# Luxembourg Income Study Working Paper Series

Working Paper No. 160

Cross-national Differences in the Rise in Earnings Inequality--Market and Institutional Factors

Peter Gottschalk and Mary Joyce

May 1997

Cross-national Differences in the Rise in Earnings
Inequality--Market and Institutional Factors

Peter Gottschalk and Mary Joyce [1.]

March 1997

# Abstract

This paper uses data from the Luxembourg Income Study to explore the role of differences in supply shifts in explaining cross-national differences in the rise in earnings inequality. Changes in returns to age and education are estimated for eight countries using a common specification of earnings functions across years and countries. We find that the small overall increase in earnings inequality in many countries reflects large but offsetting changes in returns to skill and changes in inequality within age education cells. Furthermore, these differences in returns to skill can largely be explained by differences in supply shifts.

## Cross-national Differences in the Rise in Earnings Inequality--Market and Institutional Factors

## I. Introduction

A vast literature, reviewed in Levy and Murnane (1992) and Gottschalk (1997), has documented the substantial increases in inequality of wage rates and annual earnings in the United States during the 1980's and early 1990's. A growing literature on changes in earnings inequality in other industrialized countries reviewed in Gottschalk and Smeeding (1997) indicates that the US is not unique in experiencing an increase in inequality. However, while inequality grew in most other countries, only the UK experienced as large an increase as the US. Furthermore, the countries that experienced little or no increase in earnings inequality all had some form of centralized wage setting. For example, in Finland, Sweden and Germany associations of employers and employees negotiate at the national level to set the broad structure in which wages are set at lower levels. This has led to the working hypothesis that these wage setting institutions were the primary factor limiting the growth in earnings inequality in these countries.[2]

This paper shifts the focus to market based explanations for the diversity of experiences across countries. It explores the extent to which changes in relative factor supplies are able to explain differences across countries in the change in returns to observable indicators of skill. Using a unique data set we estimate changes in returns to age and education (or occupation) in eight OECD countries using a common statistical framework in all countries. This allows us to go behind the overall changes in earnings inequality to see whether the small growth in inequality in some countries reflect small increases in differentials between groups and small increases in inequality within groups or whether the small net increases noted in the previous literature are the result of large offsetting changes in different components.

We then explore whether changes in relative supplies are consistent with changes in returns to observed skills.

Our objective is not to pit institutional explanations against market explanations, since we believe that both matter. Rather our aim is to distinguish between countries where institutional forces were placing binding constraints on wage changes from those countries where market forces were primarily responsible for moderating the rise in inequality.[3]

The paper is divided into five parts. The next section reviews the literature on cross-national comparisons of inequality. Section 3 uses the data sets in the Luxembourg Income Study to measure changes in overall inequality and changes in inequality between and within age and education/occupation groups. We include three countries that have received little previous attention (Israel, Netherlands and Finland) and several countries that have been analyzed previously with different data sets and a variety of methods (Australia, Canada, Sweden, and the UK). In Section 4 we examine the relationship between changes in relative supplies of more educated or older workers and changes in the return to education and age to see whether market forces are consistent with the limited increase in inequality even in countries with centralized wage setting. The final section explores the relationship between changes in relative unemployment rates and changes in relative wages to see whether this evidence on quantities is consistent with the hypothesis that constraints were limiting wages from falling to their market clearing levels.

## II. Review of Literature

### US Experience

Rising earnings and wage inequality in the United States has led to a substantial literature documenting the trends and attempting to identify the causes of the rising inequality.[4] Changes in the dispersion of the overall

4

earnings distribution can be usefully decomposed into changes in between-group inequality and within-group inequality. The former standardly focuses on changes in differentials between education groups and between experience groups. Within-group inequality focuses on changes in earnings dispersion within education and experience groups.

Almost all studies of the US use the Current Population Survey (CPS) to examine the distribution of weekly or annual earnings for males, working full-time and full-year[5]. These studies find that earnings growth varied dramatically between the upper and lower parts of the distribution. For example, Gottschalk (1997) shows that the real weekly wages of males at the tenth percentile were nearly 30 percent lower in 1994 than two decades earlier. In contrast males at the ninetieth percentile in 1994 had real weekly wages that were 15 percent higher than those of their counterparts in 1973. This pattern of larger increases (or smaller decreases) for persons higher in the distribution holds as well for other percentile points. For women there is also a sharp increase in overall inequality, which, however, starts somewhat later than for men.

Part of the observed change in the overall distribution reflects the large increase in the returns to education during the 1980's . This is in sharp contrast to the decline in the returns to education during the 1970s.[6] The returns to experience also increased, especially among the less educated[7]. The result of these trends has been a dramatic decline in the relative position of young, high school graduates and high school dropouts. Juhn, Murphy and Pierce (1993) illustrate this decline by noting that real earnings at the 10th percentile of high school graduates with 1 to 10 years of experience was roughly 15 percent lower in 1989 than earnings for the same group in 1963, a quarter of a century earlier. The earnings of the least skilled workers were rapidly falling away from the rest of the distribution.

In addition to the increased inequality between education and experience groups, recent studies find a large increase in the dispersion of log earnings within skill groups. The increase in within-group inequality, however, seems to have started earlier, beginning in the early 1970s. The earnings differential between the 90th and 10th percentile has increased within the distribution of earnings of young and old workers and within the earnings distribution of high school and college graduates. Persons in the upper part of the conditional distribution have experienced significant growth in real earnings while those in the lower part experienced slight growth or actual declines in real earnings.

## International Experience

The recent availability of cross-national data has spawned a growing literature, reviewed in Gottschalk and Smeeding (1997), on levels and trends in earnings inequality in OECD countries. Most studies provide detailed information on one country or pairwise comparisons with the United States. For example, Freeman and Needels (1993) compare the United States with Canada; Katz, Loveman and Blanchflower (1994) compare the United States with the United Kingdom, Japan and France; Katz and Revenga (1989) compare the United States and Japan; while Abraham and Houseman (1994) contrast the United States with West Germany. Country-specific studies of overall changes in inequality are now available for many other countries. For example, Borland and Wilkins(1996) and Gregory (1993) present data on Australia; Gustafson and Palmer (1995), Hibbs(1990) and Edin and Holmlund(1992) on Sweden; Hartog, Oosterbeek and Teulings (1993) on the Netherlands; and Schmitt (1992) on the United Kingdom.

The broad consensus emerging out of this literature, is that while almost all countries experienced some increase in

earnings inequality, the US was unusual in the magnitude of the rise in overall inequality and increases in returns to education. Only the UK experienced an increase in overall inequality as large as the US. Furthermore, countries that experienced the smallest increase in overall earnings inequality (Sweden, the Netherlands, Germany, Italy, and France) all had more centralized labor markets than countries experiencing large increases in inequality (Canada, US and UK)[8]. This has led to the working hypothesis that these institutional constraints were largely responsible for the lack of significant increase in inequality in these countries.

The implicit assumption behind this hypothesis is that the institutional constraints were binding. While the existence of institutions may give these countries the potential for limiting wage declines for less skilled workers, market forces, such as a decrease in the relative supply of less skilled workers, may be responsible for limiting the downward pressure on wages of less-skilled workers in some of these countries. The relative importance of these two forces is an empirical questions which we explore in section IV.


## III. Patterns of Changes in Inequality

In order to assess the impact of market forces on changes in inequality by skill group we first estimate changes in returns to observable skills in each country. These are then compared to changes in relative supplies of different skill groups.

Cross-national comparisons of returns to observed skills require that we estimate earnings functions in a variety of countries using a similar techniques and data that are comparable across countries. Existing cross-national studies have largely focused on a single country or made pairwise comparisons with the United States. These studies used

selection criteria and data definitions that were most appropriate for their country. Definitions and data were, however, not designed to be consistent across studies. Therefore, at best they yield high quality data on pairwise comparisons with the United States but relatively little information that would allow comparisons across a wide variety of countries, for example between Sweden and the UK. This problem is particularly severe when trying to compare changes in returns to skill across a wide variety of countries.

## Data Source and Sample Definitions

We use a data source, the Luxembourg Income study (LIS) that was created specifically to improve consistency across countries. The LIS data is a collection of micro data sets obtained from annual income surveys in various countries.[9] The surveys are similar in form to the Current Population Survey for the United States or the Survey of Consumer Finances for Canada.[10] The advantage of these data is that extensive effort has been made by country specialists to make information on income sources and household characteristics as comparable as possible across a large number of countries. While our discussion will point out remaining issues of comparability in LIS, our judgment is that these differences are small relative to differences across studies that are not designed to be comparable. A further advantage of LIS is that it offers the only publicly available micro data sets for the Netherlands and Israel[11]. The availability of micro data allows us to estimate a consistent set of earnings functions in a wide variety of countries.

While our data overcome some problems of comparability they are by no means perfect. Since the underlying data sets were originally designed in different countries for a variety of purposes, they clearly depart from the ideal of a single survey instrument applied to all countries[12]. Attempts to

make these data sets comparable has costs as well as benefits. The major cost is that we are forced to use the lowest common denominator in defining variables and samples. For example, we are limited to the earnings of heads of households since the earnings of other individuals is not available in all years.[13] The advantage is, however, that the data definitions that have been used facilitate comparisons across countries.

Since we are interested in changes in inequality during the 1980's and early 1990's, we are restricted to the countries with at least two years of data in LIS during this period. LIS includes three years of data on Australia, Israel, Sweden, United Kingdom, and the United States. It contains two years of data for Canada, Finland, the Netherlands,[14] Although the years used were dictated by availability of data for each country in LIS, most countries cover the 1980's and early 1990's. The exceptions are Canada and Finland for which we have data only for 1987 and 1991.

Our measure of earnings is real annual gross wages and salaries. In order to restrict the sample to people who are not likely to be in school or retired, we limit our sample to male heads between the ages of 25 and 54.[15] 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 the years we use. We focus on males because the distribution of the earnings of females was affected by selection (which women entered the labor force) as well as by changes in supply and demand for women with given characteristics. Focusing on males partially avoids these selection issues. The need to restrict the sample to male heads is a limitation of these data but studies using the CPS data have found similar patterns of earnings inequality using heads or all individuals.[16] To be consistent with other studies, we also limit the sample to full-time workers whose earnings reflect changes in wages rather than changes in hours.[17] Finally, in order to exclude potential returns to

capital we exclude male heads of households who were self-employed.[18]

To maintain confidentiality some countries recode earnings above some upper bound[19]. For example, in recent years the US data is top-coded at $199,000. This top coding affects comparisons both across time and across countries.[20] 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 the truncated distribution by excluding the top five percent of the distribution in each year. By providing a consistent cutoffs across time and countries we limit the effects of top-coding.[21] Thus, the data we present on the changes in the coefficient of variation is for changes in the distribution of earnings truncated at the 95th percentile in each country. Percentile points and other measures not affected by top-coding are for the full distribution.

