings as follows. In Britain and the United States, the share of

the work force who are union members and the share of the work force who are covered by a union contract are the same. In many European countries and in Australia, by contrast, most workers are covered by a wage agreement whether or not they belong to a union. When coverage is divorced from union membership, the pay distribution is influenced more by the structure of bargaining than by density. Density is specifically important in settings in which only union members are covered by collective wage agreements.

Table 3 about here

6   The 1990s: The Importance of Social Insurance and Trade with LDCs in the Determination of Pay

During the 1990s, unions and structures of collective bargaining disappear as significant determinants of changes in pay inequality. The most important factor that prevents wage inequality from rising in the 1990s is social insurance policies. The most important factor that increases the rise in wage inequality, by contrast, is the increase in trade with less developed countries.

Our basic regression for the 1990s is presented in Table 4. Two variables stand out: expenditures on social insurance policies and exports plus imports with less developed countries, both measured as shares of GDP. The coefficient on trade with LDCs indicates that a one percentage point increase in trade with less developed countries is associated with a one percentage point increase of wage inequality as measured by $\ln\left((90/10) - 1\right)$. The coefficient on social insurance expenditures indicates that a one percentage point increase in social insurance expenditures is associated with a one percentage point decrease of $\ln\left((90/10) - 1\right)$.

Translating this into more intuitive terms, a one percentage point increase in trade with less developed countries or a one percentage point decline in social insurance expenditures is associated with a $\exp[-1] \approx .37$ rise in the 90/10 ratio.

Table 4 about here

The results for the 1990s are less robust than those for 1980s. Performing the same exercise as before, we regressed trade with LDCs and social insurance expenditures with all combinations of other independent and control variables, again throwing out variables with coefficients that are incompatible with being a cause of changes in the distribution of pay. The range of the coefficients for trade with LDCs and social insurance expenditures is much wider. Half the time, trade with LDCs does not attain statistical significance at the 95 percent confidence level with a one-tailed test. Social insurance expenditures fails to attain statistical significance at the same level for one-third of the regressions. Nevertheless, no variables ever attain statistical significance at the 95 percent level, no matter which other variables are included, except trade with LDCs and social insurance expenditures in our analysis of the 1990s. In contrast, the results from deleting countries one-by-one from the sample show the same stability as those for the 1980s, as Table 6 reveals.[19] Our results are not dependent on any single country.

Table 5 about here

Table 6 about here

In sum, the determinants of the rise of wage inequality seem to be substantially different in the 1980s and the 1990s. By the 1990s, unions lost their ability to protect the relative wages of low-paid workers. Instead, that task has been taken up by government-mandated

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[19]Denmark does not have wage data for the 1990s.

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social insurance programs. Even more striking is the decline in the importance of domestic labor market institutions and the increase in the importance of trade with less developed countries in determining the wage distribution. Trade with other developed countries does not matter for the distribution of pay. It is trade with less developed countries that is making the distribution of pay more unequal in the developed countries in the 1990s.

7   Discussion and Conclusions

In the 1980s, the cause of the growing inequality of salaries and wages was a weakening of labor market institutions that had previously promoted wage equality. We find that rising wage inequality occurred due to a decline in union density and a shift in pay-setting from the national to the industry level or from industry to the firm, depending on the country. The decline of union strength reduced the influence of organized labor on the distribution of pay. Strong unions and centralized systems of pay-setting have been associated with relatively flat distributions of pay. Both the decline of union density and the decentralization of the level of pay-setting allowed the relative pay (and sometimes the absolute pay) of low-skilled workers to fall, thereby increasing wage inequality.

In the 1990s, however, relatively more trade with less developed countries and changes in social insurance programs are more important causes of changes in wage inequality than the decline of unions. The growing trade with less developed countries is the primary explanation for the growing inequality of pay in the 1990s. For the first time, international factors became primary motors in increasing pay inequality within and between advanced industrial countries. The generosity of social insurance programs is the main barricade to the growth in

inequality. Thus, there was a switch from unions to governments — through social insurance policies — in offering protection to workers' pay relativities.

In contrast, there is no evidence that changes in trade between developed nations affected pay inequality. Nor is pay inequality associated with the decline of industrial employment within these nations. In addition, we find no robust evidence of the impact on pay inequality by any other explanatory variable we include, ranging from migration, government by parties of the right, the unemployment rate, the female share of the workforce, or the initial level of pay inequality in 1980. Of course, the level of expenditures in social insurance policies reflects the different choices of right versus left-center governments. Governments of the right, however, did not affect pay inequality beyond expenditures in social insurance.

Why should we find that different types of variables are significantly associated with rising pay inequality in the 1980s compared with the 1990s? We speculate that the cumulative impact of the decline of organized labor and the central regulation of pay setting has been to create a kind of global wage competition involving trade with less developed nations. Even though the share of trade with the less developed nations by the advanced countries did not increase substantially over the period we study, the decline of unions that we observe allows threshold effects to occur. Once unions become sufficiently incapable of protecting wage inequality, the low wages paid in the less developed nations exert a relatively large effect on the wage distributions in wealthy countries. Our data thus reveal what we might conceptualize as a regime change in the determinants of wage inequality in the affluent nations of the world.

