

Wage Inequality in the United States and Europe: A
Summary of the major theoretical and empirical
explanations in the current debate*

Frank Schroeder*

New York, October 2001

* I want to acknowledge financial support from the Ministry of Science and Technology of the State Northrhine-Westfalia, Germany.

* New School University, New York, e-mail: fschroeder@fesny.org

Introduction

The origins of increasing wage inequality and strategies to influence this development have stimulated major debates during the 1990's under economists. Over the last 20 years wage dispersion among workers has increased sharply in particular in the United States and the United Kingdom and led to a continuous shift of the income distribution at the expense of low and middle income groups of the society. The development in continental Europe is quite different, since the dispersion of wages has stayed quite stable over the same period of time. Whereas some economists argue that the quality of institutional arrangements has prevented the adoption of a more unequal Anglo-Saxon model, others state that the egalitarian structure in Europe was achieved at the cost of high unemployment. Or in other words, there is a trade-off between unemployment and wage inequality.

Research on changes in the wage structure and earnings inequality for the United States and other OECD countries has literally exploded over the past decade (Katz and Author, 1999; p. 1465). The objective of the paper is to summarize the major theoretical arguments in the current debate and to sum up empirical research results on this issue for Europe and the United States. I will then try to assess to what extent causal linkages exist between the different theoretical explanations on wage inequality.

The paper is structured as follows:

In Section 1 the theoretical framework and stylized facts of the literature on wage inequality will be introduced. The section will stress the importance of the demand and supply schedule, contains an overview of the recent development of earnings inequality in the US and Europe and explains the importance of wage differentials by educational attainment.

Section 2 presents a framework for understanding wage structure changes by taking into account the role of new technologies. Many economists argue that skill-biased technological change is the principal culprit for the decline in relative wages for less skilled workers. The section will describe the basic arguments of this proposition and will discuss its empirical relevance.

How International Trade has contributed to rising wage inequality will be discussed in section 3 of the paper. It will be looked at the assumption if International Trade Liberalization has caused losses in pay or employment for low wage workers in developed countries due to increased competition from less developed nations.

Section 4 will finally look at the importance of institutional factors for the explanation of wage inequality. This will include the role of Trade Unions as a social force and the impact of collective bargaining on earnings inequality. The section will also discuss the role of the federal minimum wage and its impact on wage dispersion. Since institutional wage setting mechanisms in Europe have prevented a more unequal structure, as in the US, it will be finally stressed if this had a negative effect on employment.

At the end of the paper the author will summarize the different factors at work in the rise of wage inequality and evaluate possible causal linkages between them.

1. Theoretical Framework and Stylized Facts

1.1 Shifts in the Demand and Supply for Labor

Through the lens of several economic textbooks the description of inequality is quite straightforward. As often stated, there is nothing about a market economy that ensures that a rising standard of living will be accompanied by reduced inequality. Technical change for example has been considered to be encouraged by the steady aspiration of economic agents to use scarce resources in a more efficient way. But why should the implementation of new technologies lead at the same time to an unequal distribution of income? The textbook view continues by referring to a situation in which technological change may bid up the price of factors that were already in scarce supply and thus already commanding high prices (see for example Danziger, Gottschalk, 1996, p. 126) For example, if the application of new machinery requires more highly skilled engineers who are the scarce factor in the economy, their wages will rise and reduce at the same time the demand for less skilled machine operators. The result is that wages of the already lower-paid machine operators will be pushed further down. Thus, as for example Rebecca Blank has put it: "Fundamentally, the demand of less-skilled workers appears to be declining faster than the number of less-skilled workers, and their wages are therefore drawn downward" (Blank, 1994, p. 125).

In other words, the magnitude of the change in wage inequality according to the conventional view depends on the given demand and supply conditions for labor in the economy. The reference to this conviction is very important for the evaluation of the literature on wage inequality, since the change in relative wages whether caused by technology, demography, globalization (trade and outsourcing) or institutional factors is almost exclusively explained by the shift of demand or supply for different groups of skilled labor (Katz, Autor, 1999, p.1466). Institutional Factors (e.g. minimum wage, unionization) may of course have a very particular status in this discussion, since they have the ability to limit market forces. It will be discussed later if the argument holds that as less responsive institutions are to changes in market forces, the more the impact is likely to fall on employment rather than on wages.

Before I will explain the different theories for understanding wage structure changes, one other important observation should be mentioned. The decomposition of overall wage

dispersion between groups falls short to explain the whole picture of the current state of the inequality discussion. As a matter of fact the available evidence suggests that wage inequality within groups has also expanded over the last 20 years. It is widely accepted that the pattern of the substantial increase in within-education group inequality is attributed to a payoff to “unobserved” skills.

1.2 Stylized Facts for the distribution of earnings

It may be a useful method first to illustrate the development of the US wage structure over the past two decades before taking into account the experiences in other OECD countries. This undertaking can be explained for several reasons. The literature on both the historical and recent changes in the US wage structure exceeds in absolute terms the coverage for all other industrial countries. The available research on the US has exploited a considerable amount of data, due to the availability of large-scale micro datasets. This has led to efforts by researchers in the United States to decompose the wage distribution into differences between groups and to develop a variety of approaches to explain changes in the US wage structure. Thus, we shall use the recent US experience as a benchmark to evaluate the wage dispersion in other OECD countries.