To explore changes both between and within education groups, we construct four education categories corresponding in the United States to less-than 12 years of education, 12 years, 13 to 15 years and 16 or more years. The recoding into these groups is straight forward in countries where the education variable represents years of schooling (i.e. Canada, Finland, and Israel) and somewhat more subjective for countries where the education variable is already grouped (i.e. the Netherlands)[22]. Since no education information is available for Sweden or the United Kingdom, we follow Katz and Loveman, Blanchflower (1994) by looking at returns to broad occupations rather than education. We construct three occupation groups corresponding roughly to professional and managerial workers, blue collar workers, and a residual category which includes lower-level white collar workers.

## Changes in Earnings Inequality

In this section we present data on changes in annual earnings inequality for our eight countries. We first present cross-national comparisons of changes in the overall earnings distribution. Where possible this allows us to benchmark our data against previous studies. We then present new estimates of changes in between-group inequality based on earnings functions that can be compared across countries.

### Changes in the Overall Distributions

Table 1 documents changes in overall inequality in each country using two different measures. The first panel presents the coefficient of variation of the truncated distribution of earnings for each country in each year (column 1) along with the yearly absolute change (column 2) and relative change(column 3).[23] While the coefficient of variation gives an overall summary measure of inequality, it does not show whether the increase in inequality is coming from a decline at the bottom or an increase in earnings at the top of the distribution. The next two panels in Table 1, therefore, present changes in the earnings of persons at the 10th and 90th percentiles, measured as log deviations from median earnings The right most panel presents the resulting change in the log deviation between the 90th and 10th percentiles.[24] Absolute changes in the log $P_{90}/P_{10}$ are plotted in Figure 1.

While changes in the coefficient of variation and the $P_{90}/P_{10}$ give somewhat different rankings, the pattern of smaller increases in countries with more centralized labor markets is clear. Based on changes in the $P_{90}/P_{10}$ the countries break down into three broad groups. The US and UK are at one end and Sweden and Finland at the other. Consistent with many other studies we find that the US and the UK experienced the largest increases in earnings inequality both during the early 1980's and late 1980's.[25]

Furthermore, where the US stands out is the 3.1 percent per year decline in the $P_{10}/P_{50}$ between 1986 and 1991  The next largest yearly decline at the bottom of the distribution is 1.5 percent per year in Canada.  While the increase in inequality in the UK partially reflects the increase in unemployment rates between the two years of data we have in LIS, the upward trend net of cycle in inequality in the UK is well documented in the literature.  For the US inequality increased both between two years of roughly similar unemployment (1986-91) and two years when unemployment rose (1979-86).[26]

Australia, Canada, Israel and the Netherlands form a middle group of countries which experienced increases in inequality but less than the US or the UK. Both the coefficient of variation and the $P_{90}/P_{10}$ increased moderately in Australia and the Netherlands.  However, these two measures show somewhat conflicting patterns in Israel and Canada.  For Israel the early period shows a large increase in the coefficient of variation compared to the $P_{90}/P_{10}$.  This reflects very modest declines at the bottom but substantial increases at the top.[27]  For Canada the increase in the $P_{90}/P_{10}$ is roughly as large as in the UK but the change in the coefficient of variation is considerably smaller.  In Australia and the Netherlands, the 10th percentile lost relative to the median by a similar magnitude as the 90th gained relative to the median.[28]

Sweden and Finland form a third group with Sweden experiencing a small increase in inequality in both periods covered and Finland experiencing an equally modest decline in inequality during the late 1980's and early 1990's. This reduction in inequality is a result of equal growth in earnings at the 90th and 50th percentiles but a slightly faster growth at the 10th percentile.[29]  The ability of these two countries to stem the increase in inequality in spite of cyclical downturns during the early 1990's is particularly remarkable.

In summary, these overall changes in earnings inequality indicate that the LIS data sets are largely consistent with previous country specific studies. Furthermore, the correspondence between the degree of centralization of labor markets and the growth in inequality is born out in our data, including the new countries we have added to the literature. The five countries with the smallest increases in inequality all have some form of coordinated wage setting which may potentially limit market forces[30]. In Finland wages are set through coordinated wage bargains between employers' organization and central trade unions. The bargained wages apply to all workers, even if they are not union members. Likewise, collective bargaining agreements are negotiated in Israel by a trade union (the Histadrut) that includes roughly three-quarters of all wage earners but these agreements are usually legally binding on the full labor force. Australia's Accord between the government and trade unions allows unions to coordinate and centralize wage setting. This agreement, enacted in the early 1980's, had the potential of limiting shifts in the distribution of earnings during the period we cover, as well limiting inflationary pressures. In Sweden wage setting is coordinated through industry-wide bargaining between employers' councils and unions. Similarly, unions bargain with employers' organizations in the Netherlands. Even though union membership is only about 25 percent, the agreements are applied to nearly 80 percent of the work force.

*Changes in Returns to Observable Skills*

In this section we exploit the availability of micro data for a large number of countries in LIS to see whether the changes in inequality documented in the previous section reflect changes in between group inequality. Did countries experiencing small increases in overall inequality also experience little change in returns to observable skills? Or was the small net change a result of increases in

inequality of some components offset by decreases in other components? To answer these questions we estimate standard log earnings regressions to obtain estimates of the education and age premiums, as well as the variance of earnings within these groups, in each country in each year for which we have data.

The equations we estimate include either a set of education or occupation dummies. The education dummies correspond as closely as possible to less than high school, high school (the excluded group), some college, and four or more years of college.[31] For Sweden and the UK, which do not provide data on educational level, we include occupational dummies that roughly correspond to managerial or professional workers, blue collar workers, and a residual category which is typically other white collar (the excluded group)[32]. We present estimates using both a quadratic in age and a set of age dummies that correspond to the age categories we use in the next section of the paper to measure changes in relative supplies by age group. The latter allows us to match increases in age premia to the corresponding change in factor supply. In addition to these variables we also include dummies for race categories identified in each country survey, marital status, and number of children under 18.

The first six panels of Table 2 show estimated coefficients in each year under our two specifications. Comparison across columns indicates that equations with the quadratic in age and those with the age dummies give similar returns to education (or occupation).

Column 1 of Table 3 ranks countries according to the yearly change in education or occupation premia in each sub-period.[33] We will return later to column 2 which shows the change in the educational premium after controlling for changes in relative supply. The change in the education premium in the US between 1979 and 1986 is clearly the largest increase across all countries and time periods. In 1979 full-time workers with at least a college degree earned

29 percent more than high school graduates of the same age (see Table 2). This differential rose to 40 percent by 1986. The result was a 1.6 percent per year increase in the college premium. The second largest increase is also for the US (1.1 percent per year between 1986 and 1991) but it is closely followed by a large number of countries, including Sweden (for the period 1981 to 1987) and Finland, two countries that had the smallest overall increases in inequality.

While the US was both at the top of the distribution of changes in overall inequality and changes in returns to education there is little correspondence between these two outcomes for the remaining countries. The UK, which experienced almost as large an increase in overall inequality as the US, had only a moderate increase in the occupational premium. Likewise, the Netherlands and Australia had similar increases in overall inequality, but Australia had moderate increases in the returns to education while the Netherlands experienced a dramatic decline in this premium [34]. Finland, which had an actual decline in overall inequality, experienced a moderately large increase in the returns to college. Clearly for some countries the stability of the overall distribution of earnings was a result of offsetting changes in inequality between and within groups.

The nature of the offsetting changes is clearly seen in Table 4, which shows the change in the log earnings differential between persons 45 to 54 and persons 25 to 34. Again most countries experienced an increase in the age premium but in this case the US and UK did not experience the largest increases. Instead, Israel (for the early period) and the Netherlands lead the pack. The 2.4 percent per year increase in the age premia in the Netherlands almost fully offset the 2.6 percent decline in the returns to college, shown in Table 3. Likewise the small declines in the age premium in Canada and Finland served to offset part of the increase in their education premia. Sweden is the only country to experience small increases in the education and

age premia as well as in overall inequality, and this is only true in the period covering the late 1980's.

While we are primarily interested in changes in returns to observable characteristics which can be compared to changes in factor supplies to see if changes in market forces are consistent with the observed changes in returns to skill, it is worth noting that changes in within group inequality also varied widely across countries. Furthermore, there is no clear relationship between the ranking of countries in changes in overall inequality and changes in within group inequality. For example, the increase in earnings inequality between 1987 and 1992 in Sweden was one of the smallest shown in Table 1. The increase in within group inequality, whether measured by the yearly change in the residual variance (shown in Table 2) or by the P90/P10 of residuals, was one of the largest increases across all countries and time periods covered in this study[35]. In contrast, the US and the UK were neither consistently high nor low in the growth in within group inequality.

In summary, we have shown that countries that avoided large increases in overall inequality did not always fare as well when we look at individual components. For many of these countries the small increases in overall inequality mask offsetting changes in the education (or occupation) premium, the age premium or inequality within groups. The Netherlands is the prime example. Its small increase in overall inequality is a result of a large decline in the college premium matched by an increase in the premium paid to older workers. For Finland the pattern is reversed. The decline in overall inequality in Finland during the late 1980's was accompanied by an increase in the college premium almost as large as in the US. The small decline in the age premium and a sufficiently large decline in inequality within groups served to offset this sharp increase in the college premium, leading to a net decline in overall earnings inequality.

The diversity in returns to observable skills we have documented in this section offers a new piece of evidence with which to gauge the relative importance of market forces in limiting the rise in inequality. If changes in the returns to skills are smaller in countries and time periods where the growth in the supply of skilled workers is relatively large then this suggests that market forces may be partially responsible for the lack of an increase in overall inequality, even in countries with centralized wage setting institutions.

## IV. Role of Changes in Factor Supply

We examine the relationship between changes in returns to observable skills documented in the previous section and increases in relative factor supplies under the maintained assumption that these OECD countries experienced similar changes in the structure of demand. Under this assumption (and the assumption of a common technology) it is straightforward to show that differences across countries in changes in relative factor prices are a negative function of the relative shifts in factor supplies.[36]

Changes in factor supplies are calculated from LIS for the same educational (or occupational) and age groups used to estimate changes in relative factor prices in the previous section.[37] In order to verify whether our estimates of changes in supply are affected by the limitations both in years and population covered in LIS we compared estimates of changes in relative factor supplies by age with published data from the International Labor Office (ILO) and by education from country specific sources. Changes from these sources closely matched those in LIS.