There are two observations worth making to keep these results in perspective. First, the differences between countries in levels of inequality are much more important than are

the changes within each country in pay inequality over time. This is true even for the advanced industrial world, where inequalities between countries are much less than between the world's wealthy and poor nations (Bourguignon and Morrisson 2002). Although changes in inequality accumulate over time to produce changes in the levels of inequality, the level of inequality itself changes only slowly. Cross-national variation in the level of inequality is much larger than the variation in changes of inequality over time within a given nation, even over a 20 year period. For example, the Swedish pay distribution is still one of the flattest in the world, even though Sweden experienced one of the proportionately largest increases in inequality between 1980 and 2000 in the OECD. In this sense, cross-national differences in levels of inequality remain the main puzzle, in spite our focus on change over time.

The second observation is that, despite the rise of inequality within OECD nations, inequality at the global level has been reduced in recent decades if countries are weighed by population (Firebaugh 2003). Trade between advanced industrial countries and less developed countries generally works to the advantage of unskilled workers in poor countries. The incomes of these workers has increased as they relocate from poor rural areas to newly developing regions, where they are absorbed into the industrial (and service) sectors. In contrast, trade between advanced industrial countries and less developed countries generally works to the disadvantage of unskilled workers in rich countries. These workers find their jobs competed away by the unskilled in developing nations.

At the global level, the rise of GDP in Asia is more important than the rise in wage inequality in advanced industrial countries. Unemployment among the low-skilled in the advanced nations is more than countered by the improvements in well-being that industrialization brings with it for workers in countries such as China and India. These improvements

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represent a reversal of a trend that begin in the nineteenth century, when a small number of countries began to industrialize, thereby creating vast disparities of wealth and well-being between their citizens and the populations of the rest the world. This decline in global inequality has occurred, however, at the expense of the low paid workers in developed countries, especially countries without adequate social insurance policies. These findings will not surprise students of international trade, because trade theory leads to expectations that match our findings. But they suggest that governments in wealthy countries will have to consider additional remedies to protect their unskilled from global competition.

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Table 1: The Causes of Growing Pay Inequality in the 1980s

Dependent variable: The growth in pay inequality			
Explanatory variables	coefficient	|t-statistic|	$p > \|t\|$
Level of wage-setting	$-.044$	3.34	0.003
Density	$-.75$	2.92	0.007

Notes: All variables have been differenced over five year periods. $n = 27$. Estimation method is weighted OLS.

Table 2: Summary of the impact of the controls in the 1980s

Dependent variable: The growth in pay inequality				
	Lower bound		Upper bound	
Explanatory variables	coefficient	$\mid t \mid$	coefficient	$\mid t \mid$
Level of wage-setting	−.048	3.22	−.039	2.83
Density	−.92	3.10	−.56	1.20
Industrial employ.	−.66	0.64	−.00	0.00
Trade	.06	0.25	.17	0.86
Trade with LDCs	.04	0.24	.65	0.85
Migrant stock	−			
Right parties in govt.	.020	0.68	.029	1.19
Social insurance	−.92	1.21	−.09	0.07
Unemployment rate	−1.75	1.03	−.67	1.33
Female share of emp	−			
Initial inequality	−.007	0.31	−.000	0.02

Notes: All variables have been differenced over five year periods. $n = 27$. Estimation method is weighted 2SLS.

Table 3: Country-by-country deletion in the 1980s

Dependent variable: The growth in pay inequality				
Explanatory variables	Level		Density	
Country deleted	coefficient	$\mid t \mid$	coefficient	$\mid t \mid$
Australia	$-.042$	3.14	$-.72$	2.71
Austria	$-.044$	3.24	$-.84$	2.94
Belgium	$-.048$	3.25	$-.72$	2.83
Canada	$-.049$	3.13	$-.73$	2.78
Denmark	$-.050$	3.11	$-.74$	2.74
Finland	$-.044$	3.21	$-.73$	2.71
France	$-.044$	3.63	$-.86$	3.41
Germany	$-.044$	3.62	$-.86$	3.57
Italy	$-.043$	3.35	$-.72$	2.87
Japan	$-.044$	3.26	$-.72$	2.66
Netherlands	$-.042$	2.71	$-.88$	3.08
Norway	$-.046$	3.03	$-.73$	2.80
Sweden	$-.041$	2.94	$-.77$	2.89
United Kingdom	$-.041$	2.90	$-.58$	1.97
United States	$-.044$	3.49	$-.61$	2.35

Notes: All variables have been differenced over five year periods. $n = 27$. Estimation method is weighted OLS. Swiss pay data for the 1980s unavailable.

Table 4: The Causes of Growing Pay Inequality in 1990s

Dependent variable: The growth in pay inequality			
Explanatory variables	coefficient	|t-statistic|	$p > \|t\|$
Trade with LDCs	1.12	3.71	0.001
Social insurance	-1.04	2.98	0.006

Notes: All variables have been differenced over five year periods. $n = 28$. Estimation method is weighted 2SLS.

Table 5: Summary of the impact of the controls in the 1990s

Dependent variable: The growth in pay inequality				
	Lower bound		Upper bound	
Explanatory variables	coefficient	$\mid t \mid$	coefficient	$\mid t \mid$
Trade with LDCs	.58	0.83	1.48	2.62
Social insurance	-1.75	2.53	$-.41$	0.38
Industrial employ.	-2.41	1.25	$-.07$	0.04
Trade	$-$			
Migrant stock	$-$			
Right parties in govt.	.000	0.00	.034	0.78
Unemployment rate	$-.86$	1.18	$-.04$	0.05
Female share of emp.	.08	0.03	2.09	1.56
Initial inequality	$-.057$	1.70	$-.013$	1.17
Level of wage-setting	$-.035$	1.29	$-.003$	0.09
Density	$-.43$	1.48	$-.01$	0.02

Notes: All variables have been differenced over five year periods. $n = 28$. Estimation method is weighted 2SLS.

