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The Impact of Technology Change, Deindustrialization, and Internationalization of Trade on Earnings Inequality An International Perspective

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Luxembourg Income Study Working Paper Series

Working Paper No. 85

**The Impact of Technology Change, Deindustrialization,
and Internationalization of Trade on Earnings Inequality
An International Perspective**

Peter Gottschalk and Mary Joyce

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(scanned copy)



The Impact of Technological Change, Deindustrialization,
and Internationalization of Trade on
Earnings Inequality--
an International Perspective

Peter Gottschalk and Mary Joyce*

I. Introduction

The United States has experienced substantial increases in inequality of wage rates and family income during the 1970's and 1980's. Highly educated workers, who were already receiving above average wages in the 1970's, received substantial raises during the 1980's. At the other end of the spectrum, high school dropouts and high school graduates experienced actual declines in pay.

Inequality increased not only between education groups, but also among persons of the same age and with the same education. The increase in dispersion of wages among workers with the same characteristics has further exacerbated the problem for those at the bottom of the distribution--young low wage high school dropouts lost ground not only to college graduates but they also lost ground relative to the average high school dropout.

This deterioration in the absolute and relative position of persons with low skills has had a substantial impact on poverty¹. While the increase in average income during the 1983-1990 recovery should have led to substantial declines in poverty rates, the increase in inequality has kept poverty rates well above the levels achieved during the late 1970's. In fact, changes in the distribution of income have had a larger impact on poverty than changes in economic growth.²

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¹ Throughout this paper we use the term skill to mean persons with more education or experience. Whether these traits lead to higher wages because of higher productivity or screening is not important to the analysis.

² See Gottschalk and Danziger (1985)

While the trends in inequality in the US are by now well known, their cause is much less well understood.³ This is largely a result of having many competing explanations-- deindustrialization, shifts in technology, demographic shifts, increased international competition, increased generosity of welfare programs-- but relatively few observations that can be used to distinguish between explanations. Some progress has been made in eliminating theories. For example, Moffitt (1990) rules out increases in welfare programs as an explanation for the increase in inequality by pointing out that inequality increased among persons not covered by public assistance programs and that inequality continued to grow during a period when welfare declined. Likewise, Murphy and Welch (1988) conclude that while cohort size explanations were consistent with the data for the 1970's, this supply side story is not sufficient to explain the continued increase in inequality during the 1980's when cohorts were getting smaller. While some theories can be eliminated, many of the remaining theories continue to be consistent with the data.

Progress in this field has not been characterized by identifying the "smoking gun" that fully explains the changes but rather by chipping away at existing explanations. By identifying theories that are no longer consistent with the data researchers have narrowed the range of possible explanations. This paper continues in that tradition.

By using a new source of data that includes information on several developed economies we hope to shed light on the importance of two structural factors-- technological change and deindustrialization-- that may have influenced the changes in wage inequality. While related, these two factors are conceptually distinct.

One often heard hypothesis is that technology (or automation) has changed throughout the world in such a way as to devalue the skills of workers with low levels of education and increase the demand for more skilled workers. For example, the computer revolution has led to both an increase in wages and employment for skilled workers.⁴ Since such innovations have wide applicability, we

³ See Danziger and Gottschalk (1989).

⁴We use the economist's definition of technological change as a change in methods of production that increase the productivity of a given number of skilled workers. Technological change could arise because of the discovery of new methods of production or managers choosing different methods. The increase in productivity will raise the demand for skilled workers, which will lead to more workers being hired at higher wages.

would expect to see educational upgrading in a wide variety of countries. Furthermore, if technological change is an important cause of the increase in the demand for skilled workers, we would also expect to see a general upgrading of the skill level used in all industries in the advanced industrialized countries we study-- both the skill mix and the skill premium would contribute to an increase in inequality within each industry.⁵

The second structural explanation also focuses on shifts in demand, but these shifts are not technologically driven. Rather, they are driven by shifts in demand for final goods. The increase in openness to foreign competition is said to be largely responsible for the shift in industrialized countries away from production of goods that requires unskilled workers towards service oriented production that requires skilled workers. The globalization of the western economies is said to have led to a sharp increase in demand for high skilled workers. At the same time, competition eroded the position of low skilled workers, who had to compete with low skilled workers in the rest of the world. Thus, according to this argument, increased openness led to "deindustrialization", which in turn led to the increase in inequality⁶.

While technological change is likely to be ubiquitous, different countries may have experienced different changes in industrial structure, leaving open the possibility that "deindustrialization " was important for some but not all countries. Thus, if countries differ in the shifts in industrial structure they experienced then cross country comparisons may be useful in determining the relative importance of these two structural factors. If, on the other hand, changes in industrial structure were similar across countries, then it is considerably more difficult to access the relative importance of technological change and deindustrialization, since both have similar empirical implications. We, however, argue that deindustrialization could not be the whole story.

The observed decline in the wages of less educated workers (relative to more educated workers) could be the result of the decline in industrial jobs or changes in technology. Both are

⁵Inequality measures reflect both changes in prices (the wage rates paid to workers of different types) and quantities (the proportion of workers of each type.) In the case of technological change, both prices and quantities contribute to the change in within industry inequality.

⁶We focus on shifts to industries with low mean wages. The term "deindustrialization" can also imply shifts to industries with large variations in wages. Thus, deindustrialization may increase both between group and within group inequality. In either case, inequality is affected by changes in the weights put on different industries.

consistent with the increase in the "skill premium". However, this rise in the "skill premium" was accompanied by an increase in the "skill mix" (ratio of the number of skilled to unskilled workers hired) within each sector. We argue that this increase in demand for skilled workers in the face of rising relative prices cannot be explained solely by changes in industrial structure. Technological change must have increased the relative productivity of skilled workers since more of them were hired in spite of their increased cost to the firm. While the shift in industrial structure cannot be the whole story, it may have reinforced the rise in the demand for skilled workers driven by technological change. If the more skill intensive sectors were the ones that expanded, then the change in industrial structure would have reinforced the effects of changing technology. We offer a way of decomposing the change in the skill mix into the portion associated with changes in industrial structure and the proportion associated with all other factors. This serves to bound the possible effects of "deindustrialization".

In summary, while we recognize that technological change and deindustrialization are not the only two possible structural factors that can affect inequality, we believe that these two factors have received sufficient attention in both the popular and academic literature to be at the center of this study of international differences. Again we do not pretend to be able to isolate "the smoking gun", rather we hope to be able to use international comparisons to continue to narrow the range of possible explanations.

The paper is divided into five parts. The next section reviews the literature on inequality in the US and the emerging literature on international comparisons of inequality. This is followed in section 3 by a detailed discussion of the links between technological change, industrial restructuring and inequality. With this as background, we turn to the empirical evidence on these three factors for the industrialized countries we study. The final section draws conclusions from the data presented.

II. Review of Literature

Rising earnings and wage inequality among male workers in the United States has led to a substantial literature documenting the trends and to a smaller literature attempting to identify the causes of the rising inequality. Changes in the dispersion in the overall wage distribution can be usefully decomposed into changes in between-group inequality and within-group inequality. The former usually focuses on increases in wage differentials between high school and college graduates and between new entrants and older workers. Within-group inequality focuses on increased dispersion in the wage distributions within education and experience groups.

Studies of the US

Changes in the Overall Distribution

Using the Current Population Survey (CPS), several studies examine the distribution of weekly wages for males⁷. In order to concentrate on changes in wages and not changes in hours worked, the studies select only persons working full-time/ full-year. Since the large changes in laborforce participation of women confound labor supply and wage effects, most studies focus on the distribution of male earnings. These studies find that wage growth varied dramatically between the upper, middle and lower ends of the distribution⁸. For example, the median wage of males working full-time/full-year increased by 25 percent between 1963 to 1973 and declined slightly (5 percent) from 1973 to 1987. In contrast, the wages of similar workers at the tenth percentile declined by 21 percent between 1970 and 1987⁹. Thus, the wages of those at the bottom of the distribution fell both absolutely and relatively. In contrast, the real wages of the ninetieth percentile rose steadily since 1963 and increased considerably (12 percent) from 1970 to 1987 (Juhn,Murphy,Pierce,1989). Thus, growth in real wages was not shared equally among the labor force. Rather, large wage growth was experienced by those in the upper ends of the distribution and small or no wage growth was experienced by those in the lower tail.