Figure 2 plots the yearly change in the age premium from Table 4 against the yearly change in the proportion of the work force aged 45 to 54. Increases in the premium paid to older workers were largest in countries in which older

workers became relatively scarce. The previously noted large increase in the age premium in the Netherlands is seen to be consistent the with a sharp decrease in the relative supply of older workers. Likewise, the decline in the relative supply of older workers in Israel between 1979 and 1986 is consistent with the large rise in the age premium. At the other extreme, the decline in the age premium in Finland, Canada, Australia (in the 1985 to 1989 period)and Sweden (1981 to 1987) are consistent with the large increases in the relative supply of older workers.

Shifts in supply go a long way toward explaining the diversity of experiences. Nearly half of the variance in changes in the age premium can be explained by the variance in changes in relative supply[38]. This is somewhat surprising given that the variables are in change form and that this is a cross sectional relationship.

Figure 2 can also be used to compare changes in the age premium over different time periods within the same country for those countries for which we have three years of data. While the small number of countries with three years of data precludes strong conclusions, it is reassuring to see that eliminating country specific effects by using only within country changes confirms the potential importance of supply shifts. For Israel the decline in the relative supply of older workers between 1979 and 1986 was reversed between 1986 and 1992. The resulting increase in the relative supply of older workers was matched by much smaller increases in the age premium. Similarly Australia went from having a shrinking pool of older workers to an expanding pool. During the early period (1981 to 1985) the age premium rose; during the later period (1985 to 1989) it fell. While the US also experienced an increase in the growth rate of older workers, the dampening effect was smaller than for either Israel or Australia. The only country for which supply shifts are not sufficient to explain differences in the change in the age premium is Sweden, which experienced a decline in the premium

between 1981 and 1987 but a substantial increase in the premium between 1987 and 1992 in spite of very similar growth in the relative supply of older workers in the two periods.

The data in figure 2 are consistent with a market based explanation for differences in the rise in the age premium in most countries. It is, however, possible that institutional factors explain differences in the growth in the age premium, holding the change in labor supply constant. To explore this possibility column 2 of Table 4 shows the yearly growth rates in the age premium, measured as a deviation from the fitted line in figure 2. These residuals show no clear pattern between the growth in the age premium and the type of labor market even after having controlled for changes in relative factor supplies. The US, UK and Canada experienced neither unusually high nor low changes in the age premium compared to countries with more centralized labor markets. Thus, after conditioning on changes in labor supply there is little evidence that countries with more regulated labor markets managed to limit the rise in the age premium.

Turning to changes in the education premium shows the same generally patterns, though the evidence is somewhat weaker. Figure 3 plots changes in the educational (or occupational) premium and changes in the relative supply of the corresponding skill group for each country. The negative slope coefficient is nearly identical to the slope coefficient in figure 2 but the random variation across countries and time periods is larger (as indicated by the $R^2$ of .316 compared to .475 for figure 2)[39]. Furthermore, the negative relationship is partially driven by the Netherlands, where a large increase in the supply of college educated workers was accompanied by a large decrease in the college premium[40]. However, the slope coefficient continues to be significantly negative even when data for the Netherlands is dropped.

Within country differences across time also provide mixed support for the importance of changes in supply in

determining changes in the education premium. In Israel the relative supply of college workers grew faster in the second period (1986 to 1992) than in the first (1979 to 1986). This is consistent with the sharp decline in the growth of the college premium between the two periods. However, the within country changes in the growth in the education premium in Australia and Sweden are not consistent with changes in their growths in factor supplies. Australia experienced a modest increase in the education premium and Sweden experienced a modest decline in the occupational premium, in spite of near constancy in the growth rate in factor supplies in both countries.

In summary, we find strong evidence that differences across countries in the growth of the age premium are associated with changes in relative factor supplies. Countries which experienced larger increases in the supply of college educated workers also experienced smaller increases in the education premium, though the relationship is not as strong.

## V. Changes in Relative Unemployment Rates

In this section we shift focus from changes in relative prices to changes in relative unemployment, as an indicator of potential disequilibrium. So far we have ignored changes in unemployment rates of less skilled workers as a potential additional source of information on the role if institutional constraints on wage adjustments[41]. Consider a simple supply and demand model in which structural unemployment reflects labor market rigidities. In such a world, a downward shift in demand for less skilled workers, unmatched by an equal downward shift in supply, would result in an increase in the relative unemployment rates of less skilled workers. Therefore, if labor market institutions kept wages from falling to their market clearing levels and if the excess supply of workers continued to search for jobs, then relative

unemployment rates of less skilled workers would rise when
the decline in demand for their skills was greater than the
decrease in supply. Empirically this implies that relative
unemployment rates of less skilled workers would increase
more in countries which experienced smaller wage declines,
conditional on exogenous changes in labor supply[42].

Note that the focus of this argument is on relative
unemployment rates, not the absolute level of unemployment
rates.[43] As long as the demand for higher skilled workers
increases, their unemployment rates will fall *relative* to the
unemployment rates of less skilled workers. Therefore, for
countries such as Finland which experienced small increases
(or actual decreases) both in the observed age premium and
the age premium conditional on changes in the relative supply
by age group, we would expect an increase in the relative
unemployment rate of the young.

Since the LIS files do not provide employment status we
must use an outside source to obtain unemployment rates for
the skill groups used in this paper. While the OECD provides
unemployment rates by age, no data set provides consistently
coded unemployment rates by education. This undoubtedly
reflects the inherent difficulty of comparing education
categories across countries. Table 5 provides two measures of
the change in relative unemployment of persons 25 to 34 based
on OECD data.[44] Column 1 shows the yearly change in the
relative unemployment rates between the two LIS years[45].
Column 2 shows the annual growth rate from a linear time
trend fit to the relative unemployment rates during each
period covered in each country. For example, .002 is the
slope of a linear time trend fit to the five years of data on
relative unemployment rates of 25 to 34 years old for
Australia between 1985 and 1989.

While we have shown that changes in market forces were
largely responsible for cross-national differences in the
growth in the age and education premia, the changes in
relative unemployment rates shown in Table 5 are consistent

with binding institutional constraints in some countries. During the 1981-87 period Sweden had the smallest absolute increase in the age premium, whether or not one controls for changes in relative supply. It also experienced the largest increase in the relative unemployment rates of the young, shown in Table 5[46]. Likewise, Finland experienced the third largest increase in relative unemployment rates, which is consistent with its small increase in age premium compared to other countries with similar changes in relative supply.[47] Thus, while we emphasize the importance of changes in relative supplies, we believe this evidence on changes in relative unemployment rates is consistent with explanations which include institutional as well as market factors.

## V.    Conclusion

This paper has presented evidence from a unique data source that allows comparisons of changes in the age and education premium as well as overall inequality across a number of countries. The data presented in the first section confirms that the US was not unique in experiencing an increase in inequality of labor market income. However, it was the only country to experience large increases in inequality between both education and age groups and within each of these groups. Other countries either had small or offsetting changes in these sources of increased inequality. As a result, many experienced much smaller increases in overall inequality.

We exploit differences in estimated changes in returns to age and education (or occupation) to explore the hypothesis that changes in relative supplies may explain some of the diversity in experiences that have been attributed to differences in institutional constraints. We find that when attention is focused on changes in returns to skills rather than changes in overall inequality the relationship between institutional constraints and distributional measures starts to break down. For example, the small increase in overall

inequality in the Netherlands is the result of large increases in the age premium which are offset by large declines in the education premium. This suggests that differences in market forces may be responsible for at least part of these changes.

This is confirmed in our finding that larger changes in relative labor supply of older workers are associated with smaller increases in the age premium. Similarly, increases in the education premium are negatively associated with increases in the relative supply of more educated workers, though the relationship is somewhat weaker.

We then turn to changes in relative unemployment rates under the assumption that if the effects of changes in market forces were being limited by institutional constraints then this might result in increases in the relative unemployment rates of the young. The evidence for Sweden and Finland suggests that their small increase in the age premium may well reflect some institutional constraints on market forces.

In summary, we find evidence that market forces can be used to explain much of the cross-national differences that have been attributed in the literature to differences in labor market institutions. This does not mean that institutional constraints are never binding, only that they may not be binding if there are sufficiently large supply shifts to offset the demand shifts. We, in fact provide some evidence that the changes in relative unemployment rates in Sweden and Finland are consistent with institutional constraints limiting the decline in the age premium for these two countries.

The broad conclusion we draw from the evidence in this paper is that market forces matter more in explaining cross-national differences in inequality than the existing literature suggests. This, of course, does not mean that institutional explanations do not matter but that the presumption should not be that they always provide binding constraints.

## REFERENCES

Abraham, Katherine and Houseman, Susan, "Earnings Inequality in Germany", in R. Freeman and L. Katz, eds. *Differences and Changes in Wage Structures*, University of Chicago Press, 1994.

Achdut, Lea, "Income Inequality, Income Composition and Macroeconomic Trends: Israel 1979-1993," Administration of Research and Planning, National Insurance Institute, Israel, 1995.

Baldwin, Robert and Glenn Cain, "Shifts in US Relative Wages: The Role of Trade, Technology and Factor Endowments", Institute for Research on Poverty Discussion Paper, University of Wisconsin, 1997.

Bean, Charles, "European Unemployment: A Survey," Journal of Economic Literature, XXXII, June 1994, pp. 573-619.

Blank, Rebecca, "Changes in Inequality and Unemployment of Over the 1980s: Comparative Cross-National Responses", *Journal of Population Economics*, forthcoming.

Blau, Francine and Lawrence Kahn, "International Differences in Male Wage Inequality: Institutions versus Market Forces", NBER Working Paper no. 4678, March 1994.

Borland, Jeff, and Roger Wilkins "Earnings Inequality in Australia" *Economic Record* March 1996.

Card, David, Francis Kramarz and Thomas Lemieux, "Changes in the Relative Structure of Wages and Employment: A Comparison of the United States, Canada, and France", September 1995, mimeo.

Edin, Per-Anders and Holmlund, Bertil, "The Swedish Wage Structure: The Rise and Fall of Solidaristic Wage Policy", mimeo, 1992.

Eriksson, Tor and Jantti, Markus, "The Distribution of Earnings in Finland 1971-1990," mimeo, 1995.