Table 6: Country-by-Country Deletion in the 1990s

Dependent variable: The growth in pay inequality				
Explanatory variables	Trade with LDCs		Social ins. over GDP	
Country deleted	coefficient	$\mid t \mid$	coefficient	$\mid t \mid$
Australia	1.02	3.08	$-.1.15$	2.88
Austria	1.10	3.46	-1.12	2.85
Belgium	1.11	3.79	-1.18	3.22
Canada	1.19	3.89	-1.07	2.82
Finland	1.25	4.00	$-.84$	1.97
France	1.11	3.57	$-.90$	2.33
Germany	1.11	3.45	-1.21	2.99
Italy	1.13	3.54	-1.08	2.84
Japan	1.11	3.57	$-.92$	2.34
Netherlands	1.06	3.19	-1.00	2.49
Norway	1.10	3.52	-1.05	2.66
Sweden	..99	2.95	-1.01	2.50
Switzerland	1.31	4.63	-1.19	3.36
United Kingdom	1.11	3.54	-1.08	2.75
United States	1.11	3.65	-1.13	2.89

Notes: All variables have been differenced over five year periods. $n = 28$. Estimation method is weighted 2SLS. Danish pay data for the 1990s unavailable.

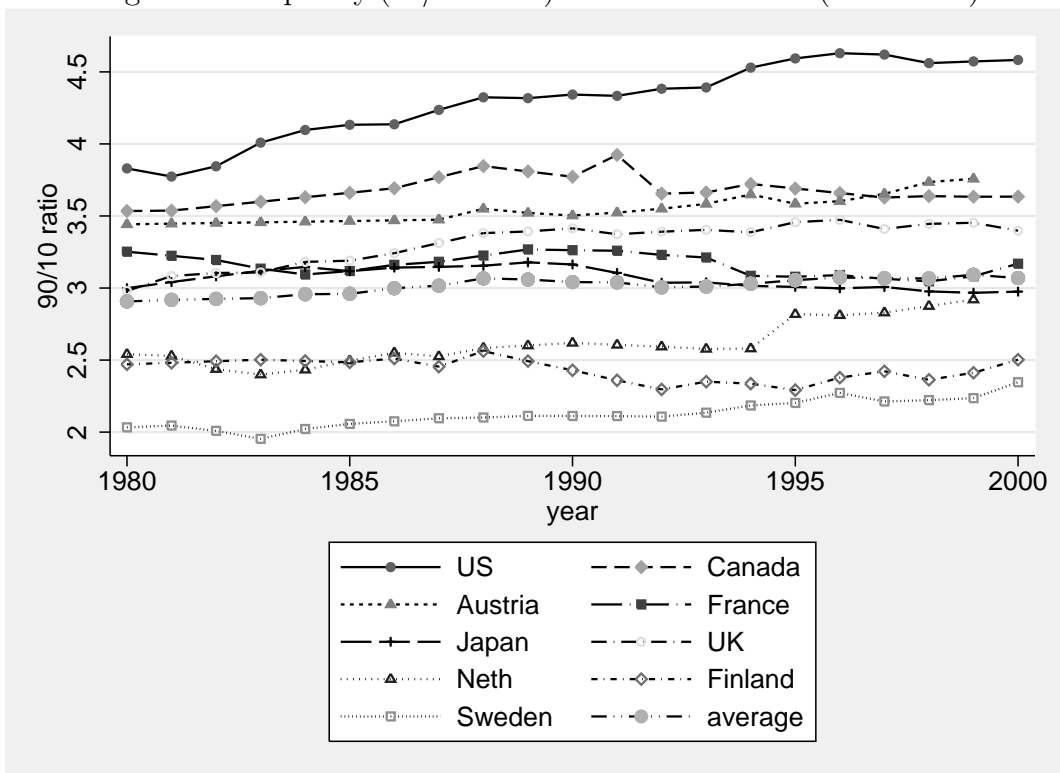Figure 1: Inequality (90/10 ratio) in Nine Countries (1980–2000)