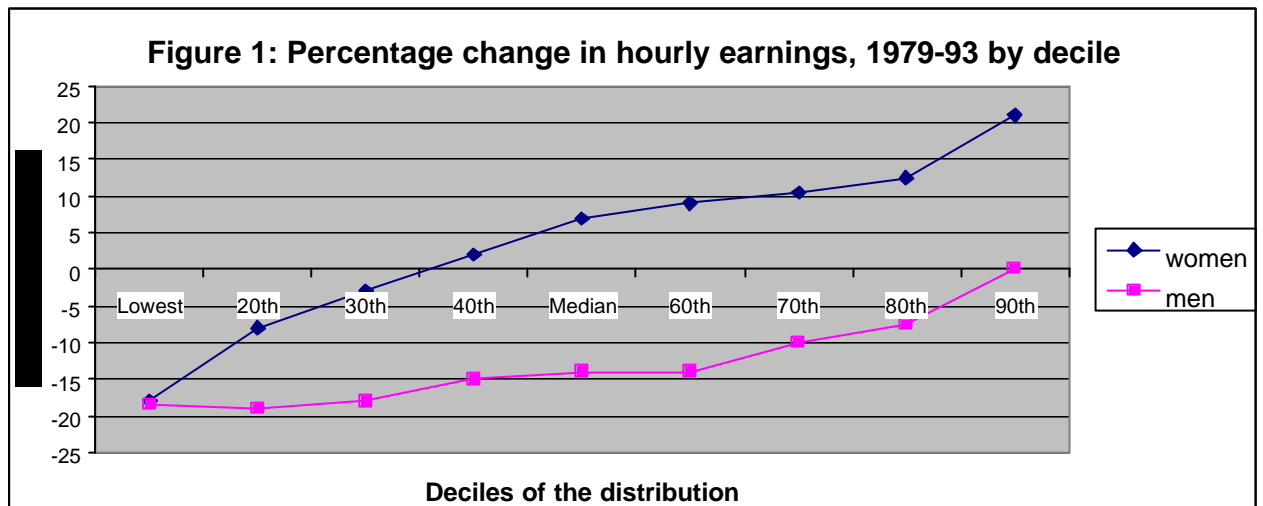
The American earnings distribution has considerably widened in the 1980s to 1990s. One commonly used summary statistic to show this development is the ratio of the earnings of workers in the top percentiles of the distribution- for instance the upper 10 percent of earners- to the earnings of workers in lower percentiles. In other words, when the ratio of earnings in the top percentiles rises relative to earnings in the lower percentiles, the distribution of earnings widens.

In 1979, top decile male workers¹ in the US were paid 3.96 times per hour as much as bottom decile male workers, whereas in the mid 1990s, they were paid 4.75 times as much. (Freeman, 1997, p. 5). This corresponds to a change by 0.79 or a 20 percent increase in inequality.² Among women, the rise in wage dispersion is even stronger. The

¹ The ratios are hourly earnings for full-time workers

top decile/bottom decile earnings ratio for the US jumped from 2.65 in 1979 to 3.88 in 1993 (an increase by 46%).

By calculating percentage changes in earnings at each decile of the distribution (see Figure 1³) we can get a much broader understanding of the US wage dispersion.



We can see in the graph that for the period from 1979 to 1993 the rate of change increased from the lower paid to the higher paid workers and hence inequality has widened. One important fact stands out from the figure above. The pattern of rising wage inequality in the United States is not only due to higher earnings among those at the top of the wage distribution. This would be for example the case if an increase in the wage premium for a highly skilled group could explain the widening of the wage gap. The rising inequality in the US took in particular the form of reduced real earnings for the lower paid.

For male workers, there was an enormous fall in pay at the bottom of the earnings distribution and even high wage groups suffered strong decreases in real wages from 1979 to 1993. At the top of the earnings distribution wages for male workers grew modestly and losses in earnings from the 70th percentile upwards were less severe

² Statistics of other researchers show similar results. (see for instance Murphy, Welch (1992); Katz, Author (1999); Gottschalk, Schmeding (1997); Levy, Murnane (1992) and Bernstein, Michel (1997).

³ Source: Freeman (1997), p. 7; calculated from CPS data.

than for the rest of the wage earners. For female workers, wages fell for the bottom three deciles, but rose for those in the higher deciles. Thus, the male-female pay differentials narrowed for the higher paid groups of the workforce. The group of women at the top of the earnings distribution, the so-called professionals, obtained the highest gain in earnings.

Since economic conditions and unemployment figures for the United States have improved remarkably since 1995, a reference to this period will be worthwhile. As one feature of the economic landscape between 1995 and 1999 earnings inequality still remained on very high levels. However, the growth of wage inequality has shifted: the top earners are still pulling away from the "middle class" of wage earners, but now the groups at the bottom of the distribution are achieving significant gains in pay and narrowing their gap to the middle (see Mishel, L./ Bernstein, J./ Schmitt, J., 2001, chapter 2). The boost in wages for the bottom decile workers in the US was probably influenced by a series of increases in the federal minimum wage, even though its inflation-adjusted value is still lower than in the 1970s. Therefore, the impact of the minimum wage on the distribution of earnings may be one important factor in understanding the whole picture of wage inequality in the United States.

In contrast to the picture of rising joblessness, earnings inequality changed rather little in continental Europe for the period of the 1980s and early 1990s. A number of recent studies have attempted to assemble data across advanced nations to compare earnings inequality in the United States with the development in Europe. One major challenge for cross-national studies is the lack of comparable data across countries. Therefore, the research in this field has focused on trends, not levels or exploited time series from the OECD, which are standardized for all member countries.

Table 1: Trends in wage inequality in selected OECD countries, measured by the ratio of 90th to 10th decile, male earnings (full time workers).⁴

Country	Change in inequality (from earliest to latest year)			Rise in Inequality
	Katz/ Autor ^I (1979-1994)	Glyn ^{II} (1979-1990)	Freeman ^{III} (1979-1995) (annual change)	
U.S.	0.29	0.17	0.027	high
U.K.	0.27	0.28	0.020	high
Italy	0.14	-0.01	0.025 ('93)	high
Canada	0.09	0.09	0.021 (81-94)	high-modest
Austria	0.03	0.02	0.009 (80-94)	modest
Netherlands	0.03	-0.02	0.009 (85-94)	modest
Sweden	0.04	0.07	0.008 ('93)	modest
Denmark	-	0.01	0.003 (80-90)	modest
France	0.01	0.03	0.002 ('94)	modest
Belgium	-	-0.02	-0.004 (85-94)	decline
Germany	-0.06	-0.06	-0.013 (83-93)	decline

Table 1 shows that inequality measured by the 90th to 10th ratio for males rose in almost all industrial countries in the 1980s and 1990s. If we compare the calculated country trends in inequality of all three studies with each other we find an almost consistent pattern. Only in the case of Italy, one author found a change in inequality in the opposite direction. This deviation can be explained by a large increase in inequality in Italy in the 1990s following the abolition of an automatic cost-of-living index favoring low-wage workers and the ending of synchronization of bargaining across industries (Katz and

⁴ hourly wages for full-time workers

^I Katz/Autor (1999), Table 10, calculated from OECD Economic Outlook, July 1996

^{II} Glyn (1995), Table 5, calculated from OECD Labor Force Statistics

^{III} Freeman (1997), Table 3; calculated from OECD Economic Outlook, July 1996

Autor, 1999; p. 1503). However, the empirical evidence shows that the English-speaking countries had the most pronounced increase in inequality. In almost all of the considered continental European countries, the rise in inequality was modest. In two countries inequality even fell, in particular and substantially, in Germany.