Fortin, Nicole and Thomas Lemieux, "Institutional Changes and Rising Wage inequality: Is There a Linkage?" *Journal of Economic Perspective*, forthcoming

Freeman, Richard. *The Overeducated American*, Academic Press, 1976.

Freeman, Richard B. and Katz, Lawrence F. "Rising Wage Inequality: The United States vs. Other Advanced Countries," in *Working Under Different Rules*, Richard B. Freeman, ed., (New York: Russell Sage Foundation), 1994, p. 29-62.

Freeman, Richard B., and Needels, Karen. "Skill Differentials in Canada in an Era of Rising Labor Market Inequality," in *Small Differences that Matter* , Card and Freeman, eds., 1993, pp.~45--67.

Gottschalk, Peter, "Inequality, Income Growth and Mobility: The Basic Facts" *Journal of Economic Perspectives* forthcoming.

Gottschalk, Peter, and Timothy Smeeding, "Cross National Comparisons of Earnings and Income Inequality" *Journal of Economic Literature* , forthcoming

Gregory, R.G. and Vella, Frank, "Aspects of Real Wage and Employment Changes in the Australian Male Labour Market," mimeo, 1992.

Gregory, R.G., "Aspects of Australian and US Living Standards: The Disappointing Decades 1970-1990," *Economic Record* March 1993, p. 61-76.

Gustafson, Bjorn and Edward E. Palmer. 1993. "Changes in Swedish Inequality: A Study of Equivalent Income 1975-1991," in *The Distribution of Economic Welfare in the 1980's*, ed. Peter Gottschalk, Bjorn Gustafson and Edward Palmer, Cambridge University Press, 1996.

Hartog, Joop and Oosterbeek, Hessel and Teulings, Coen. "Age, wages and education in the Netherlands", in *Labour Market Implications of European Ageing*, P. Johnson and K Zimmermann editors p. 182-211. 1993

Hibbs, Douglas A. Jr., "Wage Dispersion and Trade Union Action in Sweden", in *Generating Equality in the Welfare State*, edited by Inga Persson, 1990.

Juhn, Chinhui. "Wage Inequality and Industrial Change: Evidence from Five Decades," NBER Working Paper #4684, 1994.

Juhn, Chinhui, Murphy, Kevin and Pierce, Brooks. "Wage Inequality and the Rise in the Returns to Skill", *Journal of Political Economy*, Vol. 101:3, June 1993 . p. 410-42.

Karoly, Lynn A. "The Trend in Inequality among Families, Individuals, and Workers in the United States: A Twenty-Five-Year Perspective", in *Uneven Tides: Rising Inequality in the 1980's*, edited by Sheldon Danziger and Peter Gottschalk, 1993.

Katz, Lawrence F. and Loveman, Gary W and Blanchflower, David. "A Comparison of Changes in the Wage Structure of Four OECD Countries", in R. Freeman and L. Katz, eds. *Differences and Changes in Wage Structures*, University of Chicago Press for NBER, 1994..

Katz, Lawrence F. and Revenga, Ana L. "Changes in Structure of Wages: the US vs. Japan", *Journal of Japanese and International Economics*, December 1989.

Layard, R., Nickell, S., and Jackman, R. *Unemployment: Macroeconomic Performance and the Labour Market*, (Oxford: Oxford University Press), 1991.

Levy, Frank and Murnane, Richard J. "US Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations", *Journal of Economic Literature*, September 1992.

MaCurdy, Thomas and Morz, Thomas "Measuring Macroeconomic Shifts in Wages from Cohort Specifications" Department of Economics, Stanford University, 1995.

Moffitt, Robert and Gottschalk, Peter, "Trends in the Autocovariance Structure of Earnings in the U.S.: 1969-1987," John Hopkins University, July 1995.

Nickell, Stephen and Brian Bell, "Changes in the Distribution of Wages and Unemployment in OECD Countries." *American Economic Review*. May 1996, pp. 302-308.

O'Conner, Inge " A Cross-National Comparison of Education and
    Earnings" Luxembourg Income Study Working Paper no 116
OECD Job Study Part I:  *Labour Market Trends and Underlying
    Forces of Change*, 1994.
OECD Labour Force Statistics 1970-1990 Paris, France, 1992.
Schmitt, John, "The Changing Structure of Male Earnings in
    Britain, 1974-88," Center for Economic Research Working
    Paper No. 223, 1992
Smeeding, T., M. O'Higgins, and L. Rainwater, eds.  *Poverty,
    Inequality and Income Distribution in Comparative
    Perspective*. *Luxembourg Income Study (LIS)*, Harvester--
    Wheatshef, London: Urban Institute Press, USA, 1990.

[1] Gottschalk is a Professor of Economics at Boston College. Joyce is an economist at the Bureau of Labor Statistics. The views expressed are not attributable to the Bureau of Labor Statistics. We would like to thank Tim Smeeding and Lee Rainwater for the years of work it has taken to put the LIS data sets together.

[2] For a discussion of the role of institutions in limiting the rise in wage inequality see Freeman and Katz (1994)and Fortin and Lemieux (1997).

[3] We, like others, assume that the OECD countries that we study experienced a similar increase in demand for skilled workers.

[4] For a review of this literature see Levy and Murnane (1992).

[5] For recent studies using the Current Population Surveys see Juhn, Murphy, and Pierce (1993), Karoly (1993)and Gottschalk (1997). Moffitt and Gottschalk (1996) find similar trends in the PSID.

[6] See Freeman (1976)

[7] MaCurdy and Morz (1996) find that the increase in returns to experience in a cross section reflects shifts in cohort profiles.

[8] Blau and Kahn (1994) also examine the relationship between inequality and the degree of wage centralization. They, however, focus on differences in inequality across countries *at a moment in time* rather than on the relationship between institutional constraints and the *rise* in inequality.

[9] See Smeeding et al. (1990) for a detailed description of the data source and methods for accessing the data.

[10] Appendix A lists the surveys used in each country.

[11] LIS also includes two years of data on France but these data sets do not include a variable that would allow us to identify full-time workers, as required in our analysis.

[12] The International Social Survey Program (ISSP) asks similar questions in different countries. However, most countries provide earnings only in bracketed amounts that differ both across time and countries. As a result the earnings data do not replicate the patterns from larger data sets that provide non-bracketed amounts from larger samples. For example, the ISSP data for the US does not show the upward trend in inequality found in the CPS and other data sets.

[13] Recent data for some countries includes earnings of non-heads. Our focus on changes in earnings inequality, however, requires at least two years of data for each country.

[14] We did not use the 1981 data for Canada since it is impossible to impose the same full-time cut as in the later years. The German data in LIS were not used because the 1981 and 1984 data were obtained from two different surveys, the German Transfer Survey and the German Socio Economic Panel All other countries had data from the same surveys in all years.

[15] This includes single males who are the head of their own households.

[16] See Moffitt and Gottschalk (1996).

[17] We recognize that the selection of full-time workers also introduces selection issues, though there has been relatively little change in part-time work among male heads, at least in the US. Furthermore, trends in wage rates of all workers closely mirror the trends in earnings of full-time workers in the US. The Australian and Netherlands

data is for full-time last week rather than full-time in the reference year.

[18] The self-employed variable is not available in Australia, the Netherlands, and the United Kingdom.

[19] Earnings over this amount are coded at the top of the interval.

[20] Even if the nominal upper bound does not change, inflation erodes the real value.

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

[22] We follow the educational recoding in O'Conner (1994).

[23] Yearly changes are shown since the number of years between surveys in LIS varies across countries. We show both absolute and relative changes since the base differ across countries.

[24] Gottschalk (1997) shows that changes in the 10th and 90th percentiles are representative of broader changes in the earnings distribution in the US since changes in earnings are monotonically increasing in the initial percentile.

[25] Schmitt (1992) finds an increase in overall dispersion in weekly earnings using data from the British General Household Survey. Katz, Loveman, and Blanchflower (1994) also find a strong similarities in the pattern of increased wage inequality in the US and UK using gross hourly earnings from the New Earnings Survey. We take this as confirmation that the limits imposed by LIS do not lead to substantively different conclusions.

[26] There is, in fact, little correlation between changes in unemployment rates and changes in inequality over the periods covered by LIS. The correlation between the yearly change in unemployment (from Appendix B) and the change in the $P_{90}/P_{10}$ (from Table 1) is only .17.

[27] While there are no studies of changes in earnings inequality among males in Israel, Achdut (1995), using a different data set, finds increases in the Gini coefficient for all family heads that are roughly proportional to the increases in the coefficient of variation for the earnings of male heads in Table 1.

[28] Borland and Wilkins (1996) find similar increases in inequality in Australia using both data from the ABS Labour Force Survey and data from the Income Distribution Survey. Hartog, Oosterbeek and Teulings (1993, Table 8.6) provide information on the Netherlands based on cross-tabulations provided by the Central Planning Bureau and several small micro data sets. They find almost no change in inequality between 1979 and 1989.

[29] Edin and Holmlund(1992), Hibbs (1990), and Gustafson and Palmer (1995) report small increases in earnings inequality in Sweden using alternative micro data sets and tabulations from associations of employers and trade unions. Edin and Holmlund use the Level of Living Survey (LNU) and Household Market and Nonmarket Activities Survey (HUS). Hibbs uses tabulations of data provided by the Swedish Confederation of Trade Unions (LO) and the Swedish Confederation of Employers (SAF). Eriksson and Jantti (1994) find a small increase in inequality for Finland between 1985 and 1990 but this follows a sharp decline during the 1970s and early 1980's.

[30] The fact that increases in inequality are similar in the two periods we have for Australia, Israel and Sweden in spite of large changes in unemployment during these periods, also indicates that changes in inequality are more country specific than cyclical.

[31] The recoded categories follow O'Conner (1994) and are available from the authors.

[32] Katz and Loveman, Blanchflower (1994) also use occupations to measure changes in returns to observable skills. Juhn (1994) shows that occupational differentials also increased in the US.

[33] The education premium is the log differential between college and high school graduates, given by the coefficient on college. The occupation premium is the log differential between managerial and professional and other white collar. Changes in coefficients are divided by the number of years between the two data sets to obtain changes per year.

[34] The decline in returns to education in this period is consistent with evidence in Hartog (1993)

[35] Since the residuals are from log earnings equations, the variance of the residuals is sensitive to low conditional earnings. We, therefore, also examined the $P_{90}/P_{10}$ of residuals which is not sensitive to extreme low values. Rankings for these two measures were substantially different but neither ranking resembled the ranking in Figure 1.