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Figure 2: Shares of Industrial and Tertiary Employment in 16 Countries (1980–2000)
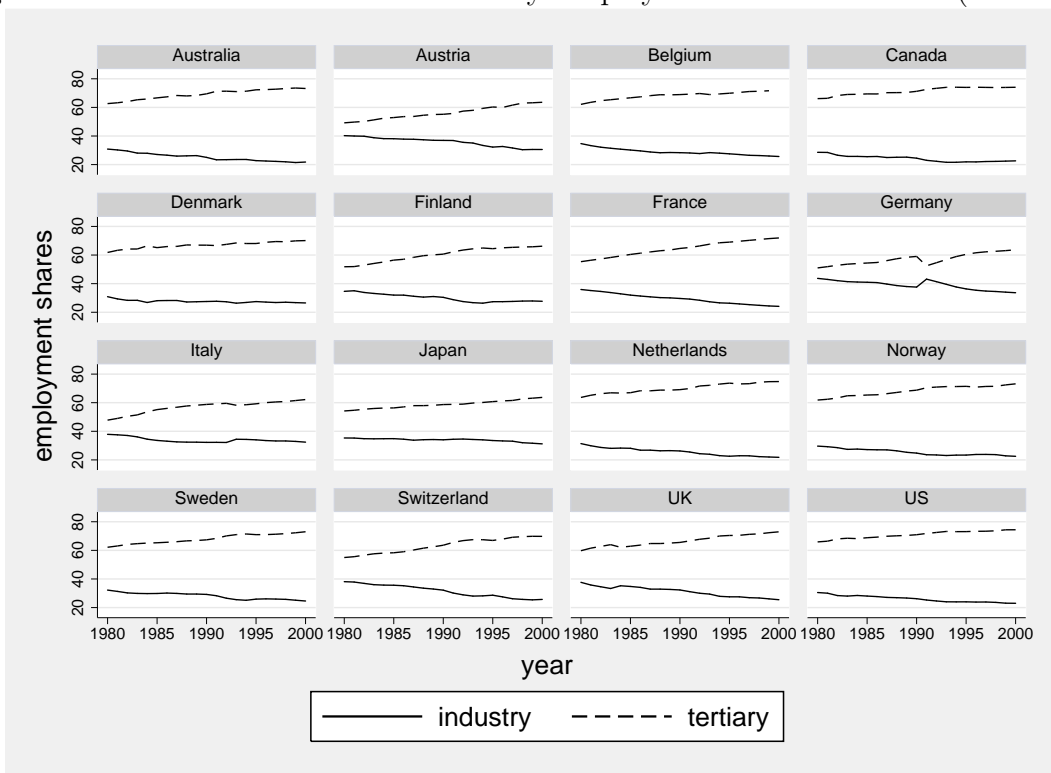
Figure 3: Total Trade and Trade with LDCs as Percent of GDP for 16 Countries (1980–2000)
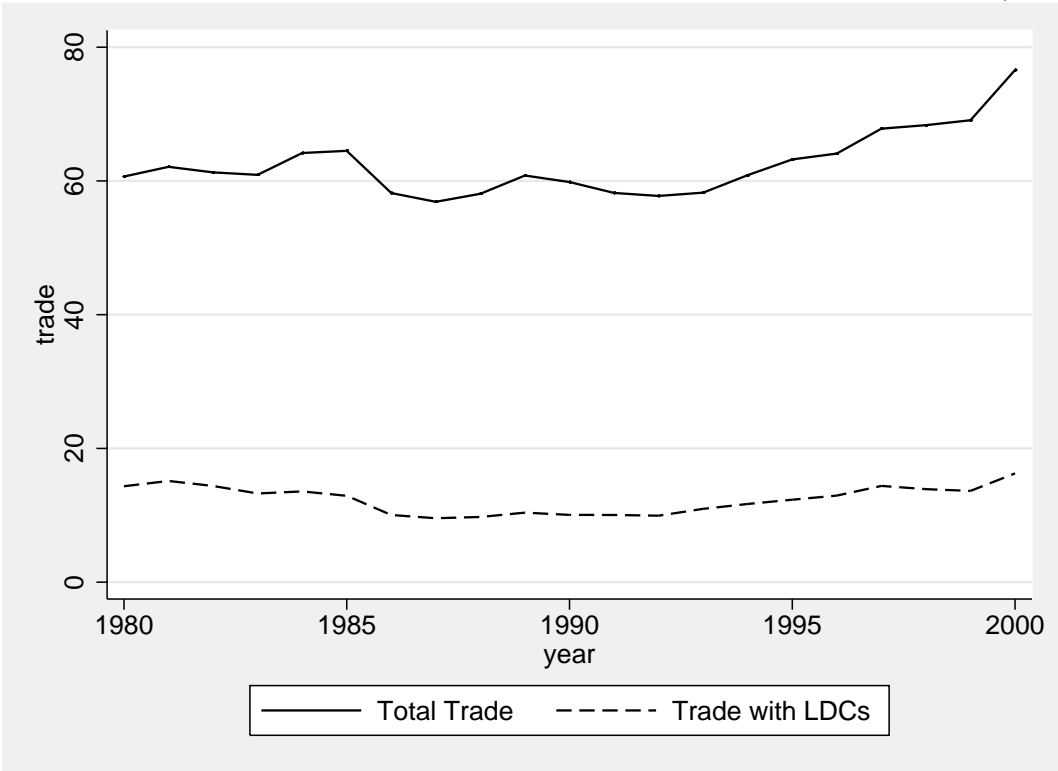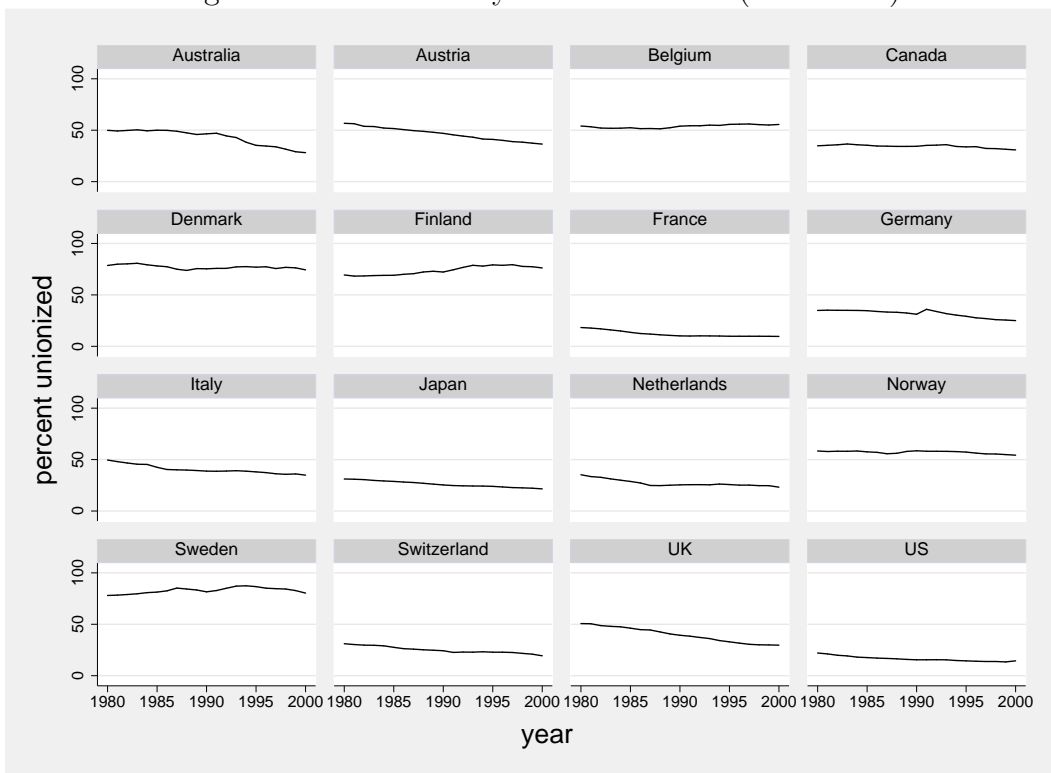
Figure 4: Union Density in 16 Countries (1980–2000)