There is not much empirical research available that covers the development of wage dispersion for females in Europe. One study shows that low female earnings at the bottom in Europe are matched by unusually high earnings at the top of the distribution. The ranking of countries for inequality of female workers corresponds to the ranking for males. There is only one exception, Germany, which goes from being one of the most equal country for male workers to being more similar to the Anglo-Saxon countries for female earners. (Gottschalk and Schmeding, 1997; p. 643).

In any case, the highest change in the inequality of earnings took place in countries, namely the United States and UK that rely extensively on market forces to determine wages. Distribution of wages set by institutions that is one of the characteristics for most countries in continental Europe seem to allow for a more equal distribution of earnings. The development in Italy in the 1990s even underlines this position.

While we are a long way from fully understanding all causes for similarities and differences in earnings, the next section will take a closer look on the importance of educational attainment as a source of inequality.

1.3 Wage differentials by educational attainment

A prominent explanation that has been offered for the United States explains increasing wage inequality by educational attainment. Empirical evidence suggests that education-based wage differentials increased sharply in the 1980s and 1990s, particularly by a rise in the relative earnings of those employees with at least a college degree.⁵ In a very detailed analysis for the United States Levy and Murnane document the historical deployment of the education premium and explain causes of the increase in the 1980s (Levy and Murnane, 1992; p. 1351- 1364). They show that in the 1970s the earnings of

college graduates⁶ relative to those of high school graduates declined precipitously, as the more educated received 22% more on average in 1971 but only 13% higher earnings in 1979. In contrast, the 1980s broke with this pattern, as differences in pay between for both groups increased massively and brought in 1987 the premium on schooling to a high of 38%. These differentials continued to rise at a more modest pace in the first half of the 1990s. (Katz and Autor, 1999; p. 1480). According to these findings, changes in the US wage structure over the past several decades seem, to be suggesting at least superficially that a rise in inequality is due to a return to skills. That is why a new debate in economic literature set in towards a bias in technological change in the 1980s and 1990s, explaining

Table 2: Change in Educational Wage Differentials in Selected Countries⁷

Countries with:	1970s	1980s
Large fall in differentials	France	
Germany		
Italy		
The Netherlands		
Sweden		
U.K.		
U.S.		
Modest fall in differentials		The Netherlands
No noticeable change in differentials		France
Italy		Germany
Modest rise in differentials		Sweden
Large rise in differentials		U.K.
U.S.		

a structural change in the economy favoring more skilled workers over less skilled ones.

⁵ Findings on a sharp increase in the relative earnings for college graduates in the 1980s are consistent across different researchers. See for instance: Katz and Autor (1999); Levy and Murnane, 1992; Gottschalk and Smeeding (1997); Danziger and Gottschalk (1996); and Nickell and Bell (1995).

⁶ The analysis compares male college graduates and male high school graduates both in the age between 25-34.

⁷ Table based on: (Schmitt, ch.5; Edin and Holmlund, ch. 9, Abraham and Houseman, ch. 9; Murphy et al, ch. 7; Freeman and Katz, p.1-25).

The labor market statistics for most European countries regarding changes in the skill premium are in striking contrast to the trends in the United States.⁸

Table 1 shows that for the 1970s all European countries share a common pattern with the United States in narrowing educational wage differentials. In the 1980s, however differentials declined at modest rates or didn't change at all. (Schmitt, ch.5; Edin and Holmlund, ch. 9, Abraham and Houseman, ch. 9; Murphy et al, ch. 7; Freeman and Katz, p.1-25). The only exceptions were the United Kingdom with a large increase in educational

differentials and Sweden which experienced a modest widening in the differentials between educational groups.

Therefore, the simple monocausal assumption that in the 1980s and 1990s new technologies are the main cause of the change in inequality is disputable, since the same technology has not produced massive inequality in most of the other advanced countries.

It seems reasonable, thus, to have a look on the labor market supply side since changes in demand may not be the only factor that drove wage differentials between more and less educated workers. Indeed, there is empirical evidence that the large influx of baby boomers who enrolled in college in the late 1960s and early 1970s overwhelmed the increase in demand for more educated workers (Freeman, 1994, p. 47; Levy and Murnane, 1992, p.1358- 1359; Katz and Murphy, 1992, Table 5). Similar patterns on the supply side for the 1970s were also observed for all other OECD countries (Freeman, 1981, OECD, 1993). In other words, the large decrease in educational wage differentials during the 1970s can be explained by a relative higher supply of more educated workers that entered the labor market.

However, in the 1980s and 1990s the conventional competitive forces of demand and supply show less homogenous pattern as explanatory power for wage inequality across countries. In the United States in the 1980s, the demand for more highly educated workers relative to less skilled workers increased and at the same time a sharp deceleration occurred in the rate of growth of college graduates as a fraction of the labor force (Levy and Murnane, 1992, p. 1359-1363). In sum, sizable and accelerated shifts in

⁸ Detailed analysis on the change in educational wage differentials for Europe can be found in: for the UK (Schmitt, 1995); Sweden (Edin and Holmlund, 1995); Germany (Abraham and Houseman, 1995); Canada

demand favoring more educated workers, and reduced growth in their relative supply combined to increase wage inequality in the 1980s.

In Europe all advanced countries experienced a different development of their labor markets. In all European countries the demand for more educated laborers has been increasing over time, but so too, with the exception of the United Kingdom, has the supply of more educated workers. (Katz and Autor, 1999; p. 1521, Freeman, 1994; p. 36-40). Therefore, the simple empirical evidence suggests that greater inequality in the United States and UK can be explained to some extent by a reduced supply of more educated workers in the 1980s and 1990s in comparison to very stable conditions on the relative supply side in continental European countries. This observation reveals at first sight from an institutional point of view one interesting conclusion. The different structure of wage settings and educational systems in continental Europe may provide a more stable supply of more educated workers than is the case in the Anglo-Saxon countries (Abraham and Houseman, 1995; p. 401-402). Which would imply, that an economic model that exclusively reflects on changes in competitive forces falls short to explain wage differentials between nations.

However, a supply and demand approach, even if controlled for institutional/noncompetitive factors can be potentially misleading if it only considers these variables as exogenous. It can be shown for instance, that numerous difficulties arise if the aggregation of skill groups is determined by years of schooling, as applied in the college premium example. One basic problem is that workplace competency differs considerably between the US and Europe due to differences in corporate training and apprenticeship programs. (Schettkatt, Freeman, 2000; p. 7-9).