Karoly (1992a) finds a similar trend by tracking wages of males in the 90th, 75th, 25th and

⁷For recent studies see Juhn, Murphy, Pierce (1989) and Karoly (1992a)

⁸Throughout this paper all values are in real terms (they are adjusted for inflation.)

⁹A male at the tenth percentile has a wage that exceeds the wages of ten percent of male workers.

10th percentiles relative to the median. Since 1975, the real wages for the 90th and 75th percentiles increased 10 percent faster than the median while real wages for the 25th and 10th percentiles declined sharply relative to the median. In addition, overall measures of inequality such as the Gini coefficient, the variance of the log of wages, and the coefficient of variation were all relatively stable until 1979 when they increased sharply (Karoly, 1992b).

Changes in Between Group Inequality

Part of the observed increase in the overall wage inequality was caused by a large increase in the returns to education. During the 1980s, the returns to education increased dramatically.¹⁰ This is in sharp contrast to the decline in the returns to education during the 1970's. (Katz and Revenga, 1989, Juhn, Murphy, Pierce, 1989, Murphy and Welch, 1988). The increase in returns to education are largest for the young. Murphy and Welch show that the ratio of college to high school weekly wages for white males with 1 to 5 years experience increased 50 percent since 1979. A similar but less pronounced increase in the college-high school wage ratio occurred for workers with 26 to 35 years experience. The returns to experience also increased sharply after 1979 and were especially pronounced for high school educated workers. Thus, young high school workers also lost ground relative to older high school workers.

The result of these trends has been a dramatic decline in the relative position of young, high school graduates. Juhn, Murphy, Pierce illustrate this decline by noting that real wages for 10th percentile high school graduates with 1 to 10 years of experience are roughly 18 percent lower today than wages for the same group in 1963. The least skilled workers are rapidly falling away from the rest of the distribution.

Changes in Within Group Inequality

In addition to the increased inequality between education and experience groups, recent studies find a striking increase in wage dispersion within these groups. The increase in within group inequality, however, seems to have started earlier, beginning in the early 1970's. The wage differential between the ninetieth and tenth percentile has increased within the distributions of young

¹⁰The return to education is the percentage increase in wages that is associated with an extra year of education.

and old workers and within the wage distributions of high school and college graduates. In all cases, persons in the upper percentiles experienced significant growth in real wages while those in the lower percentiles experienced slight growth or, in most cases, declines in real wages.

Cross-national Studies

With the recent availability of cross country data, researchers are just beginning to make cross-national comparisons of earnings and income inequality. Green, Coder, and Ryscavage (1990) examine earnings inequality in eight industrial countries using data from the Luxembourg Income Study. Their primary emphasis is on ranking the countries in terms of overall levels of inequality and seeing how the ranking varies with different inequality measures. While they take a cursory look at changes in inequality, this is not their primary focus.¹¹ Three international studies provide pairwise comparisons with the United States. Freeman and Needles (1991) compare the United States and Canada; Katz and Loveman (1990) compare the United States with the United Kingdom and France; while Katz and Revenga (1989) compare the United States and Japan. Country specific studies are also available for Australia (Borland, 1992) and Sweden (Hibbs, 1990 and Edin and Holmlund, 1992).

Freeman and Needles (1991) investigate whether the Canadians also experienced similar changes in the college wage premium and in wage differentials within education groups over the 1980s. Using data from both the Canadian Survey of Consumer Finances and the Canadian Census of Population, they calculate changes in mean log wage differentials between university graduates and high school graduates and changes in log wage differentials between deciles within these education groups. They find that Canada also experienced an increase in the university wage premium during the 1980s. The increase, however, is quite moderate compared to the United States. In addition, the increase in the university wage premium does not appear to be larger for young workers, as is the case in the United States. After controlling for changes in weeks worked, Freeman and Needles show the Canadian increase in the university premium among young workers to be only a sixth of the comparable increase for the US. They attribute this smaller rise in the college premium to the much

¹¹Blackburn and Bloom (1990) use the LIS data to compare changes in family income inequality (not wage inequality) between the United States, Canada and Australia in the 1980s.

larger increase in the number of university graduates relative to high school graduates in Canada. Freeman and Needles also find that Canada experienced increases in earnings inequality among workers with the same education level. The increase was particularly pronounced for high school educated workers and for young workers.

Katz and Loveman examine trends in weekly and hourly gross wage distributions based on age, gender, occupation, and industry for the United Kingdom. For full-time male workers, they find wage differentials between manual and nonmanual workers were stable over the 1974-1979 period and increased from 1979 to 1989. Wage differentials between experience groups expanded moderately in the later 1970s and substantially in first part of the 1980s. Wage inequality within distributions based on detailed occupations and detailed occupation-industry breakdowns narrowed in the 1970s and increased greatly in the 1980s. Thus, the United Kingdom's experience is similar to the United States.

As for France, Katz and Loveman find the nonmanual/manual differential for full-time male workers narrowed from the mid 1970s through mid 1980s and picked up slightly at the end of the sample period. Thus, unlike the U.S. and U.K. there is little evidence of a sharp deterioration in the relative wages of young unskilled workers. Data on within-occupation inequality shows relatively little change until 1984 when it begins to increase.

Katz and Revenga examine the changes in between group wage inequality in the United States and Japan. For the U.S., their findings support other studies which show a substantial increase in the returns to education and a large increase in the returns to experience among high school graduates since 1979. The plight of young, low-educated males in Japan contrasts sharply with that of the U.S. They find the college wage premium within all experience groups in Japan increased only moderately in the 1980s, whereas much larger increases were found in the U.S. During the 1980s, returns to experience did not increase in Japan as they did in the U.S. In fact, Japanese new entrants in all education groups gained ground on more experienced workers in the 1980s. Moreover, high school educated new entrants in Japan actually experienced bigger increases in monthly wages in the 1980s

than in the 1970s. This contrasts sharply with the decline in real and relative wages for young high school workers in the U.S. in the 1980s.

Katz and Revenga examine possible supply-side explanations of the observed trends. They show that the growth rate of college graduates from 1979 to 1987 declined in the U.S. and increased slightly in Japan. This difference partly explains the contrasting changes in the college wage premiums in the two countries. On the other hand, the fraction of new entrants with high school education's declined in the U.S. in the 1980s. This cohort effect would predict an improvement in high school new entrants wages yet their wages fell dramatically. In Japan, the fraction of new entrants with high school and college education's declined which is consistent with the improved position of new entrants in the Japanese labor market.

While Borland (1992), Hibbs(1990) and Edin and Holmlund(1992) do not try to gather comparable data for the US they do offer individual country studies on changes in wage inequality. Borland (1992) examines the changes in the distribution of wages for full-time males employees in Australia over the 1982 to 1990 period using individual-level data from the Income Distribution Survey. He finds that average real wages fell and overall wage inequality increased during the period. The rise in inequality is a result of an increase in wage inequality both within and across education-experience groups. Edin and Holmlund(1992) show that the trends in wage inequality in Sweden are similar to those experienced in France. That is, wage inequality has increased in the recent decade but the increase is moderate and delayed compared to the United States. Overall inequality as measured by the variance in log wages fell from 1960 to 1980 and then began to increase. They also show, using a sample of both men and woman, that the returns to education in Sweden declined over the period from 1968 to 1980 and increased thereafter. Hibbs (1990) shows a similar pattern of declining and then increasing wage inequality among white collar and blue collar workers.

III. Changes in Economic Structure

In this section we start by laying out the analytical links between changes in inequality and several structural changes that may have occurred in the economies of the countries we study. The first set of factors focus on the consequences of increased international competition and the resulting shift away from manufacturing toward services. The second set of factors focus on the implications of technological change on the demand for more skilled workers.

After having established the conceptual links between changes in inequality and these changes in economic structure, we examine three key indicators that may be useful in measuring the relative importance of these factors: (1) changes in the international competition, (2) changes in the industrial structure and (3) changes in the skill mix within industries. While these three indicators offer only a partial picture of the changes that have occurred in each country, they provide some useful information which can be used to narrow the range of possible causes of the increase in inequality.