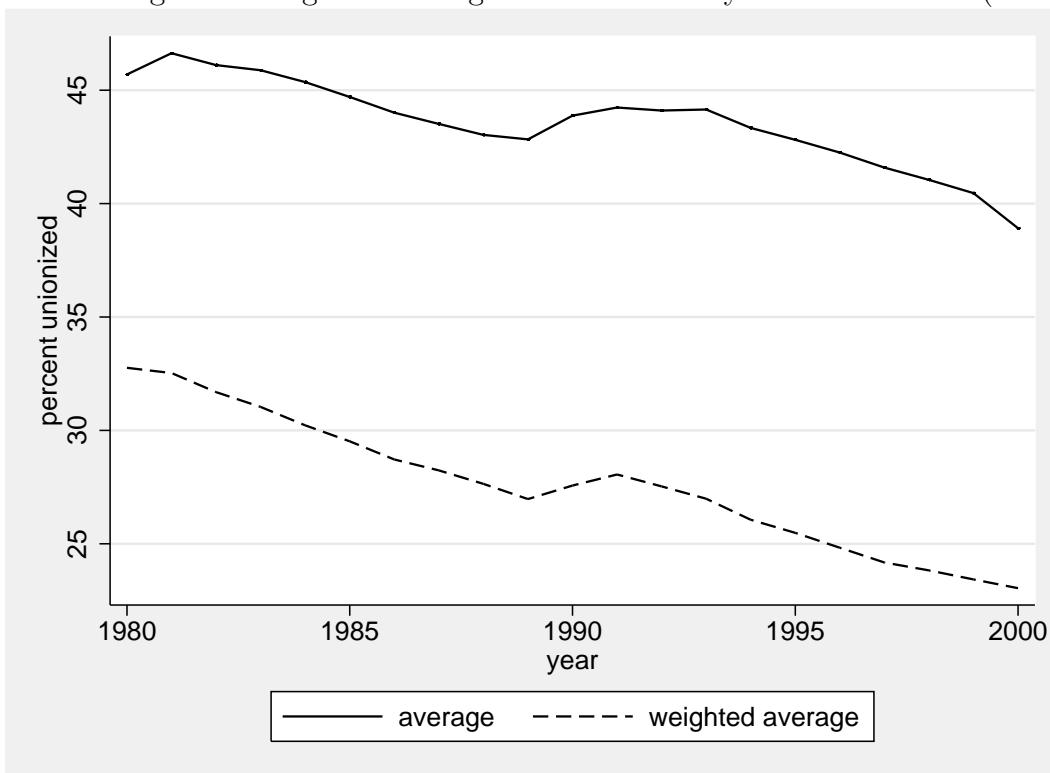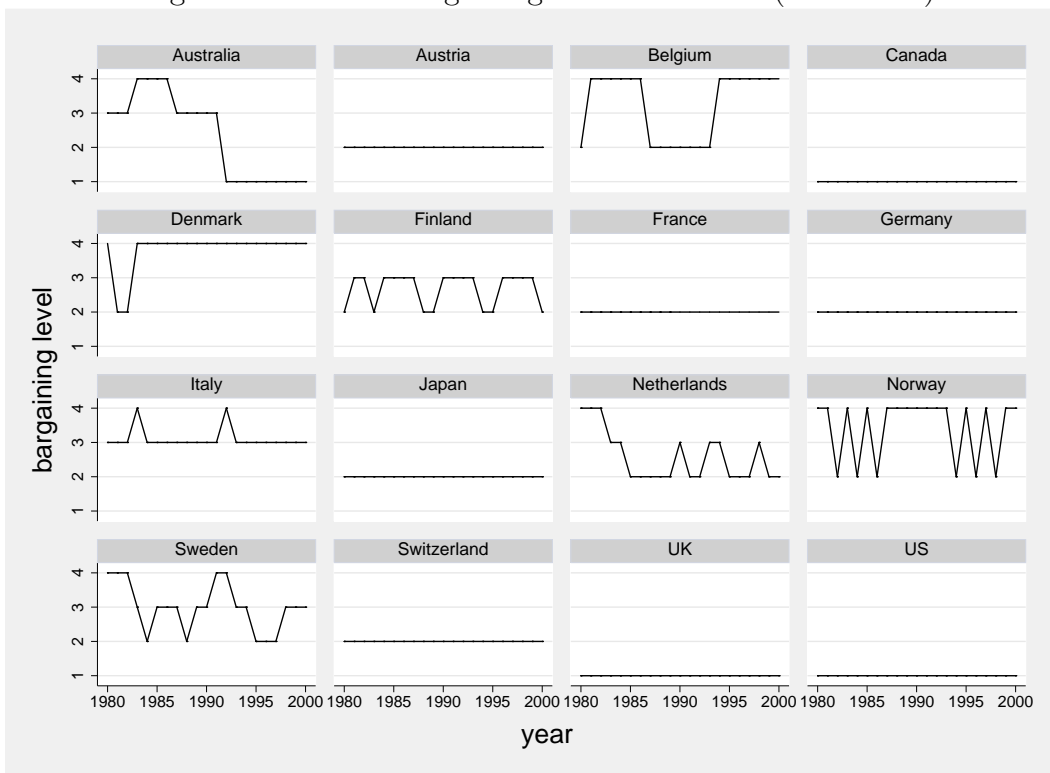Figure 5: Average and Weighted Average of Union Density for 16 Countries (1980–2000)