[36] Changes in domestic supplies do not affect relative factor prices in a Heckscher Olin model in which relative factor prices are set on the world market in the long run and factor prices are set by output prices. Baldwin and Cain (1997) find little support for this explanation of changes in education premia. They provide evidence of the importance of factor supplies during the early 1970's and mixed evidence for later periods.

[37] We interpret these as estimates of shifts in supply under the maintained assumption that in the short run supply of education and age groups is inelastic.

[38] The R of the linear bivariate regression is .475.

[39] One possible reason for the difference in the age and education results is that it is much more difficult to get measures of differences in education that are consistent across countries. If this results in measurement error in the change in the education premium but not in the change in factor supply then the slope coefficient will not be bias but the $R^2$, will be lower.

[40] The slope coefficient is only a third as large when the Netherlands is excluded.

[41] Blank (1995) stresses the need for empirical research on the links between unemployment, inequality and labor market institutions. Nickell and Bell (1996) examine a number of countries. Card, Kramarz and Lemieux (1995) explore this relationship for France, the U.S. and Canada.

[42] The following simple model shows the relationship between exogenous limits on relative wage adjustment, as captured by r, and endogenous changes in relative unemployment in a simple linear supply and demand model. The change in relative demand in country c is given by an exogenous shock common to all countries, $D_x$, and a demand response to the change in the relative wage in country c, $W_c$ :

(1) $dD_c = dD_x + \alpha \, dW_c$

Changes in relative supply are given by

(2) $dS_c = dS_{xc} + \beta \, dW_c$

where $S_{xc}$ is an exogenous shift in supply in country c. The observed change in relative wages is equal to the change in equilibrium wages minus $r_c$, whose size depends on institutional constraints.

(3) $dw_c = \{(dD_x - dS_{xc})/(\alpha-\beta)\} - r_c$.

The exogenous change in unemployment rate, defined as the difference between the change in demand and supply, therefore, depends on the exogenous $r_c$:

(4) $dU_c = dD_c - dS_c = (\alpha-\beta) r_c$

[43] The absolute level of unemployment rates in OECD countries vary both across countries and across time for a variety of reasons discussed in Bean (1994). For a discussion of the impact of institutions on relative versus absolute levels of unemployment see Gottschalk and Smeeding (1997).

[44] The underlying OECD data is in Appendix B. Table 5 presents unemployment rates of 25 to 34 year olds relative to the unemployment rates of all persons 25 to 54 rather than relative to the unemployment rates of persons 45 to 54 since the latter were small and unstable in several countries. The conclusions are, however, consistent with either series.

[45] The changes are expressed in change per year to make these figures comparable to the change in the age premium, which is also adjusted for the number of intervening years.

[46] These changes in relative unemployment rates may understate the rise in the proportion of young men not finding unsubsidized jobs since the Swedish government has a fairly large Works Projects program that provides employment to the long term unemployed.

[47] Australia, however, does not fit the pattern. The changes in the age premium would suggest that institutional constraints were keeping the age premium from rising but Australia experienced the smallest rise in the relative unemployment among all countries in Table 5.

30

Appendix A
Household Surveys in the LIS Database

| Country | Survey |
|---|---|
| Australia | The Income and Housing Survey |
| Canada | Survey of Consumer Finance |
| Finland | Survey of Income Distribution |
| Israel | The Family Expenditure Survey |
| Netherlands | The Survey of Income and Program Users |
| Sweden | The Swedish Income Distribution Survey |
| United Kingdom | The Family Expenditure Survey |
| United States | March Current Population Survey |

## Appendix B
## Unemployment Rates

| Year | Australia | | | | Canada | | | | Finland | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25-34 | 45-54 | Total | Ratio 25-34/Total | 25-34 | 45-54 | Total | Ratio 25-34/Total | 25-34 | 45-54 | Total | Ratio 25-34/Total |
| 1972 | 1.5 | 1.4 | 1.9 | 0.79 | 5.5 | 4.7 | 6.8 | 0.81 | 3.7 | 1.8 | | |
| 1973 | 0.8 | 0.7 | 1.3 | 0.61 | 4.7 | 3.8 | 5.9 | 0.80 | 2.9 | 1.4 | 2.5 | 1.16 |
| 1974 | 1.3 | 1.2 | 1.7 | 0.76 | 5.0 | 3.7 | 5.6 | 0.89 | 2.0 | 0.4 | 1.6 | 1.25 |
| 1975 | 2.4 | 2.2 | 3.5 | 0.68 | 5.1 | 3.8 | 6.7 | 0.76 | 2.9 | 1.3 | 2.7 | 1.07 |
| 1976 | 2.8 | 2.3 | 3.9 | 0.72 | 5.9 | 3.6 | 7.3 | 0.81 | 4.7 | 3.0 | 4.6 | 1.02 |
| 1977 | 3.2 | 2.5 | 4.7 | 0.68 | 6.2 | 4.3 | 7.7 | 0.81 | 6.6 | 4.3 | 6.7 | 0.98 |
| 1978 | 3.9 | 3.3 | 5.5 | 0.71 | 6.2 | 4.6 | 7.5 | 0.83 | 8.9 | 5.1 | 8.1 | 1.10 |
| 1979 | 3.7 | 2.4 | 4.8 | 0.77 | 5.6 | 4.0 | 6.6 | 0.85 | 6.8 | 4.3 | 6.2 | 1.10 |
| 1980 | 3.9 | 2.8 | 5.0 | 0.78 | 5.9 | 4.1 | 6.9 | 0.85 | 4.6 | 3.8 | 4.5 | 1.02 |
| 1981 | 4.1 | 2.8 | 4.6 | 0.89 | 6.0 | 4.2 | 7.0 | 0.86 | 5.4 | 3.4 | 5.0 | 1.08 |
| 1982 | 5.5 | 3.6 | 6.4 | 0.86 | 10.4 | 6.7 | 11.1 | 0.94 | 5.4 | 4.2 | 5.4 | 1.00 |
| 1983 | 9.1 | 5.9 | 9.6 | 0.95 | 12.0 | 7.4 | 12.0 | 1.00 | 5.2 | 4.6 | 5.6 | 0.93 |
| 1984 | 7.6 | 5.7 | 8.7 | 0.87 | 11.6 | 7.3 | 11.2 | 1.04 | 4.9 | 4.1 | 5.1 | 0.96 |
| 1985 | 7.2 | 4.8 | 7.8 | 0.92 | 10.4 | 6.7 | 10.3 | 1.01 | 5.2 | 5.0 | 5.5 | 0.94 |
| 1986 | 6.8 | 5.4 | 7.7 | 0.88 | 9.8 | 5.8 | 9.3 | 1.05 | 5.3 | 5.3 | 5.9 | 0.90 |
| 1987 | 7.0 | 4.2 | 7.5 | 0.93 | 8.5 | 5.8 | 8.5 | 1.00 | 5.3 | 5.6 | 5.8 | 0.91 |
| 1988 | 5.6 | 4.5 | 6.5 | 0.86 | 7.5 | 4.8 | 7.4 | 1.01 | 4.3 | 4.9 | 5.0 | 0.86 |
| 1989 | 5.1 | 3.0 | 5.4 | 0.94 | 7.5 | 4.8 | 7.3 | 1.03 | 3.3 | 3.1 | 3.6 | 0.92 |
| 1990 | 7.0 | 3.2 | 6.9 | 1.01 | 8.7 | 5.6 | 8.1 | 1.07 | 3.3 | 3.9 | 3.9 | 0.85 |
| 1991 | 9.8 | 6.0 | 10.1 | 0.97 | 11.9 | 7.0 | 10.8 | 1.10 | 9.4 | 7.0 | 9.1 | 1.03 |
| 1992 | 10.7 | 7.2 | 11.3 | 0.95 | 13.2 | 8.0 | 12.0 | 1.10 | 15.8 | 12.2 | 15.2 | 1.04 |
| 1993 | 11.0 | 7.2 | 11.4 | 0.96 | 12.5 | 8.1 | 11.7 | 1.07 | 20.6 | 15.5 | 19.4 | 1.06 |

Note: LIS years in bold.

Appendix B
Unemployment Rates

| | United Kingdom | | | | United States | | | |
|---|---|---|---|---|---|---|---|---|
| Year | 25-34 | 50-54 | Total | Ratio 25-34/Total | 25-34 | 45-54 | Total | Ratio 25-34/Total |
| 1972 | 3.4 | 3.0 | 4.3 | 0.79 | 3.6 | 2.6 | 4.8 | 0.75 |
| 1973 | 2.2 | 2.2 | 3.0 | 0.73 | 3.2 | 2.1 | 4.0 | 0.80 |
| 1974 | 2.4 | 2.1 | 3.0 | 0.80 | 4.0 | 2.4 | 4.9 | 0.82 |
| 1975 | 4.2 | 3.0 | 5.1 | 0.82 | 6.9 | 4.8 | 7.9 | 0.87 |
| 1976 | 5.3 | 3.8 | 6.4 | 0.83 | 6.2 | 4.0 | 7.1 | 0.87 |
| 1977 | 5.6 | 4.0 | 6.7 | 0.83 | 5.7 | 3.2 | 6.3 | 0.90 |
| 1978 | 5.2 | 4.0 | 6.5 | 0.80 | 4.4 | 2.7 | 5.3 | 0.83 |
| 1979 | 4.5 | 3.6 | 5.8 | 0.77 | 4.3 | 2.7 | 5.1 | 0.84 |
| 1980 | 5.8 | 4.5 | 7.5 | 0.77 | 6.7 | 3.6 | 6.9 | 0.97 |
| 1981 | 10.4 | 7.7 | 12.0 | 0.87 | 6.9 | 4.0 | 7.4 | 0.93 |
| 1982 | 12.0 | 8.8 | 14.3 | 0.84 | 10.1 | 5.6 | 9.9 | 1.02 |
| 1983 | 13.3 | 9.8 | 14.5 | 0.92 | 10.1 | 6.3 | 9.9 | 1.02 |
| 1984* | 11.7 | 8.0 | 12.0 | 0.98 | 7.2 | 4.6 | 7.4 | 0.97 |
| 1985 | 11.5 | 8.3 | 11.6 | 0.99 | 6.6 | 4.6 | 7.0 | 0.94 |
| 1986 | 11.6 | 8.2 | 11.6 | 1.00 | 6.7 | 4.4 | 6.9 | 0.97 |
| 1987 | 11.4 | 8.6 | 11.1 | 1.03 | 5.9 | 4.2 | 6.2 | 0.95 |
| 1988 | 8.5 | 7.1 | 9.0 | 0.94 | 5.3 | 3.5 | 5.5 | 0.96 |
| 1989 | 7.3 | 5.7 | 7.4 | 0.99 | 4.8 | 3.2 | 5.2 | 0.92 |
| 1990 | 7.0 | 5.0 | 7.0 | 1.00 | 5.5 | 3.7 | 5.6 | 0.98 |
| 1991 | 9.2 | 6.3 | 9.2 | 1.00 | 7.0 | 4.8 | 7.0 | 1.00 |
| 1992 | 11.7 | 8.4 | 11.5 | 1.02 | 7.8 | 5.6 | 7.8 | 1.00 |
| 1993 | 12.0 | 9.4 | 12.4 | 0.97 | 6.9 | 5.0 | 7.1 | 0.97 |

*Start of new series for UK

Note: LIS years in bold.