Some Analytical Links between Economic Structure and Inequality

In this section we develop the conceptual links between distributional changes and two commonly cited causes of the trend in inequality: changes in the international competition and changes in technology. Our choice to focus on these factors is motivated largely by the attention that they have received in the popular and academic literature.

Changes in Industrial Structure and International Competition

The 1980's was marked by substantial shifts in the industrial structure of developed economies. This led to two related hypotheses which predict that changes in inequality were caused by this restructuring. The first hypothesis focuses on "deindustrialization" per se, independent of its cause. The second focuses on changes in industrial structure caused by changes in international competition. Each is considered in turn.

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"Deindustrialization"

The hypothesis that changes in industrial structure may have caused distributional changes has been prompted by the observation that manufacturing declined and the service sector expanded in the US during the same period during which inequality increased. In popular terms, auto workers were

being forced to become "hamburger flippers". The resulting shift of workers into industries that had both lower average wages and greater dispersion in wages would increase overall inequality, even if there was no change in the wages paid in each industry.

However, the resulting decline in demand for low skilled workers in the auto industry and the subsequent increase in supply of low skilled workers in the service sector will tend to decrease the wages of low skilled workers. As a result, the skill premium (i.e. wages of more skilled workers relative to less skilled workers) is bid up. With the resulting increase in the relative cost of hiring more skilled workers, firms would want to substitute less skilled workers for the now more expensive skilled labor.¹² As summarized in the top row of Figure 1, the net result of deindustrialization would, therefore, be an increase in the skill premium and a decline in skill intensity within each sector¹³.

Figure 1

Implications of Alternative Theories

Causal Mechanism	Implication	
	Change in Skill Premium	Change in Skill Intensity within an Industry
Changes in Industrial Structure	Increase	Decline
Changes in Technology	Increase	Increase

Institutions, such as unions and governments, can partially mediate the effects of these industrial shifts. For example, union negotiated wages or social contracts can limit the extent to which these market forces alter wages. If all countries lost manufacturing and gained service sector

¹² This is a movement along the demand function.

¹³ The aggregate skill intensity would still have risen, even though each industry became less skill intensive. The reweighting toward the more skill intensive sector would more than offset the decline in skill intensity within each sector since the net change in demand for more skilled workers must have been positive if their wages rose.

jobs but these same countries experienced different patterns in inequality then this would call into question the primacy of changes in industrial structure as an explanation for the growth in inequality-- deindustrialization either had little impact on inequality or its effects were countered by institutional factors.

International Competition

The change in industrial structure is often attributed to increases in international competition. At the heart of this argument is the hypothesis that foreign competition has its biggest impact on the wages of low skilled workers-- when international trade increases, firms producing goods which require unskilled workers face the largest increase in competition from abroad. This puts downward pressure on the wages of low skilled workers. At the same time, firms producing skill intensive goods are able to increase exports. This increases the demand for skilled workers.

The result of the decline in demand for less skilled workers and the increase in demand for more highly trained workers raises the gap between the wages of low and high skilled workers in industrialized countries. Meanwhile, the wage gap is expected to narrow in skill-poor countries. Skilled workers in these countries have to compete with their counterparts in other, more highly educated countries. On the other hand, unskilled workers in less developed countries can effectively compete with unskilled workers in developed countries through exports. These conceptual links between openness and inequality suggest that changes in inequality should be related to changes in openness-- if countries that experienced substantial increases in inequality did not experience a concurrent increase in international trade then this is evidence against the international trade interpretation of rising inequality.

Changes in Technology

Changes in technology are often cited as an alternative underlying cause of the increase in inequality. According to this argument, the widespread application of computers and automated technologies reduced the demand for less skilled workers whose jobs were automated out of existence. At the same time there was an increased demand for high skilled workers to run the automated systems.

This explanation for the increase in inequality has similar empirical implications for the skill premium but different implications for the skill mix within sectors. Both deindustrialization and technological change predict that the wage differential will widen as the demand for less (more) skilled workers falls (rises). While the cause of the decline (rise) in demand for less (more) skilled workers is different the prediction for a rising wage differential is identical for the two theories.

Where the theories do differ is in their predictions about changes in the skill mix within each industry. As we argued earlier, the deindustrialization argument implies that each sector will become less skill intensive-- the increase in the cost of skilled workers with no offsetting increase in their productivity will induce firms to substitute less skilled workers for their now more expensive counterparts. If, however, the increase in demand for more skilled workers came from technological change that made more educated workers more productive, then one should observe an increase in the skill intensity accompanying the increase in the skill premium. Both reflect the increased productivity of the more highly trained workers. Thus, as Figure 1 shows, the two theories have different implications about changes in the skill mix within industries.

IV. Empirical Results

Data

We use two types of cross-national data in this paper. The first is the family survey data from the Luxembourg Income Study (LIS). This data is used to obtain comparable measures of overall inequality, as well as between and within group inequality. The second source of data is published times series on measures of industrial structure and international competition from the Organization for Economic Co-Operation and Development (OECD). This data is used to try to gain insight into the possible causes of changes in inequality.

LIS Data

We use LIS data on Australia, Canada, France, Netherlands, Sweden, United Kingdom, and the United States¹⁴. The LIS data is a collection of micro data sets obtained from annual income surveys in various countries.¹⁵ The different surveys are similar in form to the Current Population Survey for the United States and the Survey of Consumer Finances for Canada¹⁶. The advantage of these data is that extensive effort has been made by country specialists to make information on income and household characteristics as comparable as possible across countries.

Since we are interested in changes in inequality, we are restricted to the countries with two years of data in LIS. Although the years used were dictated by the years covered for each country in LIS, they represent a roughly similar time period-- the first wave of data for each country is from the early 1980's and the second wave is from the mid or late 1980's. For all countries other than Sweden and the Netherlands unemployment rates were higher in the second year than the first year¹⁷.

Our measure of earnings is real annual gross wages and salaries of male family heads¹⁸. We use the earnings of male heads, rather than all males since data on individuals who are not heads or spouses is not available in LIS for all countries in both years. Studies using the CPS data have found similar patterns of earnings inequality using heads or individuals. We exclude females since we are trying to replicate studies for the US that have focused almost exclusively on males.¹⁹ In order to focus on people who are not likely to be in school or retired we limit our sample to males between the ages of 25 and 55. Since consistent data on full-time and full-year are not available for all countries in all years we include part-time and part year workers.²⁰ Thus, our data includes changes

¹⁴The German data in LIS were not used because the two years of data were obtained from two different surveys, the German Transfer Survey and the German Panel Survey. All other countries had data from the same surveys in the two years.

¹⁵The data is stored in Luxembourg under the sponsorship of the Luxembourg government. See Smeeding (1986) for a detailed description of the data source and methods for accessing the data.

¹⁶Appendix A lists the surveys used in each country

¹⁷Appendix B provides the country specific unemployment rates between 1975 and 1989.

¹⁸Current dollar values have been inflated to 1988 prices (each in their own currency) using the implicit price deflators from the OECD National Product Accounts.

¹⁹Since there were large inflows of women into the labor markets during the 1970's and 1980's, the distribution of the earnings of females was affected by selection (which women entered) as well as by changes in supply and demand for persons of given characteristics. Focusing on males partially avoids these selection issues.

²⁰For both years of Australian and Netherlands data and the later years of Canadian data, the information that does exist is for full-time last week rather than for the reference year. No full-time variable is available for France.

in inequality that arise out of changes in the distribution of hours as well as wages. When we limit our analysis to full-time/full year workers in those countries for which data are available we obtain very similar results. Finally, in order to focus solely on labor market income we exclude male heads of households that report any self-employment income²¹.

In order to maintain confidentiality, data on income above some upper bound is often reported at the upper bound. For example, in recent years the CPS data is top-coded at \$100,000--individual earnings over this amount are recoded to \$100,000. This top-coding affects comparisons both across time and across countries²². We use two different methods to account for the effects of top coding. The first is to use summary measures, such as percentile points, that are not affected by top coding. The second method, which we use when calculating the coefficient of variation, is to measure the dispersion of a truncated distribution by excluding the top five percent of the distribution in each year²³. By providing a consistent cutoff across time and countries we limit the effects of top-coding²⁴. Thus, the data we present in this paper on the coefficient of variation is for the truncated distribution. Medians and percentile points which are not affected by top-coding are for the full distribution.