Figure 6: Level of Bargaining in 16 Countries (1980–2000)

Appendix**: Variables and Data Sources**

Civilian employment (thousands of persons): OCED Labor Market Statistics Database, last updated July 15, 2005.
Location: `http://www1.oced.org/script/cde/members/Ifsdataauthenticate.asp`.
Data available from 1980–00 except when noted in the country notes.

Belgium: Data series ends in 1999.

Civilian employment in agriculture (thousands of persons): OCED Labor Market Statistics Database, last updated July 15, 2005.
Location: `http://www1.oced.org/script/cde/members/Ifsdataauthenticate.asp`.
Data available from 1980–00 except when noted in the country notes.

Belgium: Data series ends in 1999.

Denmark: 1980 was obtained by geometric interpolation.

Finland: The 1990–97 figures are not credible. We used the *Quarterly Labour Force Statistics*, OECD Employment Statistics (`www.sourceoecd.org`) for 1990–97.

France: The 1990–00 data is not available from the Labor Market Statistics Database. We used the *Quarterly Labour Force Statistics*, OECD Employment Statistics (`www.sourceoecd.org`) for 1990–00.

Civilian employment in industry (thousands of persons): Same as civilian employment in agriculture, except for Belgium. We divided by the sum of civilian employment in agriculture, services and industry when calculating the share of civilian employment in industry.

Belgium: Data series ends in 1999. We added 2000 by assuming that the difference between 1999–2000 was the same as the difference between 1998–99.

Civilian employment in services (thousands of persons): Same as civilian employment in agriculture.

Employees (thousands of persons): OCED Labor Market Statistics Database, last updated July 15, 2005.
Location: `http://www1.oced.org/script/cde/members/Ifsdataauthenticate.asp`.
Data available from 1980–00.

Number of unemployed (thousands of persons): OCED Labor Market Statistics Database, last updated July 15, 2005.
Location: `http://www1.oced.org/script/cde/members/Ifsdataauthenticate.asp`.
Data available from 1980–00. We divided the number of unemployed by the sum of employees plus the unemployed to calculate the unemployment rate.

Union density (employed union members as a share of employees): OCED Labor Market Statistics Database, last updated July 15, 2005.
Location: `http://www1.oced.org/script/cde/members/Ifsdataauthenticate.asp`.
The data come from administrative data and/or survey data, with administrative data

being more frequent. We used administrative data except in noted in the country notes. Data available for all countries for 1980 to 2000.

Australia: The administrative data ends in 1996. We estimated density from 1997–2000 by assuming that the administrative data would have shown the same decline in density as the survey data. In particular, we added a constant to the survey data so the two series were equal in 1996.

United Kingdom: The administrative data end in 1996. We estimated density from 1997–2000 by assuming that the administrative data would have shown the same decline in density as the survey data. In particular, we added a constant to the survey data so the two series were equal in 1996.

United States: The administrative data end in 1980. We estimated density from 1981–2000 by assuming that the administrative data would have shown the same decline in density as the survey data. In particular, we added a constant to the survey data so the two series were equal in 1980.

Women as a share of the civilian work force: Source: OECD Labor Forces Statistics, various years. Courtesy of Evelyne Huber, Charles Ragin, John D. Stephens, David Brady and Jason Beckfield, Comparative Welfare States Data Set, Northwestern University, University of North Carolina, Duke University and Indiana University, 2004.

Government spending and revenues as a share of GDP: Disbursements: OECD, National Accounts, various years, Table 6.6, *OECD Historical Statistics*, 2001. Receipts: OECD, *National Accounts*, various years, Table 6.4, *OECD Historical Statistics*, 2001. Data includes disbursements and receipts received at all levels of government. Courtesy of Evelyne Huber, Charles Ragin, John D. Stephens, David Brady and Jason Beckfield, Comparative Welfare States Data Set, Northwestern University, University of North Carolina, Duke University and Indiana University, 2004.