Appendix B
Unemployment Rates

| Year | Netherlands | | | | Sweden | | | |
|---|---|---|---|---|---|---|---|---|
| | 25-39 | 50-54 | total | Ratio 25-34/Total | 25-34 | 45-54 | total | Ratio 25-34/Total |
| 1972 | 2.5 | 1.9 | 2.5 | 1.00 | 2.1 | 1.6 | 2.5 | 0.84 |
| 1973 | 2.4 | 1.9 | 2.5 | 0.96 | 2.0 | 1.3 | 2.2 | 0.91 |
| 1974 | 2.9 | 2.0 | 3.0 | 0.97 | 1.4 | 1.0 | 1.7 | 0.82 |
| 1975 | 4.1 | 2.4 | 4.2 | 0.98 | 1.0 | 0.6 | 1.3 | 0.77 |
| 1976 | 4.1 | 2.4 | 4.4 | 0.93 | 1.0 | 0.7 | 1.3 | 0.77 |
| 1977 | 3.7 | 2.2 | 4.0 | 0.93 | 1.5 | 0.9 | 1.5 | 1.00 |
| 1978 | 3.4 | 2.0 | 3.7 | 0.92 | 1.9 | 1.1 | 2.1 | 0.90 |
| 1979 | 3.3 | 1.9 | 3.6 | 0.92 | 1.8 | 0.9 | 1.9 | 0.95 |
| 1980 | 4.0 | 2.2 | 4.3 | 0.93 | 1.5 | 0.9 | 1.7 | 0.88 |
| 1981 | 6.5 | 3.4 | 7.0 | 0.93 | 2.2 | 1.4 | 2.3 | 0.96 |
| 1982 | 9.4 | 5.1 | 10.0 | 0.94 | 2.9 | 1.6 | 3.0 | 0.97 |
| 1983 | 13.1 | 8.2 | 14.5 | 0.90 | 3.3 | 1.8 | 3.4 | 0.97 |
| 1984* | 13.7 | 9.2 | 14.6 | 0.94 | 3.0 | 1.4 | 3.0 | 1.00 |
| 1985 | 13.0 | 9.5 | 13.1 | 0.99 | 2.7 | 1.7 | 2.8 | 0.96 |
| 1986 | 11.7 | 9.5 | 11.9 | 0.98 | 2.7 | 1.5 | 2.6 | 1.04 |
| 1987 | 6.6 | 6.2 | 7.1 | 0.93 | 2.4 | 0.8 | 2.0 | 1.20 |
| 1988 | 6.5 | 5.5 | 7.0 | 0.93 | 2.0 | 0.8 | 1.7 | 1.18 |
| 1989 | 5.9 | 5.5 | 6.3 | 0.94 | 1.7 | 0.6 | 1.4 | 1.21 |
| 1990 | 4.8 | 4.5 | 5.4 | 0.89 | 2.1 | 0.7 | 1.7 | 1.24 |
| 1991 | 4.7 | 4.1 | 5.3 | 0.89 | 4.2 | 1.6 | 3.2 | 1.31 |
| 1992 | 4.3 | 5.1 | 5.3 | 0.81 | 8.1 | 3.1 | 6.1 | 1.33 |
| 1993 | na | na | na | | 12.3 | 5.4 | 9.6 | 1.28 |

Note: LIS years in bold.

**Figure 1**

**Yearly change in ln $P_{90}/P_{10}$ for overall distribution**
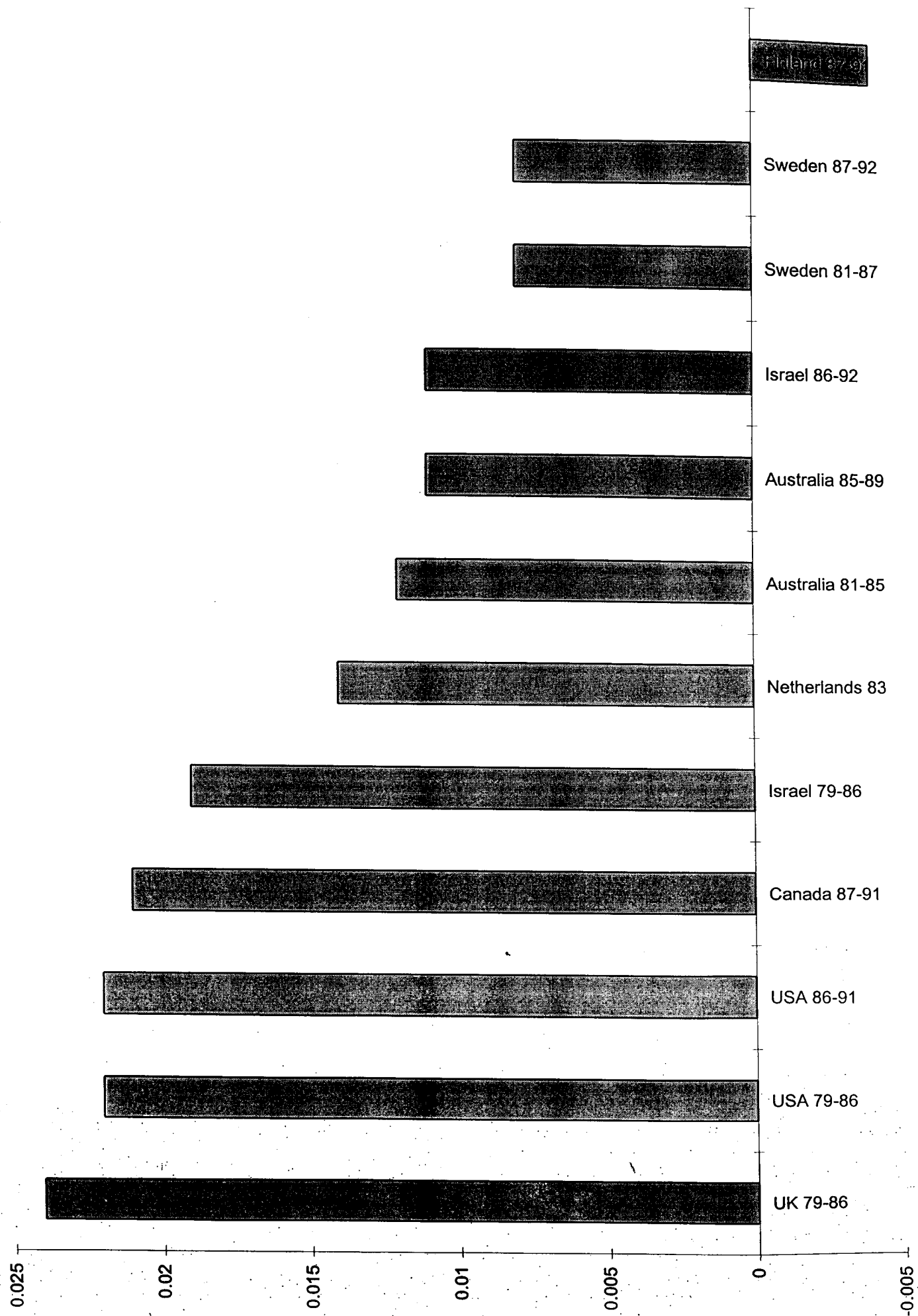
**Figure 2**

**Yearly change in age premium and relative supply of older workers**



change in age premium

- Is79-86
- A81-85
- US79-86
- N83-87
- Sw87-92
- Is86-92
- US86-91
- UK79-86
- F87-92
- C87-92
- A85-89
- Sw81-87

$y = -0.0134x + 0.0085$
$R^2 = 0.4755$

change in relative supply

0.030
0.025
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010

-1.2   -1.0   -0.8   -0.6   -0.4   -0.2   0.0   0.2   0.4   0.6   0.8
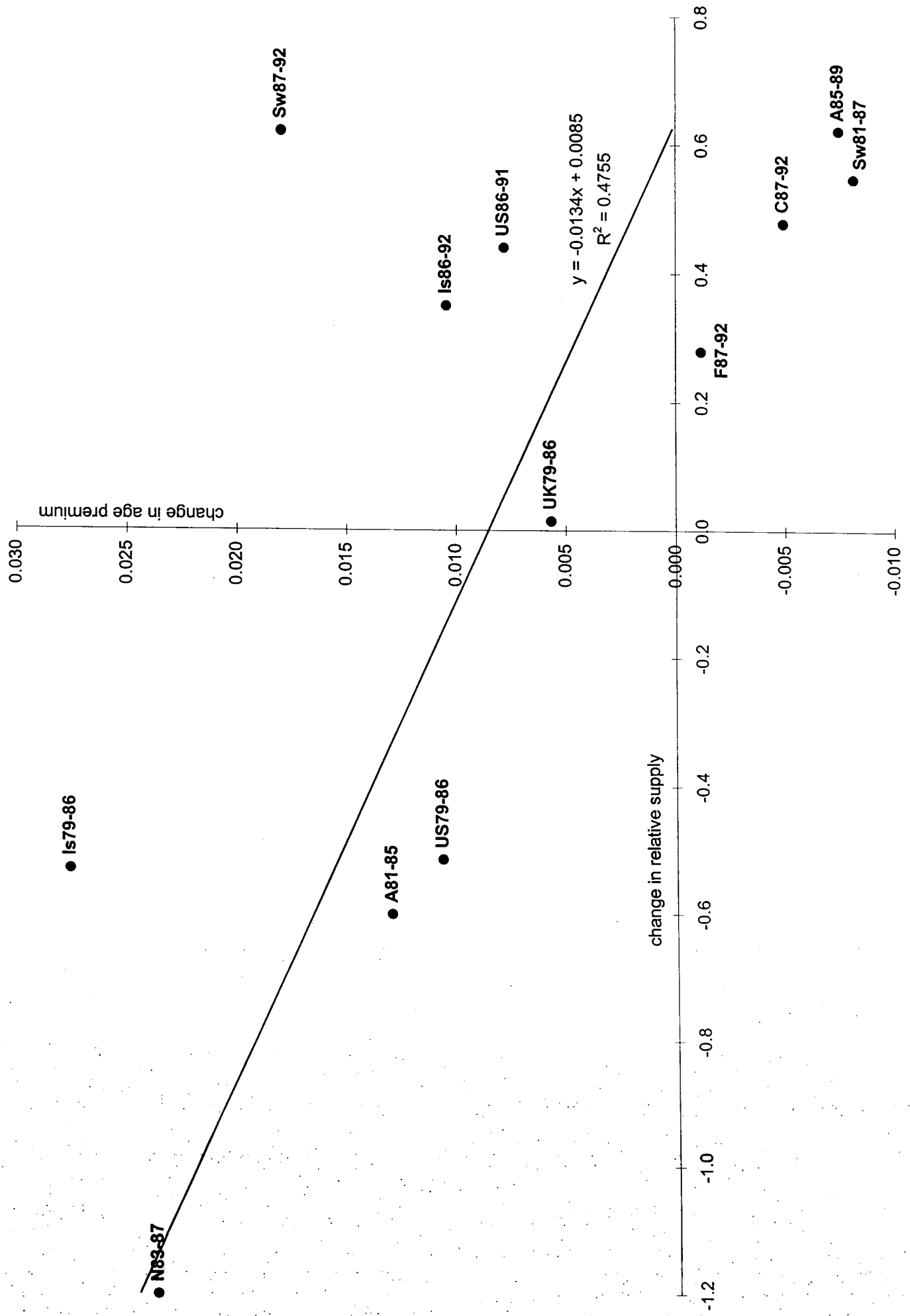
# Figure 3