To explore changes both between and within education groups, we construct three education categories corresponding in the United States to less-than 12 years of education, 12 years, and more than 12 years of education. The recoding into the three groups is straight forward for Canada and somewhat more arbitrary for the Netherlands²⁵. Since no education information is available for Australia, France, Sweden or the United Kingdom, we cannot compare changes in inequality between and within education groups for these countries.²⁶

²¹Self-employment income is available only at the family level.

²² Even if the nominal upper bound does not change, inflation will erode its real value.

²³ In computing the CV within groups, the top five percent of the age or education specific distribution is excluded. For example, when calculating the coefficient of variation for high school graduates we trim the top five percent of high school graduates.

²⁴ An alternative would be to impute values to persons who are top coded. This has the advantage of maintaining information on all persons but the disadvantage of introducing substantial measurement error, which may have a large effect on second moments.

²⁵ See Appendix C for more detail on education categories.

²⁶ An education variable is available for Australia but the coding is not consistent in the two years. This makes the changes in inequality between and within education groups less reliable.

Published Data

We use published information on the level of trade and the proportion of workers with a university education, by sector in each country over time. The published data on imports and exports (as a share of gross domestic product, GDP) is from the OECD National Accounts 1960-1986. Imports, exports and GDP in each country are measured in billions of U.S. dollars at current prices and 1980 exchange rates. The employment by sector data is from the OECD Labour Force Statistics 1967-1987. We include females as well as males in these data since structural changes reflect changes in the employment of all persons.

Changes in Economic Structure in OECD Countries

Changes in Inequality Across Countries

In this section we present information on inequality from the seven countries in the LIS data set. We separate our discussion of changes in inequality across countries into three sections: (1) changes in the overall wage distribution, (2) changes in between group inequality and (3) changes in inequality within groups. Following in the tradition of the existing literature we group by age and education.

Changes in the Overall Distributions

We start by describing changes in the median of the wage distributions in each country. This gives an indication of the underlying rate of growth in each country. Table 1 shows the yearly percentage change in median earnings (column 1), in coefficients of variation (column 2) and in real earnings by decile (columns 3-6). The last columns indicate changes in inequality. Countries are ranked from the highest increase in the coefficient of variation (Sweden) to the lowest (Australia).²⁷

Table 1 indicates that median earnings in the U.S. declined between 1979 and 1986. This is consistent with other studies tracking the growth in real wages over the 1980s (Karoly, 1992a). The lack of growth was, however, not restricted to the United States--the majority of countries experienced negative growth in median real gross annual wages and salaries. The exceptions are

²⁷ When we restricted our sample to full-time workers Sweden did not have the highest increase in the coefficient of variation. This suggests that the large increase we find in Sweden is at least partially a result of changes in wages and hours among part-time workers.

Canada, which experienced a small increase in mean wages and salaries, and the U.K., which experienced over two percent per year wage growth.²⁸

Our summary measures of inequality replicate the results of others for the United States-- a falling median was accompanied by rising inequality during the 1980's. Again this pattern is not isolated to the United States. We find increases in the yearly percentage change in the coefficient of variation for all countries. Furthermore, the increase in inequality in the U.S. was roughly in the middle of the experiences of other countries. Australia experienced a small increase in inequality, while inequality in Sweden increased by nearly two points yearly in the coefficient of variation.

Changes in Between Group Inequality

Previous studies of the United States found large increases in the returns to education and experience since 1979. In Table 2, we compute the ratio of median real wage ratios of young (25 to 30 years old) to older (40 to 55) workers, low to high educated workers, and medium to high educated workers in each year. We examine the percentage change in these ratios for each country for which we have data.

In all countries, we find the mean earnings of young workers falling behind the mean earnings of older workers. The ratio of mean wages for workers 25-30 years old relative to 40-55 years old workers has declined by 1.14 percent per year in the United States. This is in contrast to a low of .31 percent in Sweden to as much as 2.92 percent in France. Thus, the increased returns to experience, which has been an important factor in increasing inequality in the US, is a widely experienced phenomenon.

Consistent with other studies, we also find that the returns to education increased sharply in the United States, while Canada experienced a much smaller increase in the education premium. The Netherlands, on the other hand, has a different pattern -- less educated workers actually gained on higher educated workers. Recall that Borland (1992) finds an increase in the log wage differential between educated and less educated workers in Australia over the 1982 to 1990 period. The increase

²⁸Katz and Loveman also find high real wage growth rates for the United Kingdom in the 1980s. They attribute the difference in wage growth between the U.K and the U.S. to the sharp rise in unemployment in Britain relative to the U.S. This suggests that low skilled workers in the U.K. experienced high rates of unemployment rather than wage reductions and thus mean wages actually increased in the U.K.

is however less dramatic than the US. Thus, the US is different from other countries in its exceptionally large increase in returns to education --in the US, the ratio of mean wages of low to high educated workers declined by 2.03 percent per year. In contrast, the change in Canada was only half as large.

Changes in Within Group Inequality

Previous studies of the United States, found that the changes in wage dispersion within experience and education groups were as large as the changes in the overall distribution. In Table 3, we examine the changes in the coefficient of variation for persons age 25 to 30 (relatively inexperienced workers) and persons 45-55 (relatively experienced workers) to see whether inequality has also increased within these groups in other countries. We also look at changes in inequality for persons classified by education.

Inequality among young workers, as measured by the coefficient of variation, increased considerably in all countries. While inequality among older workers also increased in all countries except France and the Netherlands, the increase in inequality within this group tended to be smaller. Similarly inequality increased in all education groups in all countries. Borland(1992) shows that in Australia wage inequality within education groups increase over the 1982-1990 period within all education groups except the least educated group. Thus, the patterns within age and education groups are generally consistent with the data for the US.

From the data presented in this section, we conclude that the industrialized countries we have studied have strikingly similar patterns of increased wage inequality for every measure other than the rise in returns to education. In the following section we explore whether these countries also experienced similar structural changes in trade and industrial structure.

Changes in Trade and Industrial Structures

Changes in Trade

In order to obtain a rough measure of the extent to which these economies were subject to increases in international competition we use OECD data to calculate the proportion of GDP that is

directly involved in trade. We use the standard measure of imports plus exports as a proportion of GDP.²⁹ The time series between 1960 and 1986 for the US and each country are shown in Chart 1.

The US experienced moderate growth in exports plus imports between 1965 and 1972 and rapid growth between 1973 and 1981. Openness then fell in 1982 through 1984, stabilizing at roughly its 1974 level. The trade patterns for France are the most similar to the U.S. While Canada, U.K. and Sweden also show increases during the overall period, openness for these countries increased by less than it did for the U.S. Only Australia shows much smaller rates of growth in openness. Since it also experienced the smallest increase in inequality, this suggests that inequality and openness may be related. Given the high degree of industrialization of all the countries we study, it should not be surprising that all the countries that experienced an increase in trade also experienced an increase in inequality. The more skilled workers in these countries found new markets in the countries with few highly educated workers while the less educated workers in these industrialized countries found themselves having to compete with imports made in countries with an abundance of less skilled workers.

If increased international competition had a large effect then we would expect inequality to decrease in less developed countries while it increased in more developed countries. Highly educated workers in these countries would find themselves competing with their counterparts in industrialized countries. This would decrease the wages of skilled workers in less developed countries. Meanwhile, the less skilled workers would experience an increase in their relative wages as the goods they produce compete in new overseas markets. Put another way, jobs lost in the US as a result of international competition would mean an offsetting increase in demand for low skilled workers in other countries. Given the high degree of industrialization of all the countries we study, it is not surprising that the increase in trade experienced by these countries was accompanied by an increase in inequality. The more skilled workers in these countries found new markets in the countries with few highly educated workers while the less educated workers in these industrialized countries found

²⁹Very similar patterns emerge when we plot exports as a percentage of GDP.

themselves having to compete with imports made in countries with an abundance of less skilled workers.