Canada: Expenditure and revenue data missing for 1999–2000 in the Comparative Welfare States Data Set. We assumed that the figures for 1999–00 were the same as in 1998.

Japan: Expenditure data missing for 1999–2000 in the Comparative Welfare States Data Set. We obtained the expenditure figures from the revenue figures assuming that the deficit remained constant as a share of GDP since 1998.

Netherlands: Expenditure data missing for 1999–2000 in the Comparative Welfare States Data Set. We obtained the expenditure figures from the revenue figures assuming that the deficit remained constant as a share of GDP since 1998.

Sweden: Expenditure data missing for 1999–2000 in the Comparative Welfare States Data Set. We obtained the expenditure figures from the revenue figures assuming that the deficit remained constant as a share of GDP since 1998.

Switzerland: Expenditure data missing for 1999–2000. Revenue data is missing for 2000 in the Comparative Welfare States Data Set. We obtained the expenditure figure in 1999 from the revenue figures assuming that the deficit remained constant as a share

of GDP since 1998. We assumed that the expenditure and revenue figures for 2000 were the same as 1999.

United Kingdom: Expenditure data missing for 1999–2000 in the Comparative Welfare States Data Set. We obtained the expenditure figures from the revenue figures assuming that the deficit remained constant as a share of GDP since 1998.

United States: Expenditure and revenue data missing for 1998–2000 in the Comparative Welfare States Data Set. Data for 1998–2000 data obtained from the *Statistical Abstract of the United States*, U.S. Census Bureau, available at `www.census.gov/prod/www/statistical-abstract-04.html`. Since the two series differed slightly, we added a constant to the 1998–2000 figures equal to the difference between the two series in 1997.

Partisan composition of government: We use three variables. LEFT is the left parties' share of parliamentary seats held by all parties in government. CENTER is the center parties' share of parliamentary seats held by all parties in government, including both Christian and secular center parties. RIGHT is the right parties' share of parliamentary seats held by all parties in government, including both Christian and secular right parties. Source: Evelyne Huber, Charles Ragin, John D. Stephens, David Brady and Jason Beckfield, Comparative Welfare States Data Set, Northwestern University, University of North Carolina, Duke University and Indiana University, 2004.

Level of wage setting: This is a four-category scale of the level of wage setting in the private sector. The categories are (1) firm or plant-level wage setting, (2) industry-level wage setting, (3) national wage setting without constraints on lower level wage negotiations and (4) national wage setting constraints with constraints on lower-level wage negotiations. See the (Golden, Lange, and Wallerstein 2002) dataset at `http://www.shelley.polisci.ucla.edu/data` for details. Data available from 1980–00.

Migrant stock: The share of migrants in the population, available in 1980, 1990 and 2000. Source: *Trends in Total Migrant Stock, 1960–2000*, 2003 Revision, United Nations, Population Division, Department of Economic and Social Affairs, 2004.

Social insurance expenditures as a share of GDP: Data includes both public expenditures on social insurance and mandated private expenditures on social insurance. Source: Social Expenditure database (SOCX), 1980–2001, OECD, 2004.

Public expenditures on old age benefits as a share of GDP: Source: Social Expenditure database (SOCX), 1980–2001, OECD, 2004.

Public expenditures on health as a share of GDP: Source: Social Expenditure database (SOCX), 1980–2001, OECD, 2004.

Expenditures on unemployment insurance benefits as a share of GDP: Data includes both public expenditures on unemployment insurance and mandated private expenditures on unemployment insurance. Data also included all programs described as unemployment benefits by the OECD. In particular, the data includes much higher spending

in Denmark and Italy than standard payments of cash benefits from the unemployment insurance system. Source: Social Expenditure database (SOCX), 1980–2001, OECD, 2004.

France: From 1980–84, the French expenditure data show no spending on unemployment benefits. Yet the data set on the replacement rate in France show substantial spending. We used the figures from the OECD Social Expenditure Database 1980–1996.

Replacement ratio of unemployment benefits 1: Data is available for odd-numbered years between 1961 and 1999. we used the average of the two surrounding for even-numbered years and we assumed that there was no change between and 1999 and 2000. Source: OECD 2002, Benefits and Wages, OECD Indicators.

Italy: The replacement ratio between 1980 and 1993 was very low, less than one per cent.

Replacement ratio of unemployment benefits 2: Obtained by dividing expenditures on unemployment insurance benefits as a share of GDP by the unemployment rate times the share of employee compensation as a share of GDP, or RRUB2=UIEXP/(UE*WSHARE). Sources: Social Expenditure database (SOCX), 1980–2001, OECD, 2004, OCED Labor Market Statistics Database, last updated July 15, 2005 and Annual National Accounts for OECD Member Countries, Data for 1970 Onwards, available at `www.oecd.org > Statistical Portal > National Accounts`, June 21, 2005.

Trade: Imports and exports over GDP. Data for all countries from 1980–96 is from the International Monetary Fund, Direction of Trade [Computer file], ICPSR version, Washington, DC: International Monetary Fund [producer], Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 1999. For more details regarding this ICPSR study (#7628), go to `http://webapp.icpsr.umich.edu/cocoon/ICPSR-STUDY/07628.xml`. Exports are valued at "free on board." Imports are valued at "cost, insurance and freight," unless noted in the country notes. Data for all countries from 1997–2000 is from the Direction of Trade Statistics Yearbook (International Monetary Fund, 2000).

Australia: Reports imports as well as exports as "free on board."