In other words, a basic empirical Demand and Supply approach may lead to ambiguous results for understanding the dispersion of wages among advanced countries. Therefore, it may be helpful to develop an economic model under stronger assumptions to separate out the impact of relative supply and demand shifts. With this approach relative demand and supply shifts can be decomposed into interpretable factors such as the impact of technology, institutional factors, domestic product market changes and globalization factors (International Trade and outsourcing). The following sections will therefore

explain a more in-depth examination of the single parameters that can have an impact on the level of wage inequality.

2. Technological Change and Wage Inequality

2.1 Skill Premium, Supply, Demand and elasticity of substitution

Many economists argue that skill-biased technological change is the principal culprit for the decline in relative wages for less skilled workers. The leading argument is that the last twenty years have seen a major technological revolution, led by widespread computerization and the consequent penetration of information technology (Wolff, 1997; p. 6). It is further stated that this change caused a major impact on the income distribution by placing a high premium on highly skilled labor while reducing the demand for semi-skilled and unskilled workers.

Table 3

Average Annual Percentage Rates for the US of Growth of College/High School Relative Wages, Supplies and Demand in Average Aggregate Real Compensation⁹

Period	Relative Wage (R)	Relative Supply	Demand Shift ¹⁰	Average Real Wage
1940-1950	-1.3	2.6	0.7	1.7
1950-1963	0.6	2.4	3.3	2.8
1963-1970	0.8	2.3	3.6	2.5
1970-1979	-0.7	4.8	3.7	1.7
1979-1989	1.3	2.7	4.7	0.4
1989-1993	1.1	3.3	5.0	0.8

There is considerable microeconomic evidence in recent literature that finds for the US a positive relationship between the introduction of new technologies into production and the returns to skills. For example Berman/Bound and Griliches (1994, p. 367-397) show

⁹ Johnson, 1997; p. 43; the average real wage in column 5 was calculated by the rate of growth of manufacturing wages for 1940-1950 and of compensation per hour in private businesses for 1950-1993 less rate of growth of the consumption deflator.

that industries that invested more in R&D in the mid 1970s tended to pay a higher premium for skill in the 1980s. Table 3 shows the ratio of the wages rates of college-educated workers to high-school educated worker in the United States over time. As mentioned in the previous section, while the wage premium (R) did fall during the 1990s, it increased at an annual rate of 1.3% from 1979-1989 and continued to increase in the 1990s at a slightly smaller rate. Therefore, the rise in the wage premium for skilled labor is typically understood with a conventional supply and demand model as the result in a large rightward shift in the demand function.

Figure 2 Determination of the skilled/ unskilled relative wage rate with simultaneous shifts in demand and short run supply functions

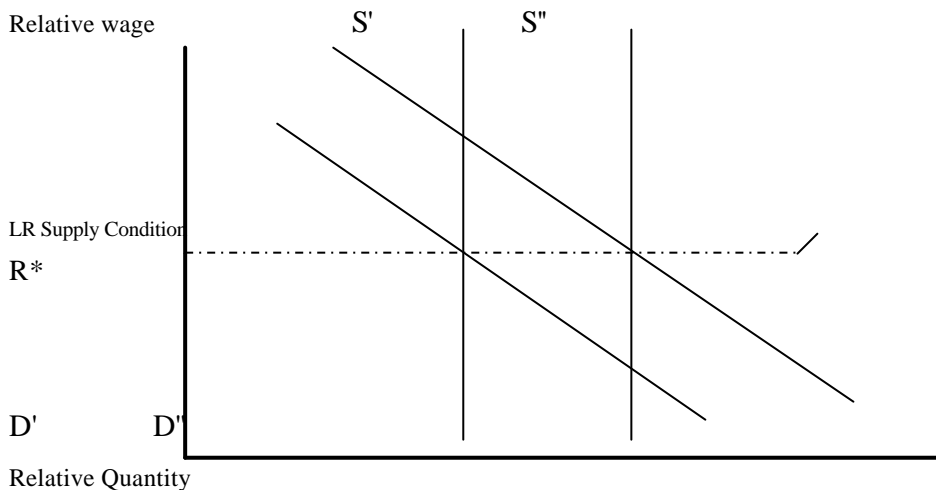


Figure 2 shows the relative quantity of skilled and unskilled labor on the horizontal axis and the relative wage of skilled to unskilled labor on the vertical axis. The short run relative supply function shifted from S' to S'' , but according to our data in table 3 the shift in the relative demand function was significantly greater (for the periods of 1979-1993) than that from D' to D'' . Thus, R rose above its equilibrium value R^* .

The conclusion that the relative demand function in the US has shifted during the 1980s can be shown by the method of aggregating different types of labor in a production

¹⁰ calculated by equation [1], see below

function context. (see for instance: Bound and Johnson, 1992; Katz and Murphy, 1992 and Murphy and Welch, 1992).

The demand shift can be represented by the following function:

$$\frac{\Delta R}{R} = \frac{1}{s} \left[\frac{\Delta A}{A} - \frac{\Delta S}{S} \right] \quad [\text{Equ. 1}]$$

R is the relative wage between two groups, in this case college and high school graduates, and $\Delta R/R$ is its proportional change over a particular period. S measures the relative supply of college to high school labor, as reported in table 3. The parameter A measures the conditions concerning the relative demand for labor by skill. Given the case that $\Delta A/A$ is positive over a particular time period it follows that the demand curve is shifting to the right. The elasticity of substitution between highly skilled and low skilled labor is represented by the parameter s. For the United States estimates for s for the time period of 1960 to 1993 are about 1.5 (Johnson, (1997); Katz and Murphy (1992)). Since changes in the wage ratio and the relative supply of labor by skill are observable and available as CPS data, the authors calculate the shift of the demand curve, as represented in table 3, indirectly through supply factors and the elasticity of substitution between highly skilled and low skilled labor. Thus, they conclude, that for the period from 1979 to 1993 the relative demand function has shifted much stronger than the relative supply function, resulting in an increase in the wage premium.

There are several problems with the basic assumptions of this approach since it includes the key supposition of full employment and that the relative wage R^* is free to adjust. Conditions that can not be satisfied for most of the European countries due to high unemployment rates but in particular because of its institutional labor market regulations. Another weakness of the approach is the assumption that the relative supply of labor by skill is given exogenously. The relative wage premium might directly affect educational investment decisions, in particular in the United States where in comparison to most European countries education is not free of tuition charges.