While the evidence on changes in inequality in less developed countries is very limited, Davis (1992) presents some suggestive evidence on changes in inequality between education groups for South Korea, Brazil, Venezuela and Columbia. He finds that the skill premium decreased in all four countries. Topel and Kim (1992) who conduct a detailed study of labor market changes in Korea also find that inequality between education groups fell over the period from 1976 to 1989. Unlike the developed countries we study, all these less developed countries experienced a decline in inequality.

The growth in inequality in developed countries and the decline in less developed countries is consistent with the view that increases in international competition were partially responsible for changes in inequality. This evidence is, however, at best only suggestive. While the growth in inequality in the developed countries is unusual the decline in the less developed countries is consistent with the Kuznets hypothesis that countries in the latter stages of development will experience a decline in inequality. With the data at hand we simply cannot differentiate between a movement along Kuznets inverted U shaped inequality profile and a downward shift of the profile that would result from increased openness.

We conclude that the U.S. was not alone in experiencing an increase in openness during the 1970's, and that trade may be partially responsible for the increase in inequality in industrialized countries. The fact that inequality grew least in Australia, the country with the smallest growth in trade and the fact that several less developed countries experienced a decline in inequality suggests that international competition was instrumental in raising inequality in the industrialized countries.

Changes in Industrial Structure

If international competition from less developed countries is important, than we should expect similar changes in industrial structure among developed countries in LIS. Are there systematic differences between these countries in the degree to which they lost manufacturing and gained service

sector jobs³⁰? To answer this question, Gottschalk and Joyce(1992) examined the distribution of civilian employment across four sectors; agriculture, services, manufacturing and a residual sector to see if the other countries have experienced changes in industrial structure that are similar to the US experience. They find remarkable similarity across countries in the redirection of employment toward the service sector. Although the relative size of the sectors in each countries varies, the direction of the changes in employment by sector is the same in all countries. Each experienced a decline in employment shares in agriculture and manufacturing and an increase in employment shares in the service sector. We conclude that if inequality is being driven by deindustrialization, which is in turn being driven by increased international competition, then deindustrialization is affecting all these countries in a very similar manner.

Changes in Skill Mix within Sectors

Our initial hope of distinguishing between the impact of changes in industrial structure from the impact of changes in technology by exploiting cross-national comparisons, has proven to be elusive. The data has shown that the countries we studied experienced similar changes in the inequality and industrial structure. With little variation in either the dependent or the explanatory variable it is difficult to determine the role played by changes in industrial structure.

However, as discussed earlier, deindustrialization and technological change have different implications for changes in the skill mix within sectors. If changing industrial structure is the primary cause of the increase demand for skilled workers then we would expect to see an increase in the skill differential. This increase in the relative cost of more skilled workers would, however, lead to a decline in the proportion of skilled workers hired as firms had to pay higher prices for workers whose productivity had not increased. In contrast, if technological change was the cause of the increase in the skill premium (documented in Table 3) then we would expect to see an increase in skill intensity within all sectors. The rising skill differential would reflect the fact that the productivity of skilled workers had increased enough to induce firms to bid up their relative price.

³⁰Topel and Kim(1992) find a massive increase in the employment shares in manufacturing for Korea. This is supportive of the hypothesis that world manufacturing production is shifting away from developed countries to middle income economies.

Table 4 presents data on the growth in the proportion of the labor force with a university education by sector and country. The bottom row shows the yearly percentage increase in the proportion of the labor force (in all industries) with a college degree. The growth rates for each country are very similar (ranging from .27 to .58 percent per year)³¹. While there is some diversity across sectors, almost all sectors in all countries show an increase in the proportion of university educated workers. Agriculture, a rapidly declining sector, experienced some of the largest increases in educational upgrading. Likewise, manufacturing and professional services, two sectors with very different employment patterns, had above average growth in the proportion of their workers with a university degree. This suggests that technological change was increasing the demand for college educated workers sufficiently fast to offset any effects of the rising skill premium coming from deindustrialization. Without some outside force to drive up demand for skilled workers we would have observed firms cutting back on their demand for skilled workers whose wages had risen sharply relative to other workers. Thus, changes in technology are a necessary part of the explanation for the rise in inequality.

Relative Importance of Changes in Industrial Structure

The increase in the skill differential reflected increases in demand coming from both greater skill intensity within each sector (the technological aspect) and growth in the more skill intensive sectors (deindustrialization). How important were each of these factors in accounting for the higher wages of the more educated workers?

In order to answer this question, Table 5 shows the aggregate skill intensity, as measured by the ratio of university educated workers to less than a secondary educated workers, under two scenarios. The first shows the actual change in skill intensity or skill mix. This change reflects both changes in skill intensity within sectors and changes in the weights attached to each sector. If the more skill intensive sectors experienced the largest growth then more weight would be given to these sectors. The second scenario shows what the skill intensity would have been if the skill mix had

³¹ This table does not address the cause of the increase in skill intensity. It could have come about because the fast growing sector were the more skill intensive (i.e. the deindustrialization explanation) or because each sector became more skill intensive (the technological explanation).

changed within sectors but the weights had not changed.³²

In all countries, the fastest growing industry was finance, insurance real estate and business, which is also typically the most skill intensive. Similarly, all countries experienced large declines in agricultural employment which happens to be the least skill intensive sector in every country. Table 5 indicates that these and similar shifts toward the skill intensive sectors in all countries accounts for an important part of the skill upgrading. The proportion of the total change resulting from shifts in employment ranged from a low of 53.2 percent in Canada to a high of 72.4 percent in Sweden. In all countries, the shift in employment towards the skill intensive sectors was more important in accounting for the change in the skill mix than was the shift in skill intensity within sectors. Thus, we conclude that while both technological change and changing industrial structure are necessary parts of the explanation for the growth in inequality, the latter may be quantitatively more important.

V. Conclusions

There are two types of conclusions that can be reached on the basis of the data in this paper. The first are purely descriptive. Our review of the evidence shows similar patterns in inequality, international competition and industrial structure in the seven industrialized economies we studied. All countries experienced an increase in inequality both within and between groups. Viewed in this light, the US experience is not atypical. Furthermore, the deindustrialization and increased openness of the US are again not aberrations. All countries experienced increases in trade, declines in manufacturing and increases in service sector jobs.

While there are individual differences across countries, we are struck by the similarities in the changes in inequality of earnings. This is particularly surprising given that the countries we study have considerably different institutions. The fact that all countries experienced rapid increases in inequality suggests that the economic pressures were sufficiently large to overcome many of the institutional barriers to market forces. This is not to say that these countries were not able to

³² The skill intensities for all industries were computed by weighting each sector by its percent of the civilian employed. The employment percentages were taken from the OECD Labor Force Statistic 1967-1987 while the data on skill intensities by sector were taken from a special 1987 OECD study on education and the labor force.

redistribute income to offset the effects of market forces. In fact, Blank and Hanratty (1991) show that Canada's social safety net kept poverty from rising in spite of the increase in wage inequality. What the data in this paper suggests is that the market forces were sufficiently strong to overcome many of the institutional factors put in place to control market incomes.

Some causal conclusions are also offered on the basis of data in this paper. These are offered much more tentatively since cross-national comparisons do not provide the type of natural experiment which one would need to draw causal inferences. The data we have presented suggests that both internationalization of competition and changes in technology were important. The fact that less developed countries experienced a decrease in inequality while all the industrialized countries we studied experienced an increase in inequality suggests that the relative wages of more skilled workers were being bid down in less developed countries while they were being bid up in the more developed countries. This is consistent with the effects of increased international competition. On the other hand, the fact that the proportion of the labor force with a college degree increased in all sectors despite its higher price implies that deindustrialization could not be the whole story-- without technological change industries would have become less skill intensive as a result of the increase in the cost of skilled workers.

In summary, the US experience is very similar to that of many industrialized countries. While there is still no "smoking gun", this study shows that both international competition and technological change remain as primary suspects of the cause of rising inequality.