Canada: Reports imports as well as exports as "free on board."

Trade with less-developed countries: Imports plus exports from less-developed societies. The source is the same as trade. For 1980–96, the set of industrial countries is defined as Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, San Marino, South Africa, Spain, Sweden, Switzerland, Turkey, Yugoslavia (but not the current countries that used to be part of Yugoslavia), the United Kingdom and the United States.

Wage inequality: There are five variables: 90/10, 90/50 and 50/10 wage ratios for both genders, 90/10 wage ratio for men, and 90/10 wage ratio for women. Source: OECD

wage dispersion dataset, last updated on Nov. 26, 2004. Except when noted in the country notes, the data refer to full time workers or full time equivalent workers and to gross wages and salaries.

Australia: 1996 was obtained by linear interpolation. Data is available from 1980–2000.

Austria: Data includes both part-time and full-time employers. Since the data on pay is collected by the day, it combines workers who work a full day with only part of a day. 1981–86 was obtained by linear interpolation. For 1995–99, the 90/10 ratio for both genders was estimated by regressing the ln(90/10) on the ln(75/25) without a constant, the 90/50 ratio for both genders was estimated by regressing the ln(90/50) on the ln(75/50) without a constant, the 50/10 ratio for both genders was estimated by regressing the ln(50/10) on the ln(50/25) without a constant and the 90/10 for women was estimated by regressing the ln(90/10) on the ln(75/25) for women without a constant. For 1990–94, the 90/10 ratio for men was estimated by regressing the ln(90/50) ratio for men on the ln(80/50) ratio for men without a constant and then subtracting the ln(50/10) ratio for men to obtain the ln(90/10) ratio for men. For 1995–99, the 90/10 ratio for men was obtained by regressing the 90/10 ratio on the 75/25 ratio for men without a constant. Data available for 1980–1999.

Belgium: The data is taken from the 2002 version of the OECD wage dispersion dataset. The 2004 dataset only contains pay net of taxes starting from 1999. The 90/10 ratio for both genders in 1985 and 1994–95 was estimated by regressing the ln(90/10) ratio on the ln(80/20) ratio for both genders without a constant. The 90/50 ratio for both genders in 1985 and 1994–95 was estimated by regressing the ln(90/50) ratio on the ln(80/50) ratio without a constant. The 90/10 ratio for men in 1985 and 1991–95 was estimated by regressing the ln(90/50) ratio on the ln(80/50) ratio for men and subtracting the ln(50/10) ratio for men to obtain the ln(90/10) ratio for men. Data available from 1985–95.

Canada: Pay data from the 2004 dataset only begins in 1997 and is calculated differently from the pay data in the 2002 dataset. In particular, the OECD switched from calculating pay on a weekly basis and calculated pay on a yearly basis. We assumed that the difference in calculation makes little difference above the median but may make a substantial difference below the median. Therefore, the 90/10 ratio for both genders, the 90/10 ratio for men and the 90/10 ratio for women for 1980–94 were obtained by regressing ln(90/10) on ln(90/50) without a constant, using the 2002 data for the 90/50 ratio from the 2002 dataset. 1980, 1982–85, 1987,1989 and 1995–96 were obtained by linear interpolation. Data on the 90/50 ratio for both genders from 1980–94 is from the 2002 dataset. 1980, 1982–85, 1987,1989 and 1995–96 were obtained by linear interpolation. Data on the 50/10 ratio for both genders from 1980–94 is from the 2002 dataset and is not comparable with the 50/10 data from the 2004 dataset that starts in 1997. Data available from 1980–2000 for all measures of inequality except for the 50/10 ratio, which is only available from 1980–94.

Denmark: Danish data includes both part-time and full-time employees, but the Danish wages are calculated by the hour. Data for the 90/10 ratio, 90/50 and 50/10 for all genders is available from 1980–90. No data available for men and women separately.

Finland: 1981–82 and 1984 were obtained by linear interpolation for all measures of inequality. Data available for 1980–00.

France: The French data is net of social security contributions. Data is available for 1980–00.

Germany: Data available for 1984–00.

Italy: Data available for 1986–96.

Japan: Data is available for 1980–00.

Netherlands: Data for 1998 for the 90/10 ratio, 90/50 ratio and the 50/10 ratio for both genders obtained by linear interpolation. Data for 1986–88, 1991–93 and 1998 for the 90/10 ratio for men and women separately obtained by linear interpolation. Data for the 90/10, 90/50 and the 50/10 available for 1980–99. Data for the 90/10 for men and women separately available from 1985–99.

Norway: The 90/10 ratio, the 90/50 ratio and the 50/10 ratio for both genders for 1980, 1983, 1987 and 1991 obtained from the OECD 2002 dataset. 1981–2, 1984–86, 1988–90 and 1992–96 obtained from linear interpolation. Data for the 90/10, 90/50 and the 50/10 are available for 1980–00. Data for men and women separately are not available.

Sweden: All measures of inequality for 1990 obtained by linear interpolation. The 1990 figures appear to be a mistake in the data. Data is available from 1980–00.

Switzerland: The data for the 10th percentile from 1999–2002 is not credible. Since the pay at the 20th percentile is unchanged from 1998–00, we assumed that the pay at the 10th percentile was unchanged as well from 1998–00. The data for men and women separately are not credible for 2000, so we replaced both with linear interpolations. Data available from 1991–00.

United Kingdom: Data available from 1980–00.

United States: Data available from 1980–00.