## Yearly change in college premium and relative supply of college educated labor



$y = -0.0127x + 0.0086$
$R^2 = 0.3163$

change in relative supply

change in college premium

* based on occupation
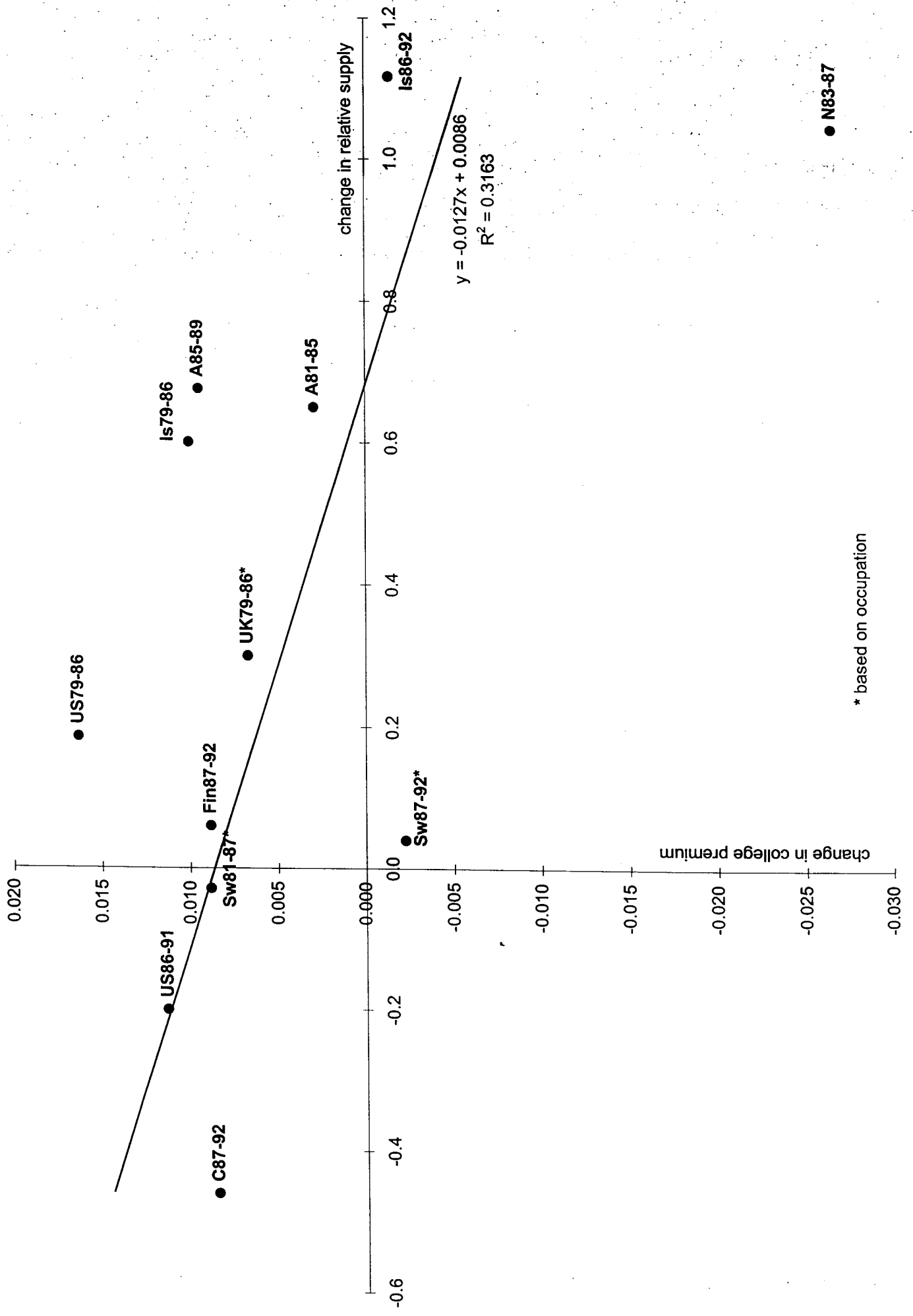
Table 1: Coefficient of Variation and Percentile Points for Earnings Distribution

| | | Coefficient of Variation | | | ln P90/P50 | | | ln P10/P50 | | | ln P90/P10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | Change/yr | Pct Ch/Yr | | Change/yr | Pct Ch/Yr | | Change/yr | Pct Ch/Yr | | Change/yr | Pct Ch/Yr |
| Australia | 1981 | .335 | | | .448 | | | -.482 | | | .930 | | |
| | 1985 | .356 | .005 | .016 | .476 | .007 | .016 | -.503 | -.005 | -.011 | .979 | .012 | .013 |
| | 1989 | .367 | .003 | .008 | .511 | .009 | .018 | -.513 | -.003 | -.005 | 1.024 | .011 | .011 |
| Canada | 1987 | .411 | | | .508 | | | -.745 | | | 1.253 | | |
| | 1991 | .421 | .002 | .006 | .532 | .006 | .012 | -.805 | -.015 | -.020 | 1.337 | .021 | .017 |
| Finland | 1987 | .305 | | | .495 | | | -.376 | | | .871 | | |
| | 1991 | .299 | -.001 | -.005 | .495 | .000 | .000 | -.359 | .004 | .011 | .854 | -.004 | -.005 |
| Israel | 1979 | .434 | | | .675 | | | -.654 | | | 1.329 | | |
| | 1986 | .501 | .010 | .022 | .748 | .010 | .015 | -.716 | -.009 | -.014 | 1.464 | .019 | .015 |
| | 1992 | .517 | .003 | .005 | .801 | .009 | .012 | -.728 | -.002 | -.003 | 1.529 | .011 | .007 |
| Netherlands | 1983 | .304 | | | .518 | | | -.326 | | | .844 | | |
| | 1987 | .315 | .003 | .009 | .549 | .008 | .015 | -.351 | -.006 | -.019 | .900 | .014 | .017 |
| Sweden | 1981 | .276 | | | .433 | | | -.312 | | | .745 | | |
| | 1987 | .298 | .004 | .013 | .463 | .005 | .012 | -.331 | -.003 | -.010 | .794 | .008 | .011 |
| | 1992 | .314 | .003 | .011 | .497 | .007 | .015 | -.337 | -.001 | -.004 | .834 | .008 | .010 |
| United Kingdom | 1979 | .322 | | | .506 | | | -.422 | | | .928 | | |
| | 1986 | .377 | .008 | .024 | .580 | .011 | .021 | -.522 | -.014 | -.034 | 1.102 | .025 | .027 |
| United States | 1979 | .444 | | | .538 | | | -.822 | | | 1.360 | | |
| | 1986 | .485 | .006 | .013 | .667 | .018 | .034 | -.847 | -.004 | -.004 | 1.514 | .022 | .016 |
| | 1991 | .502 | .003 | .007 | .622 | -.009 | -.013 | -1.003 | -.031 | -.037 | 1.625 | .022 | .015 |

Table 2: Estimated Coefficients from Ln Earnings Regression

| | Australia | | | | | | Canada | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1985 | | 1989 | | 1987 | | 1991 | |
| Grade School | -.0270*** (0.043) | -.0278*** (0.043) | -0.505 (0.445) | -0.530** (0.444) | -1.211*** (0.270) | -1.229*** (0.270) | -0.339*** (0.040) | -0.337*** (0.040) | -0.348*** (0.035) | -0.354*** (0.035) |
| Less than HS | -0.136*** (0.030) | -0.140*** (0.030) | -0.136*** (0.041) | -0.140*** (0.041) | -0.184*** (0.024) | -0.186*** (0.026) | -0.151*** (0.030) | -0.152*** (0.030) | -0.125*** (0.023) | -0.128*** (0.023) |
| Some College | -0.034 (0.030) | -0.040 (0.030) | -0.009** (0.040) | -0.013 (0.040) | 0.001 (0.025) | 0.000 (0.025) | 0.034 (0.030) | 0.031 (0.030) | 0.053*** (0.019) | 0.054*** (0.019) |
| BA | 0.244*** (0.034) | 0.237*** (0.034) | 0.255*** (0.047) | 0.252*** (0.047) | 0.293*** (0.028) | 0.293*** (0.028) | 0.290** (0.033) | 0.279*** (0.033) | 0.332*** (0.023) | 0.329*** (0.023) |
| Age | 0.049*** (0.009) | | 0.065*** (0.017) | | 0.035*** (0.010) | | 0.075*** (0.013) | | 0.056 (0.010) | |
| Age$^2 \times 10^3$ | -0.001*** (0.000) | | -0.001*** (0.000) | | 0.000*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | |
| 25-34 | | -0.090*** (0.016) | | -0.159*** (0.027) | | -0.128*** (0.017) | | -0.196*** (0.024) | | -0.175*** (0.017) |
| 45-54 | | 0.002 (0.019) | | -0.015 (0.033) | | -0.014 (0.020) | | 0.103*** (0.028) | | 0.099*** (0.018) |
| Standard Error | .496 | .494 | .627 | .626 | .539 | .539 | .636 | .633 | .565 | .563 |
| R$^2$ | .070 | .074 | .048 | .050 | .092 | .092 | .095 | .102 | .111 | .118 |
| N | 5628 | 5628 | 2868 | 2868 | 5478 | 5478 | 3818 | 3818 | 6363 | 6363 |

Note: Equations also include race dummies specific to each country, marital status and number of children under 18. Significantly different from zero at the 10 percent (*), 5 percent (**) and 1 percent (***) levels.