1.2 Skill biased technological change

The deteriorating labor market outcomes of less-educated workers in most OECD countries over the past two decades implies a steep decline in the relative demand for

less-skilled workers (Katz and Autor, 1999; p. 1530). Therefore, the relative demand shift in favor for high skilled workers suggests indirectly a dominant role for skill-biased technological change, associated with changes in production techniques. As technical progress occurs, the marginal productivity of different input changes. If skills and new technologies are complementary the demand for more educated employees rises, which generates an increase in their wages relative to the unskilled workers. Much econometric and case study evidence for the United States indicates that the relative utilization of more skilled workers is positively correlated with capital intensity and the implementation of new technologies both across industries and across plants within detailed industries (Mark, 1987, p. 26-29; Levy and Murnane, 1996 p. 259-261). These patterns indicate that physical capital and new technologies appear to be relative complements with more skilled workers. Berman, Bound and Machin (1997) present evidence from manufacturing that substitution toward skill labor within industries occurred in 10 OECD countries over the time period from 1970-90, despite constant or increasing relative wages of skilled labor. At a more aggregate level Bound and Johnson (1992) and Murphy and Welch (1992) prove that within industries skill upgrading exist also outside of manufacturing and show this for such as retail and financial services. But even that all advanced countries experienced large, steady shifts in the industrial and occupational distribution of employment toward sectors and job categories that used a greater proportion of more educated workers, inequality is much smaller in continental Europe in comparison to the US and UK. Besides different institutional settings across countries one may find differences in the elasticities of substitution between high skilled and low skilled workers, due to variations in educational training and learning on the job. As for example shown in the previous section, in most economic models technological change has not been directly observed or measured; rather its impact on inequality has been inferred from observations on the increased employment and wages of highly paid workers. Hence, endogenous growth models that give an explicit analysis of the relationship between relative wages and the endogenous introduction of technologies may be a better approach to explain differences across countries. Greiner, Rubart and Semmler (2001) for example show in a model for Germany and the United States the impact of technical change on wage inequality by considering endogenously the stock of

technological knowledge. For both countries they show that the knowledge variable has a positive effect on the wage premium, but that the mean growth rate of wage inequality is in the US four times higher than in Germany. They come to the conclusion, that there appear to be other forces in Germany that have reduced wage inequality over time.

Nevertheless, one weakness of endogenous growth models is the assumption that new ideas and technologies do not require greater skill levels to implement them. A worker's absorptive capacity is limited by his current skill level and it takes time to acquire technology-specific skills (Lloyd-Ellis, 1999; p. 48). Therefore, when new technologies are introduced at a rate that exceeds the rate at which they can be absorbed, wage inequality rises even though technological change is not inherently skill biased and relative skill dispersion remains unchanged.

An alternative approach to explain the impact of technology on wage inequality is the vintage capital model (Jovanovic, 1998). If new machines are always better than old ones and if society cannot provide everyone with a new machine all of the time, inequality will result. Thus, the limited capacity of the capital goods sector induces workers to invest unequally in skill because capital-quality and skill are complements. As a result a worker who is paired with the better technology will become more productive and small differences in skills will translate into larger differences in productivity and inequality will persist indefinitely.

However, the considerable microeconomic evidence that finds a positive relationship between the introduction of new technologies into production and the returns to skill raises one other question about the hypothesis of skill biased technological change. Why have productivity increases been so moderate in a time of accelerating technology? US productivity during the 1980's showed only sluggish growth and not the rapid advance one might have expected if technological change were the chief cause of the changing structure of wages (Lloyd-Ellis, 1999; p. 48).

3. International Trade and Wage Inequality

There is considerable disagreement among economists concerning the role of international trade in accounting for the wage decline of less educated workers relative to

the more educated since the late 1970s in the United States (Baldwin, Cain, 1997; p. 1). Increased trade with developing countries is commonly viewed as a driving force behind deindustrialization and at the expense of low-skilled workers, as reductions in trade barriers may stimulate the export of skill-intensive goods and raises the import of labor intensive goods. (Wood, 1995; p. 57-58).

Between 1965 and 1990, according to the World Bank, the share of output exported rose for low income countries from 8.18% (Richardson, 1995, p. 34). US Imports from less-developed countries were 0.4 % of GNP in 1970, before rising to 2.5 % of GNP in 1990. Meanwhile in the European Union, imports from less-developed countries increased from 0.5% in 1970 to 2.1 % of GNP in 1990.

There are two research methods to assess the effects of trade on labor and there is disagreement between economic researchers about which is the appropriate mode of analysis (Freeman, 1995a; p. 16). The first approach is the so called factor content analysis. The basic approach is to determine how much of different types of labor (skilled and unskilled) are used to produce a country's exports, and how much would have been used to produce its imports. Since US imports goods that make use of low-skilled workers, and export goods that make use of high-skilled, trade with developing countries reduces the relative demand for less skilled labor in the United States, or, increases the relative supply of less-skilled labor. An estimate of the aggregate elasticity of substitution between skilled and unskilled labor can then be used to simulate the impact of the implicit change in relative skill supplies from trade (Katz and Autor, 1999; p. 1536). Several recent studies use factor content calculations to explain the fall in relative wages for low skilled workers due to trade during the 1980s and 1990s. Sachs and Shatz (1994) analyzed trade flows with less-developed countries for the period 1978-1990 and concluded that increased import penetration from less-developed countries reduced manufacturing jobs modestly. Borjas, Freeman and Katz (1992) estimated the effect on relative employment of less skilled Americans as a result of the change in trade in the 1980s and concluded that the reduction in employment was modest.

However, Wood's (1994) factor content study reaches a different conclusion, namely that within each sector there is a wide distribution of factor proportions and labor productivity, and that less-developed countries imports are likely to be most directly

competing with the segment of an industry using the most unskilled-labor intensive production techniques. The issue is rather more complicated since some imports from less-developed countries may not closely compete with any domestic industry so that their absence might expand domestic demand for goods or services with quite different skill intensities than in the assumed import-competing sector. (Katz and Autor, 1999; p. 1537).

The second approach called product-price studies attempts to assess the implication of the Heckscher-Ohlin/ Stolper- Samuelson (HOSS) approach which states that impacts of trade on relative wages operate through changes in the relative product price (Katz and Autor, 1999; p. 1538). In the model price declines in import-competing sectors should lower the relative wages of unskilled labor, which those sectors use intensely, and ultimately the prices of all goods and services produced by those workers. The lower relative pay of the less skilled ought further lead firms to substitute them for more expensive skilled labor throughout the economy. Two research projects have exploited this approach and looked for evidence that prices of sectors that extensively use unskilled labor have fallen strongly (Freeman, 1995a, p. 28). Lawrence and Slaughter (1993) correlate changes in input prices with the share of production workers across industries. Their finding is that when prices are adjusted for changes in total factor productivity, the prices of less skill intensive goods fell only slightly.