Table 1

Yearly Percentage Changes in Median, Coefficient of Variation and Real Wages and Salaries by Decile

Country	yearly % change median	yearly % change CV	yearly % change 10th percentile	yearly % change 20th percentile	yearly % change 80th percentile	yearly % change in 90th percentile
Sweden 1981-1987	-.03	1.98	-4.06	-1.13	.43	.53
United Kingdom 1979-1986	1.54	1.97	.73	.91	2.47	2.42
United States 1979-1986	-.50	1.91	-1.79	-.91	.66	1.44
Netherlands 1983-1987	-.10	1.80	-.89	-.19	.00	.92
France 1979-1984	-.50	1.69	-1.84	-1.43	-.48	-.27
Canada 1981-1987	.79	1.56	-1.79	-.78	1.27	1.06
Australia 1981-1985	-.67	.91	-1.10	-.70	.40	.37

Table 2
Between Group Inequality

Ratio of Median Real Wages and Salaries			
<u>United States</u>	Young/Old	Low Ed/High Ed*	Med Ed/ High Ed*
1979	.743	.606	.850
1986	.684	.520	.733
Yearly % Δ	-1.14	-2.03	-2.10
<u>Canada</u>	Young/Old	Low Ed/High Ed	Med Ed/ High Ed
1981	.853	.754	.869
1987	.744	.707	.822
Yearly % Δ	-2.12	-1.04	- .90
<u>Netherlands</u>	Young/Old	Low Ed/High Ed	Med Ed/ High Ed
1983	.811	.542	.695
1987	.743	.696	.840
Yearly % Δ	-2.10	7.10	5.65
<u>Australia</u>	Young/Old		
1981	.915		
1985	.874		
Yearly % Δ	-1.12		
<u>Sweden</u>	Young/Old		
1981	.822		
1987	.807		
Yearly % Δ	-.31		
<u>France</u>	Young/Old		
1979	.883		
1984	.754		
Yearly % Δ	-2.92		
<u>United Kingdom</u>	Young/Old		
1979	.952		
1986	.868		
Yearly % Δ	-1.26		

* See Appendix C for educational categories used in each country.

Table 3

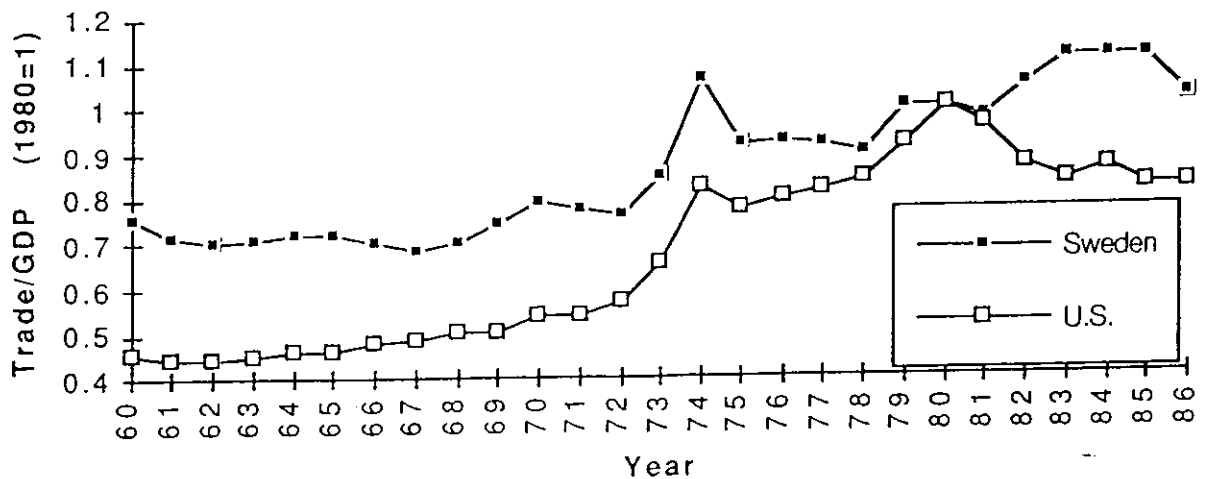
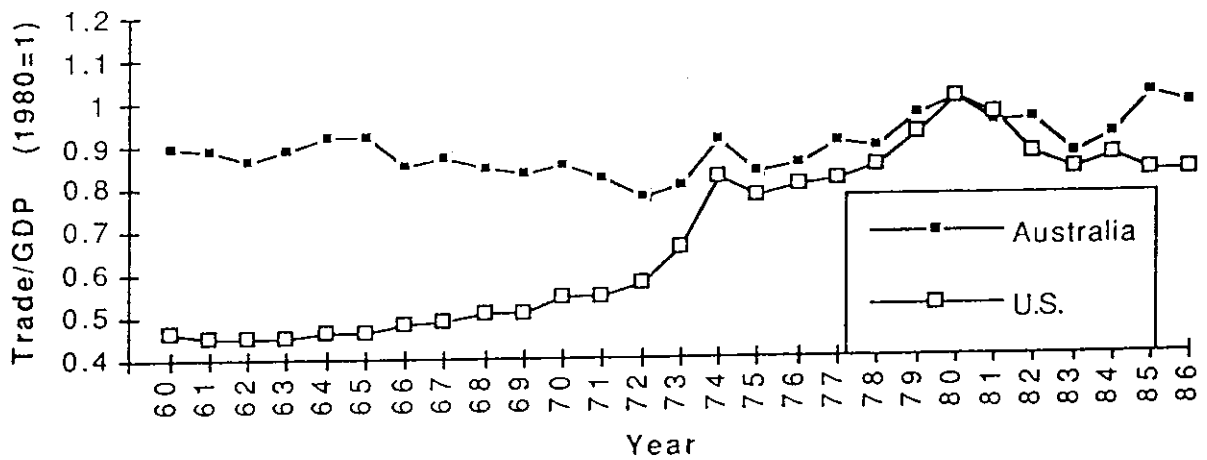
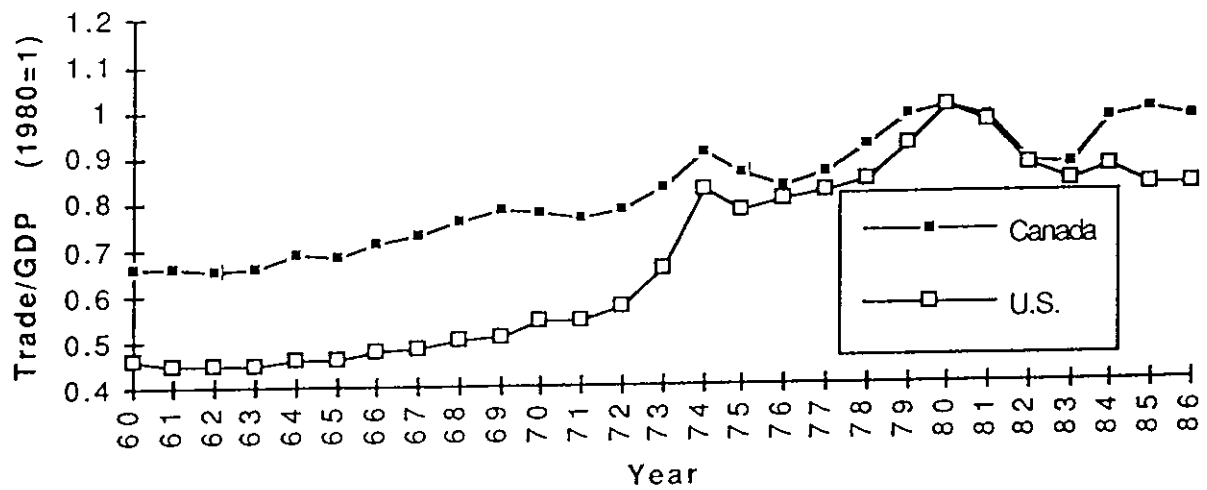
Yearly Percent Change in the Coefficient of Variation
by Age and Education Group

C. V. ¹	Full Sample	Age		Education		
		25-30	40-55	Low	Medium	High
United States	1.91	2.32	1.00	2.76	2.37	.96
Canada	1.56	1.77	1.45	1.53	1.04	2.25
Netherlands	1.80	2.23	.21	6.36	5.03	3.40
Australia	.91	1.82	1.29	na	na	na
Sweden	1.98	2.62	1.75	na	na	na
France	1.69	1.32	.73	na	na	na
United Kingdom	1.97	1.23	1.59	na	na	na

¹ The top 5% of each sample is truncated in computing the coefficient of variation.