Table 2 continued

| | Finland | | | | Israel | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1987 A** | **1987 B** | **1991 A** | **1991 B** | **1979 A** | **1979 B** | **1986 A** | **1986 B** | **1992 A** | **1992 B** |
| Less than HS | -0.260*** (0.016) | -0.260*** (0.016) | -0.233*** (0.015) | -0.232*** (0.015) | -0.287*** (0.041) | -0.286*** (0.041) | -0.262*** (0.033) | -0.259*** (0.032) | -0.272*** (0.036) | -0.272*** (0.036) |
| Some College | 0.202*** (0.022) | 0.198*** (0.022) | 0.200*** (0.021) | 0.202*** (0.021) | 0.069 (0.060) | 0.077 (0.060) | 0.086*** (0.044) | 0.079*** (0.044) | 0.128*** (0.044) | 0.123*** (0.044) |
| BA | 0.363*** (0.020) | 0.359*** (0.020) | 0.399*** (0.020) | 0.407*** (0.020) | 0.228*** (0.046) | 0.217*** (0.046) | 0.298*** (0.037) | 0.279*** (0.037) | 0.290*** (0.037) | 0.279*** (0.037) |
| Age | 0.051*** (0.008) | | 0.049*** (0.008) | | 0.082*** (0.021) | | 0.133*** (0.017) | | 0.098*** (0.019) | |
| $\text{Age}^2 \times 10^3$ | 0.000*** (0.000) | | 0.000*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | |
| 25-34 | | -0.189*** (0.014) | | -0.167*** (0.015) | | -0.151*** (0.037) | | -0.276*** (0.030) | | -0.281*** (0.034) |
| 45-54 | | 0.079*** (0.015) | | 0.096*** (0.015) | | -0.023 (0.043) | | 0.046 (0.033) | | 0.103*** (0.035) |
| Standard Error | .348 | .346 | .334 | .332 | .437 | .433 | .519 | .513 | .527 | .526 |
| R² | .371 | .379 | .386 | .395 | .235 | .250 | .283 | .298 | .229 | .234 |
| N | 3689 | 3689 | 3385 | 3385 | 874 | 874 | 1891 | 1891 | 1603 | 1603 |

Note: Equations also include race dummies specific to each country, marital status and number of children under 18. Significantly different from zero at the 10 percent (*), 5 percent (**) and 1 percent (***) levels.

Table 2 continued

| | United States | | | | | | Netherlands | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1979 | | 1986 | | 1991 | | 1983 | | 1987 | |
| Less than HS | -0.301*** (0.027) | -0.306*** (0.027) | -0.322*** (0.037) | -0.322*** (0.037) | -0.371*** (0.031) | -0.371*** (0.030) | -0.332*** (0.026) | -0.339*** (0.025) | -0.351*** (0.023) | -0.357*** (0.022) |
| Some College | 0.109*** (0.025) | 0.108*** (0.025) | 0.176*** (0.032) | 0.172*** (0.032) | 0.162*** (0.023) | 0.157*** (0.023) | -0.192*** (0.025) | -0.199*** (0.025) | -0.120*** (0.025) | -0.123*** (0.024) |
| BA | 0.287*** (0.025) | 0.280*** (0.025) | 0.401*** (0.028) | 0.386*** (0.028) | 0.458*** (0.023) | 0.454*** (0.023) | 0.272*** (0.035) | 0.256*** (0.035) | 0.166*** (0.031) | 0.159*** (0.030) |
| Age | 0.059*** (0.021) | | 0.079*** (0.015) | | 0.069*** (0.012) | | 0.066*** (0.011) | | 0.074*** (0.011) | |
| Age$^2$ × 10$^3$ | -0.001*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | |
| 25-34 | | -0.180*** (0.022) | | -0.191*** (0.026) | | -0.230*** (0.020) | | -0.145*** (0.019) | | -0.194*** (0.018) |
| 45-54 | | 0.046* (0.026) | | 0.109*** (0.032) | | 0.109*** (0.024) | | 0.033* (0.022) | | 0.079*** (0.023) |
| Standard Error | .614 | .612 | .669 | .666 | .641 | .638 | .333 | .330 | .322 | .314 |
| R$^2$ | .148 | .153 | .170 | .178 | .205 | .214 | .238 | .247 | .285 | .318 |
| N | 4406 | 4406 | 3502 | 3502 | 5320 | 5320 | 1866 | 1866 | 1742 | 1742 |

Note: Equations also include race dummies specific to each country, marital status and number of children under 18. Significantly different from zero at the 10 percent (*), 5 percent (**) and 1 percent (***) levels.

Table 2 continued

| | United Kingdom | | | | | | Sweden | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1979 | | 1986 | | 1991 | | 1981 | | 1987 | | 1992 | |
| Laborer | -0.119*** (0.026) | -0.116*** (0.026) | -0.161*** (0.029) | -0.160*** (0.029) | -0.210*** (0.026) | -0.210*** (0.025) | -0.311*** (0.017) | -0.303*** (0.017) | -0.219*** (0.016) | -0.216*** (0.016) | -0.193 | -0.193 |
| Manager/ Professional | 0.178*** (0.028) | 0.177*** (0.028) | 0.224*** (0.030) | 0.223*** (0.030) | 0.302*** (0.026) | 0.299*** (0.026) | 0.516*** (0.034) | 0.507*** (0.034) | 0.569*** (0.050) | 0.567*** (0.050) | 0.558 | 0.558 |
| Age | | 0.051*** (0.010) | | 0.083*** (0.012) | | 0.048*** (0.012) | | 0.066*** (0.010) | | 0.053*** (0.010) | | 0.030 |
| Age²×10³ | | -0.001 (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | | -0.001*** (0.000) | | 0.000 |
| 25-34 | -0.066*** (0.018) | | -0.146*** (0.021) | | -0.075*** (0.022) | | -0.154*** (0.018) | | -0.119*** (0.018) | | -0.114 | |
| 45-54 | -0.030 (0.021) | | -0.070*** (0.024) | | 0.021*** (0.025) | | 0.024* (0.020) | | 0.010*** (0.019) | | 0.104 | |
| Standard Error | .375 | .374 | .409 | .408 | .420 | .418 | .387 | .385 | .418 | .417 | .473 | .473 |
| R² | .121 | .128 | .181 | .188 | .233 | .238 | .240 | .249 | .134 | .138 | .190 | .191 |
| N | 2429 | 2429 | 2107 | 2107 | 2094 | 2094 | 2676 | 2676 | 3288 | 3288 | 3634 | 3634 |

Note: Equations also include race dummies specific to each country, marital status and number of children under 18. Significantly different from zero at the 10 percent (*), 5 percent (**) and 1 percent (***) levels.

Table 3: Yearly Change in the Education or Occupation Premium[1]

| | Yearly change in | |
|---|---|---|
| | Education Premium | Residual Education Premium[2] |
| USA 79-86 | 0.016 (1) | 0.010 (1) |
| USA 86-91 | 0.011 (2) | 0.000 (8) |
| Israel 79-86 | 0.010 (3) | 0.009 (3) |
| Australia 85-89 | 0.010 (4) | 0.010 (2) |
| Finland 87-92 | 0.009 (5) | 0.001 (7) |
| Sweden 81-87* | 0.009 (6) | 0.000 (9) |
| Canada 87-92 | 0.008 (7) | -0.006 (10) |
| UK 79-86* | 0.007 (8) | 0.002 (6) |
| Australia 81-85 | 0.003 (9) | 0.003 (5) |
| Israel 86-92 | -0.001 (10) | 0.004 (4) |
| Sweden 87-92* | -0.002 (11) | -0.010 (11) |
| Netherlands 83-87 | -0.026 (12) | -0.022 (12) |

[1]  Ranks in parenthesis.
[2]  Deviation from fitted values in Figure 3.
*   Uses occupation premium.

Table 4: Yearly Change in the Age Premium[1]

| | Yearly change in | |
| --- | --- | --- |
| | Education Premium | Residual Age Premium[2] |
| Israel 79-86 | 0.028 (1) | 0.012 (2) |
| Netherlands 83-87 | 0.024 (2) | -0.001 (5) |
| Sweden 87-92 | 0.018 (3) | 0.018 (1) |
| Australia 81-85 | 0.013 (4) | -0.004 (7) |
| USA 79-86 | 0.011 (5) | -0.005 (8) |
| Israel 86-92 | 0.010 (6) | 0.007 (3) |
| USA 86-91 | 0.008 (7) | 0.005 (4) |
| UK 79-86 | 0.006 (8) | -0.003 (6) |
| Finland 87-91 | -0.001 (9) | -0.006 (9) |
| Canada 87-92 | -0.005 (10) | -0.007 (10) |
| Australia 85-89 | -0.007 (11) | -0.008 (11) |
| Sweden 81-87 | -0.008 (12) | -0.009 (12) |

[1] Ranks in parenthesis.
[2] Deviation from fitted values in Figure 2.

Table 5: Changes in Relative Unemployment Rates of Persons 25-34[1]

| | Change Per Year[2] | Trend |
|---|---|---|
| Sweden 81-87 | 0.041 (1) | 0.031 (2) |
| UK 79-86 | 0.033 (2) | 0.037 (1) |
| Finland 87-91 | 0.030 (3) | 0.022 (5) |
| Canada 87-91 | 0.025 (4) | 0.026 (4) |
| Sweden 87-92 | 0.023 (5) | 0.031 (3) |
| USA 79-86 | 0.018 (6) | 0.01 (6) |
| Australia 81-85 | 0.008 (7) | 0.008 (8) |
| Netherlands 83-87 | 0.007 (8) | 0.01 (7) |
| USA 86-91 | 0.006 (9) | 0.006 (9) |
| Australia 85-89 | 0.005 (10) | 0.002 (10) |

[1] Unemployment rates of 25 to 34 year olds relative to 25-54 year olds. Ranks in parenthesis.
[2] Value of second year minus value in first year, divided by number of intervening years.