In another study Sachs and Shatz (1994) examines output prices for all of manufacturing, not just imports, which provides a larger sample of industries. After the adjustment for productivity changes that should independently affect prices, they also find only a modest negative correlation between the production worker share of employment and changes in industry prices.

Desjonqueres et al (1999) assesses in their research the implications of the HOSS approach for 8 OECD countries¹¹. They evaluate the removal of trade barriers of the North with the South and the impact of the following increase of relative prices of skill intensive industries in developed countries. This would lower relative prices in the North and increase wage inequality. To show the impact of the removal of trade barriers the

¹¹ The countries are Australia, Denmark, Finland, France, Denmark, Japan, Sweden, UK and US

authors take another route and examine the extent of shifts in skill structure in non-traded sectors. The HOSS approach would imply that in the absence of any other offsetting factor, there should be strong within-industry shifts in skill structure in non-traded industries towards the less skilled who, after opening up to trade, are relatively much cheaper to employ. However it is striking, that their result is a shift towards the use of more skilled workers in the North despite their increased relative wages. Therefore for none of the countries a trade based explanation on the expense of the less skilled could be shown.

4. Labor market institutions

4.1 Unions and collective bargaining

Differences across countries in wage setting institutions (union and government roles in wage setting) appear to be strongly related to differences in levels of wage inequality among advanced nations. This accounts in particular for the lower half of the wage distribution and to differences in the magnitude of educational wage differentials. (Freeman and Katz, 1994, p. 51-54). But there are many ways to categorize labor market institutions and the impact of unions on wage setting across countries. If we would for example compare wage differences by the degree to which wage setting procedures are centralized due to governmental intervention, this method could account only for some differences between the United States and Europe. It would fall short to explain the whole picture within the OECD, since European wage setting institutions actually differ greatly among themselves.

Unions play an important role in wage determination in all advanced countries both directly through collective bargaining and union threat effects on wages and indirectly by affecting government policies (e.g. minimum wages and labor market regulations) (Katz and Autor, 1999; p. 1542). Since unions typically negotiate contracts that allows for less variation in pay than occurs in the nonunion sector and because they are much less prevalent in the United States, we would expect a higher overall variance in wages in the United States than in Europe. Blau and Kahn (1996) show in a comparative study for 7

OECD¹² countries, that the 50-10 percentile wage differential within each sector in the US is not only much larger than in other countries, the study shows also enormous international differences by controlling for the union and non-union sector. Whereas the dispersion of earnings in the US for union members was higher than in all other OECD countries, the most striking contrast in inequality could be found for the group of wage earners in the non-union sector. Therefore, it is strongly suggestive that spill over effects of union bargaining are much lower in the US than in other OECD labor markets.

The sharp decline in the United States in unionization itself over the past two decades could be another important source for rising wage inequality, as it is in particular concentrated among less-educated male workers. Card (1998) for instance estimates that the rate of US Union membership rate declined for males from 30.8% in 1974 to 18.7% in 1993. But for the same period it fell by 20.8% for those with less than 12 years of schooling, whereas for example it slightly increased for college graduates.

However, the decrease in the degree of unionization might be an important factor to explain the widening of wage inequality in the union and non-union sector in the United States, but this explanatory variable is less important for continental Europe. The US has a business-oriented union movement largely based on relatively autonomous local unions who bargain for better conditions from individual employer (Freeman, 1994; p. 15). In continental Europe Unions play a smaller role in the local firm and a larger one at the industry or national level with a much broader coverage of wage setting for non-union members. Thus, wage bargaining in continental Europe is of greater institutional influence and union density has a smaller impact on the wage-level of collective contracts. Additionally, the existence of work councils in many European Countries on the firm level give employees a second channel to influence workplace decisions. Nevertheless, no matter which factors one stresses in categorizing the differences in workers participation on the firm level and in wage setting mechanisms, the union share of the work force dropped much stronger in the United States than in Europe. Only in the United Kingdom it showed a similar pattern as in the US. Since the UK has also very decentralized wage-setting mechanisms, the fall in union membership had a strong impact on the widening of wage dispersion. According to a study of Schmitt (1995) the

¹² The countries are Germany, Great Britain, Austria, Switzerland, Norway and Hungary.

fall in union density accounts for about one-fourth of the growth of wage inequality in the UK.

4.2 The Minimum wage

Direct governmental labor market interventions are another factor that can affect the level of wage inequality. One key instrument in labor market policy in particular in the United States is the Federal minimum wage, since it can have significant effects in reducing wage inequality by raising wages in the lower end of the wage distribution. (Katz and Autor, 1999; p. 1545). The possible adverse effect of the minimum wage on the employment of low-wage workers will not be stressed in this section. Nevertheless, it should be mentioned that there is a large and growing batch of recent studies that have shown for the United States that minimum wages actually have a positive impact on employment (Card, 1992a, 1992b; Katz and Krueger, 1992; Machin and Manning, 1992; Card and Krueger, 1993).

As already mentioned in section 1, the rising inequality in the US took in particular the form of reduced earnings for the lower paid. Given the fact, that the real value of the minimum wage in the US dropped in the 1980s by ten percentage points¹³ (Freeman, 1995b; p.68) this pattern is suggestive as a substantial possible role of the erosion of the real minimum wage for increasing inequality.

Fortin and Lemieux (1997, p.75-96) stimulate the effects of the minimum wage by calculating that if the real value from 1979 had prevailed in 1988. They show for the US that the variance of male log wages under this assumption would have increased by 24.2% less than it actually did. Interestingly, the result for women is even larger, explaining 32.1 % of the rise in the variance of female log wages. In a similar study Card and Krueger (1995) conclude that 20 to 30 per cent of the rise in wage dispersion in the US could be attributed to the decline in the real value of the minimum wage.

The main critique against these findings is whether it is reasonable to assume that there are no disemployment effects and no spillovers of the minimum wage onto the

¹³ Freeman measures the change in the value of the minimum wage relative to the average wage of production workers in manufacturing.

distribution of all wages above the minimum wage. Lee (1999) addresses these issues and additionally controls for cross-state differences in the minimum wage. He comes to the conclusion that even by controlling for these factors much of the increase in residual wage inequality in the 1980s can be explained by the decrease in the real value of the minimum wage.