Chart 1

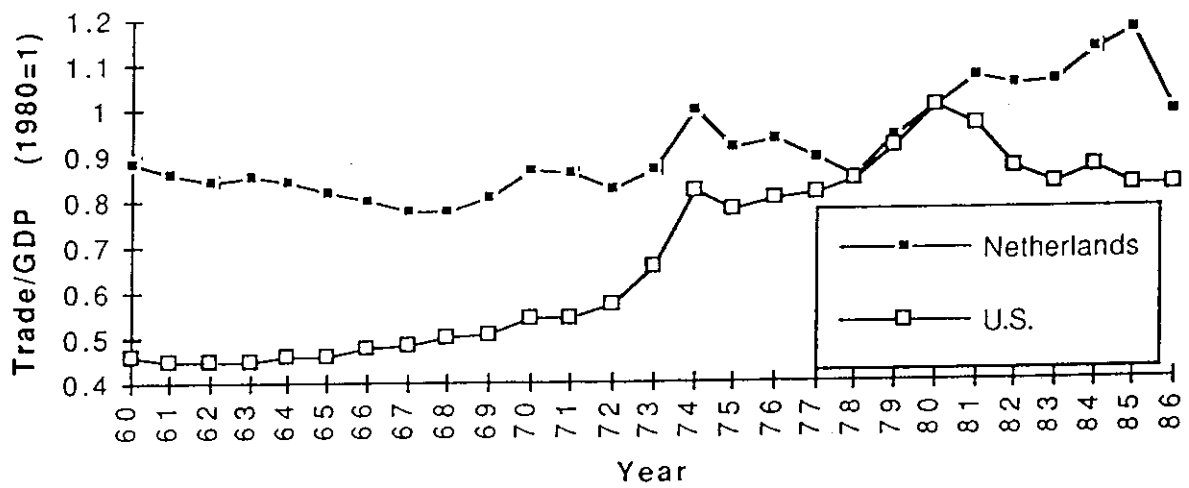
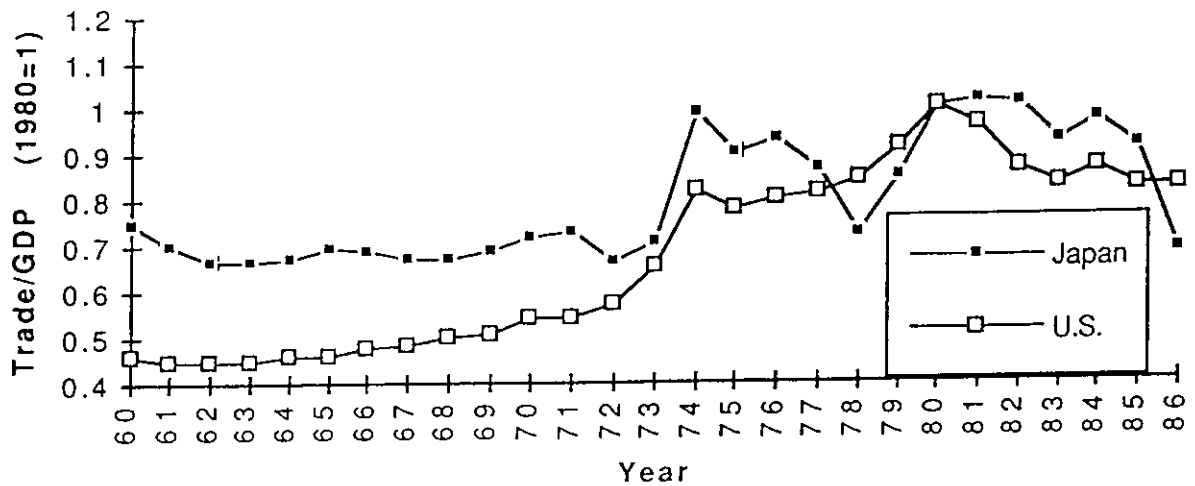
Imports plus Exports as Percent of GDP*



* Source: OECD National Product Accounts 1960-1986

Chart 1a(cont.)

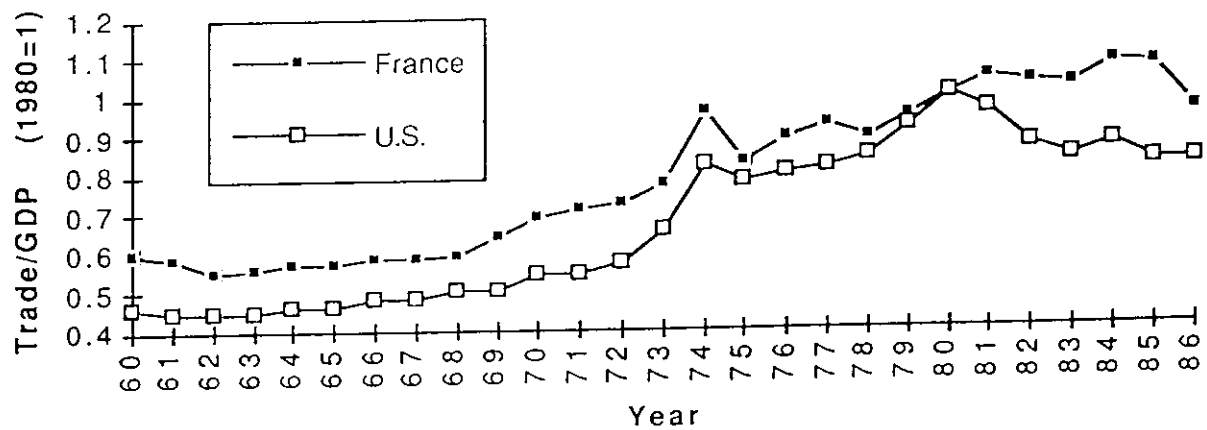
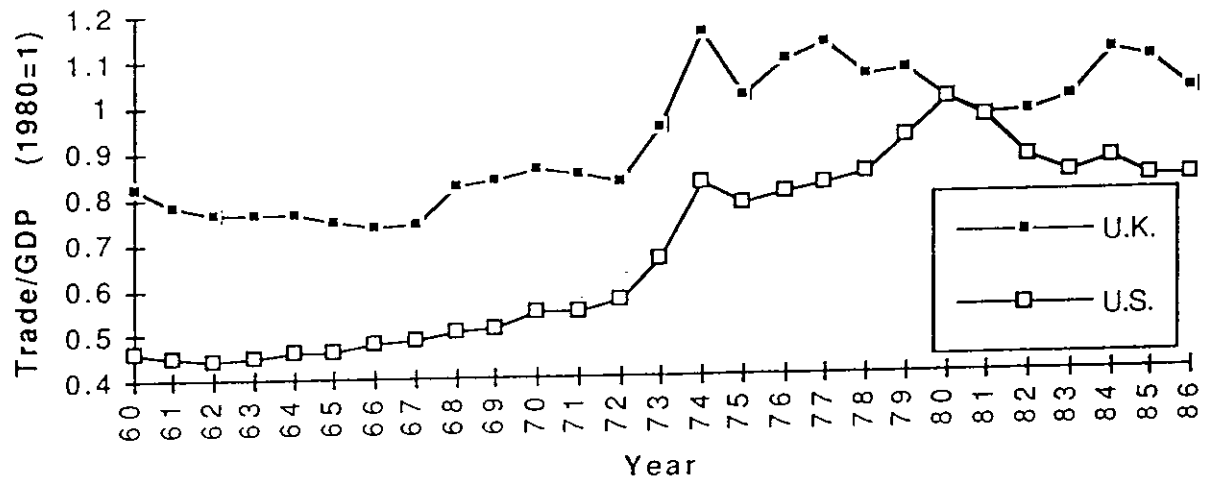
Imports plus Exports as Percent of GDP*



* Source: OECD National Product Accounts 1960-1986

Chart 1b(cont.)

Imports plus Exports as Percent of GDP*



* Source: OECD National Product Accounts 1960-1986

Table 4

Yearly Percent Change in the Relative Proportion of the Labor Force with University Educational Attainment.