For continental Europe the role of the minimum wage as an explanatory variable for wage inequality is less important. Unlike in the United States unions set wage floors that are often above the federal minimum rate. Since collective bargaining is coupled with the solidaristic wage policy of unions, it can be assumed that any pressures toward greater wage inequality would be muted in countries with a high degree of collective wage setting. (Abraham et al ,1995; p. 388). This may also explain why some European countries don't even have federal minimum wages. Nevertheless, two exceptions should be mentioned, namely the United Kingdom and France. The UK that has a very decentralized wage setting mechanism introduced for the first time a minimum wage in 1999, and its impact has to be shown in future research. In France, a country with very low union density, the minimum wage is important in determining the overall level of wages. (Freeman, Katz 1994, p. 17). The minimum wage adjustments take into consideration not only the evolution of prices, but increases are also linked to the level of average wages. Therefore, groups at the bottom of the distribution are achieving significant gains in pay, which narrow the gap to higher wage earners.

4.3 The trade-off between wage inequality and unemployment

Some economists argue that the quality of institutional arrangements in Europe may have prevented the adoption of a more unequal distribution of wages but that this was achieved at the cost of high unemployment. Or in other words, there is a trade-off between unemployment and wage inequality. There is a wide range of research in economic literature on the question if labor market inflexibility is the main cause of high unemployment in Europe. Since this controversy should be discussed in a broader macroeconomic context, I will in this section only refer briefly to differences in the employment of the unskilled and their educational levels across countries.

If falling wages for the low skilled and increasing wage inequality created new jobs for the less skilled, wage flexibility in the US would be a success story. But despite falling wages, the rate of unemployment in the US in the 1980s for male workers aged 25 to 64 with or without high school education increased relative to college graduates (Freeman, 1995b, p. 66-68). Freeman also shows that measured in actual working hours the participation of low-wage workers in the labor market was noticeably smaller, suggesting a shortage of employment opportunities for them. In another study Nickell and Bell (1995) show that over the period from the mid-1970s to 1990s, in contrast to the United States unemployment rates in European OECD¹⁴ countries have risen significantly among the unskilled as well as the skilled workers. An indication that some of the causes of the rise in unemployment are neutral with respect to skills and can therefore probably not be solved by a widening of the wage distribution. A direct comparison between German and US workers for instance in the bottom wage decile reveal another interesting aspect. For the period from the mid-1970s to 1990s, the level of unemployment for low skilled workers are in both countries almost identical. However, even that German workers in the bottom wage decile are no more likely to be unemployed, they earn around twice as much as their American counterparts (Nickell, 1998; p. 301-310). One explanation might be that the German education system at the bottom end contributes to a much higher level of productivity, high enough to sustain these wage levels.

Schettkat et al (2000) show in a comparative study on the skill level among German and US workers that measured in literacy scores, unemployed and out of the labor force groups in the US are substantially below the score of the employed. But the German unemployed and out of the labor force persons have scores only modestly below those of employed Germans. Therefore, German joblessness has little of the pattern that one would expect if it were due to a lack of wage dispersion. Or in other words, the much more compressed German earnings distribution does not necessarily cut off low skill jobs and thus may not be the main cause of unemployment.

In summary we can state, that the sizable reductions in pay for the less skilled in the US have not been sufficient to maintain their employment. (Freeman, 1995b, p.72). Given

¹⁴ The countries are Germany, The Netherlands, Spain and the United Kingdom.

this fact and the particular different distribution of skills in Europe, probably more than US-style wage flexibility will be needed to cure European high levels of unemployment.

5. Conclusions

The existing research on wage inequality suggests several directions for future research. The roles of changes in labor market institutions as well as changes of supply and demand factors are relevant to assess changes in the wage structure. For the latter it might be in particular helpful to consider a longer-term historical perspective, since demographic changes and relative shifts in demand and supply have varied considerably over time. Endogenous growth models could be a good approach to investigate the impact of technological change on wages but should consider workers' absorptive capacity to apply new technologies. Analyses of wage structure changes also can benefit from vintage capital models, since they may be capable to explain the existence of within-group inequality. Large variations in earnings within groups with the same observed characteristics may also be explained by the incidence of industry rents. But once again this may have appeared significantly greater in the United States than in Europe, since collective bargaining in the EU area takes places for whole industries and tends to reduce large differences in wages between firms of the same industry.

The importance of models concerning the role of international trade are less promising for getting a broader understanding of earnings inequality. Research that focusses on differences in wage setting institutions should not only take into account the degree of unionization but also the overall coverage of wage bargaining on the national level for union and non-union workers. Cross-country comparative work and differences across regions within a country may also provide useful information for future research in particular with respect to institutional factors.

References

Abraham, K. G.; Houseman, S. N. (1995): earnings Inequality in Germany, in: Freeman, R.; Katz, L. (eds.) Differences and Changes in Wage Structures, The University of Chicago Press

R. E. Baldwin, Glenn C. C. (1997): Shifts in relative wages- The role of trade, technology and factor endowments, NBER working paper 5934, National Bureau of Economic Research

Berman, E.; Bound, J.; Grilliches, Z. (1994): Changes in the Demand for Skilled Labor within US Manufacturing Industries, Quarterly Journal of Economics, Volume 109

Berman, E.; Bound, J; Machin, S.: Implications of Skill biased Technological Change- International Evidence, NBER working paper 6166, National Bureau of Economic Research

Bernstein, J.; Mishel, L., Schmitt, J.:(2001): The State of Working America 2000-01, Cornell University Press

Bernstein, J.; Mishel, L. (1997): Has wage Inequality Stopped Growing?, Monthly Labor Review, No. 120, December

Blank, R. (1994): The Employment Strategy: Public Policy to increase Work and Earnings; in: Danziger, S. et al. (eds.), Confronting Poverty- Prescriptions for Change, Russell Sage Foundation

Blau, F. D.; Kahn L., M. (1996): International Differences in Male Wage Inequality: Institutions versus Market Forces, Journal of Political Economy, Volume 104, Issue 4

Borjas, G.; Freeman, R., Katz L. (1992): On the Labor Market Effects of Immigration and Trade, in: Borjas, G., Freeman, R. (eds.), *Immigration and the Work Force*, University of Chicago Press

Bound, J.; Johnson G. (1992): Changes in the Structure of Wages in the 1980s- An Evaluation of Alternative Explanation, *American Economic Review*, No. 82

Card, D. (1992a): Using regional variation in wages to measure the effects of the federal minimum wage, *Industrial and Labor Relations Review*, No. 46

Card, D. (1992b): Do minimum wages reduce employment? A case study of California, *Industrial and Labor Relations Review*, No. 46

Card, D. ; Krueger, A.(1993): Minimum wages and employment- A case study of the fast food industry in New Jersey and Pennsylvania, Princeton University Industrial Relations Section Discussion Paper no. 315

Card, D. ; Krueger, A.(1995):*Myth and Measurement: The New Economics of the Minimum Wage*, Princeton University Press

Card, D. (1998): Falling union membership and rising wage inequality: what's the connection, NBER working paper 6520, National Bureau of Economic Research

Danziger, S.; Gottschalk, P. (1996): *America Unequal*, Russell Sage Foundation

Desjonqueres, T.; Machin, S.; Van Reenen, J.(1999): Another nail in the coffin?- Or can the trade based explanation of changing skill structures be resurrected?, *Scandinavian Journal of Economics*, Vol. 101, No. 4

Edin, P; Holmlund, B. (1995): The Swedish Wage Structure- Rise and Fall of Solidarity Wage Policy, in: Freeman, R.; Katz, L. (eds.) Differences and Changes in Wage Structures, The University of Chicago Press

Fortin, N. M., Lemieux, T. (1997): Institutional Changes and Rising Wage Inequality- Is there a linkage? Journal of Economic Perspectives, Volume 11, No. 2

Freeman, R. {ed.} (1994): Working under Different Rules, Russell Sage Foundation

Freeman, R. (1995a): Are your wages set in Beijing?, Journal of Economic Perspectives, Volume 9, Issue 3

Freeman, R. (1995b): The limits of wage flexibility to curing unemployment, Oxford Review of Economic Policy, Vol. 11, No. 1

Freeman, R. (1997): When earnings diverge- Causes, Consequences, and Cures for the New Inequality in the U.S., National Policy Association

Freeman, R.; Katz, L. (1994): Rising Wage Inequality- The US vs. other Advanced Countries in: Freeman, R. (ed.), Working under Different Rules, Russell Sage Foundation

Gottschalk, P.; Schmeeding, T. M. (1997): Cross-National Comparisons of Earnings and Income Inequality, Journal of Economic Literature, Volume 35, Issue 2

Glyn, A. (1995): The Assessment- Unemployment and Inequality, Oxford Review of Economic Policy, Vol. 11, No. 1

Greiner, A.; Rubart, J.; Semmler, W.: Economic Growth, Skill-Biased Technical Change and Wage Inequality- A Model and Estimations for the US and Europe, Working Paper No. 16, Center for Empirical Macroeconomics, University of Bielefeld, Germany

Johnson, G. E. (1997): Changes in Earnings Inequality: The Role of demand Shifts, *Journal of Economic Perspectives*, volume 11, No. 2

Jovanovic, B. (1998): Vintage Capital and Inequality, NBER working paper 6416, National Bureau of Economic Research

Katz, L. F.; Murphy, K. M. (1992): Changes in relative wages, 1963-1987- Supply and Demand Factors, *Quarterly Journal of Economics*, Volume 107, Issue 1

Katz, L.F.; Krueger, A. (1992): The effect of the Minimum Wage in the fast food industry, *Industrial and Labor Relations Review*, No. 46

Katz, L.F.; Autor, D.H. (1999): Changes in the Wage Structure and Earnings Inequality, in: Ashenfelter et al. (eds.), *Handbook of labor economics- Volume III*, Elsevier

Lawrence, R.; Slaughter, M. (1993): trade and US wages: Great sucking sound or Small Hiccup?, *Brookings Paper on Economic Activity*, Volume 2

Lee, D. S. (1999): Wage inequality in the US during the 1980s- Rising dispersion or falling minimum wage?, *Quarterly Journal of Economics*, 114

Levy, F.; Murnane, R. J.(1992): US earnings Levels and Earnings Inequality- A Review of Recent Trends and Proposed Explanations, *Journal of Economic Literature*, Volume 30, Issue 3

Levy, F.; Murnane, R. J.(1996): With what Skills are Computers a Complement?, *American Economic Review*, Vol. 86, No. 2

Lloyd-Ellis, H. (1999): Endogenous Technological Change and wage Inequality, *American Economic Review*, Vol. 89, No. 1

Machin, S. ; Manning A. (1992): Minimum wages, wage dispersion and employment- Evidence from the UK wage councils, *Industrial and Labor Relations Review*, No. 49

Mark, J. S. (1987): Technological Change and Employment- Some results from BLS Research, *Monthly Labor Review* 110

Murphy, K. M.; Welch, F. (1992): The Structure of Wages, *Quarterly Journal of Economics*, Volume 107, Issue 1

Murphy, K. M.; Riddell, C. W.; Romer, P. M.: "Wages, Skills and Technology in the United States and Canada, in : Helpmann, E. (ed.), *General purpose technologies*, MIT Press

Nickell, S.; Bell B.(1995): The Collapse in Demand for the Unskilled and Unemployment across the OECD, *Oxford Review of Economic Policy*, Vol. 11, No. 1

Nickell, S (1998): The Collapse in Demand for the Unskilled- What can be done? In: Freeman/ Gottschalk (eds.), *Generating Jobs- How to increase demand for less-skilled workers*, Russell Sage Foundation

OECD (1993), *Employment Outlook*, Paris

Richardson, D. J. (1995), *Income Inequality and Trade- How to think, what to conclude*, *Journal of Economic Perspectives*, Volume 9, Issue 3

Sachs, J.; Shatz H. (1994): Trade and jobs in US Manufacturing, *Brookings Paper on Economic Activity*, Vol. 1

Schettkat, R.; Freeman, R. (2000): Skill Compression, wage Differentials and Employment- Germany vs. the US, NBER working paper 7610, National Bureau of Economic Research

Schmitt, J. (1995): The changing structure of male earnings in Britain, 1974-1988, in Freeman, R.; Katz, L. (eds.) Differences and Changes in Wage Structures, The University of Chicago Press

Wolff, E. (1997): Economics of Poverty, Inequality and Discrimination, South western college publishing

Wood, A. (1994); North-South Trade, Employment and Inequality, Claredon Press

Wood, A. (1995); How trade hurt unskilled workers, journal of Economic Perspectives, Volume 9, Issue 3