	United States 1972-1987	Canada 1975-1987	Japan 1974-1987	United Kingdom 1981-1987	Sweden 1971-1987
Agriculture	.5	.58	.31	.40	.42
Mining and Quarrying	.28	.34	.43	1.23	na
Manufacturing	.39	.43	.29	.78	.42
Electricity, gas and water	na	na	.28	1.57	na
Construction	.29	.37	.26	.78	.28
Trade, restaurants	.29	.43	.25	.45	.39
Transport, communicatin	.46	.43	.22	.05	.33
Finance, Insurance, Real Estate Business	.25	.43	.31	.60	.18
Other Services	.16	.23	.26	.33	.18
All Industries	.27	.33	.33	.58	.32

Source: OECD Outlook on Employment, 1987.

Table 5
Ratio of Skilled to Less Skilled in Labor Force by Industry*

United States	Ratio of Skilled to Less Skilled		Percent of Civilian employed		% change in percent employed
	1972	1987	1972	1987	72-87
Agriculture	0.273	0.313	4.4	3.0	-31.8
Mining & quarrying	1.289	1.451	0.7	0.7	0
Manufacturing	0.784	0.879	24.7	18.6	-24.7
Construction	0.325	0.360	6.3	6.6	4.8
Trade and restaurants	0.547	0.597	21.3	22.2	4.2
Transport & communication	1.326	1.534	6.0	5.4	-10.0
FIREB	5.073	5.585	6.9	11.1	60.9
Other Services	2.699	2.923	28.5	31.2	9.5
All Industries-(actual weights)	1.129	1.374			
All Industries-(1972 weights)	1.129	1.240			
Percent of change due to changes in weights	54.7 %				
Percent of change due to changes within industries	45.3 %				

Canada	Ratio of Skilled to Less Skilled		Percent of Civilian employed		% change in percent employed
	1975	1987	1975	1987	75-87
Agriculture	0.075	0.084	6.1	4.9	-19.7
Mining & quarrying	0.259	0.283	1.5	1.5	0
Manufacturing	0.240	0.267	20.2	17.1	-15.3
Construction	0.096	0.106	6.5	5.7	-12.3
Trade and restaurants	0.250	0.277	21.9	23.6	7.8
Transport & communication	0.303	0.337	7.6	6.6	-13.1
FIREB	1.738	1.913	8.1	10.5	29.6
Other services	1.309	1.409	2.7	29.1	7.8
All industry-(actual weights)	0.461	0.555			
All Industry-(1972 weights)	0.461	0.505			
Percent of change due to changes in weights	53.2%				
Percent of change due to changes within industries	46.8%				

* Skilled are employed workers with university education. Less skilled are employed workers with less than secondary education.

Appendix A

Household Surveys in the LIS Database

Country	Survey	Sample Size
United States	March Current Population Survey	1979-15,225 1986-13,707
Australia	The Income and Housing Survey	1981-15,985 1985-7,560
Canada	Survey of Consumer Finance	1981-15,136 1987-10,999
France	The Survey of Individual Income Tax Returns	1979-11044 1984-12693
Netherlands	The Survey of Income and Program Users	1983-4833 1987-4190
Sweden	The Swedish Income Distribution Survey	1981-9625 1987-9421
United Kingdom	The Family Expenditure Survey	1979-6888 1986-7178

Table 5. (cont.) a

Japan	Ratio of Skilled to Less Skilled		Percent of Civilian employed		% change in percent employed
	1974	1987	1974	1987	74-87
Agriculture	0.015	0.017	12.9	8.3	-35.6
Manufacturing	0.326	0.364	27.3	24.1	-11.7
Construction	0.186	0.206	8.9	9.0	1.1
Trade and restaurants	0.492	0.543	20.9	23.1	10.5
Transport & communication	0.281	0.308	6.3	5.9	-6.3
FIREB	2.571	2.853	3.1	7.4	138.7
Other services	1.305	1.448	19.5	21.1	8.2
All industries-(actual weights)	0.377	0.507			
All industries-(1972 weights)	0.377	0.416			
Percent of change due to changes in weights	70.0%				
Percent of change due to changes within industries	30.0%				

United Kingdom	Ratio of Skilled to Less Skilled		Percent of Civilian employed		% change in percent employed
	1981	1987	1981	1987	81-87
Agriculture	0.068	0.074	2.8	2.4	-14.3
Manufacturing	0.166	0.181	30.1	21.6	-28.2
Construction	0.171	0.182	6.2	6.2	0
Trade and restaurants	0.073	0.078	18.6	20.3	9.1
Transport & communication	0.105	0.112	6.3	6.0	-4.8
FIREB	0.461	0.494	6.9	10.4	50.7
Other services	0.670	0.706	26.4	29.9	13.2
All industries-(actual weights)	0.271	0.309			
All industries-(1972 weights)	0.271	0.283			
Percent of change due to changes in weights	68.4%				
Percent of change due to changes within industries	31.6%				

Table 5 (cont.) b

Germany	Ratio of Skilled to Less Skilled		Percent of Civilian employed		% change in percent employed
	1978	1987	1978	1987	78-87
Agriculture	0.012	0.014	6.1	5.2	-14.7
Mining & quarrying	0.067	0.070	1.4	1.2	-14.3
Manufacturing	0.091	0.100	34.8	31.9	-8.3
Electricity, gas and water	0.197	0.203	0.9	0.9	0
Construction	0.047	0.050	7.4	6.5	-12.2
Trade and restaurants	0.087	0.094	15.3	15.1	-1.3
Transport & communication	0.067	0.072	6.0	6.0	0
FIREB	0.700	0.743	5.5	6.8	23.6
Other services	0.891	0.908	22.7	26.3	15.8
All industry-(actual weights)	0.215	0.256			
All Industry-(1972 weights)	0.215	0.225			
Percent of change due to changes in weights	75.6%				
Percent of change due to changes within industries	24.4%				

Sweden	Ratio of Skilled to Less Skilled		Percent of Civilian employed		% change in percent employed
	1971	1987	1971	1987	71-87
Agriculture	0.026	0.031	7.8	3.9	-50.0
Manufacturing	0.085	0.098	27.3	22.1	-19.0
Construction	0.042	0.048	9.1	6.4	-29.7
Trade and restaurants	0.078	0.091	14.5	14.0	-3.4
Transport & communication	0.071	0.082	6.9	7.1	2.9
FIREB	0.502	0.560	5.2	7.6	46.1
Other services	0.515	0.558	28.0	37.5	33.9
All industry-(actual weights)	0.178	0.254			
All industry-(1972 weights)	0.178	0.199			
Percent of change due to changes in weights	72.4%				
Percent of change due to changes within industries	27.6%				

Appendix B

Unemployment Rates by Country* 1975-1989

	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
U.S.	8.5	7.7	7.1	6.0	<u>5.8</u>	7.1	7.6	9.7	9.6	7.5	7.2	<u>7.0</u>	6.2	5.5	5.3
Australia	4.4	4.6	5.6	6.3	6.2	6.1	<u>5.8</u>	7.2	10	9.0	<u>8.2</u>	8.1	8.1	7.2	6.4
Canada	6.9	7.1	8.1	8.4	7.5	7.5	<u>7.6</u>	11	11.9	11.3	10.5	9.6	<u>8.9</u>	7.8	7.5
France	4.0	4.4	5.1	5.5	<u>6.3</u>	6.8	7.4	8.2	8.5	<u>10</u>	10.2	10.4	10.5	10.0	9.4
Netherlands	5.0	5.1	5.9	9.0	12.6	<u>17.1</u>	17.2	15.7	14.7	<u>14</u>	6.4	5.7
Sweden	1.6	1.6	1.8	2.2	2.1	..	<u>2.5</u>	3.2	3.5	3.1	2.8	2.7	<u>1.9</u>	1.6	1.4
U.K.	3.9	5.3	5.8	5.7	<u>5.4</u>	8.8	10.6	9.8	10.7	11.1	11.3	<u>11.4</u>	10.1	8.1	6.3

Source: OECD Main Economic Indicators

*Underlined values are for LIS survey years.

Appendix C

Recoding from LIS education categories

Canada 1981 and 1985

High	-University Degree - Post secondary diploma -Some post-secondary
Medium	-11-13 years
Low	-no schooling - less than 10 years

Netherlands 1983 and 1987

High	-University
Medium	-Secondary
Low	-Primary and extended primary

United States 1979 and 1986

High	-13 years or more
Medium	-12 years
Low	- less than 12 years

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