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Have the relative employment prospects for the low-skilled deteriorated after all?

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9 June, 2000

Have the Relative Employment Prospects for the Low-Skilled Deteriorated After All?

By Knut Røed and Morten Nordberg*

Abstract

With the aid of Norwegian register data, the paper investigates whether or not the relative unemployment propensity for the low-skilled has increased during the 1990's. Two alternative notions of 'low skills' are employed; i) low education, and ii) low previous earnings, conditioned on education and work experience. According to the standard education-based measure, we find that unemployment propensity has not at all developed unfavourably for the low-skilled. According to the earnings based measure, it has. We uncover a steady and significant deterioration of employment prospects for persons with particularly low previous earnings relative to others with similar formal qualifications.

Keywords: Skill-biased technical change, relative unemployment rates

JEL Classification: J31, J64

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1 Introduction

The prospect of becoming unemployed plays a major role in the economics of the labour market. In modern theory of wage formation, the threat of unemployment serves as the ultimate disciplinary device that prevents wages from rising indefinitely. However, this threat does not worry all workers to the same extent. First, depending on individual skills, the solidity of the firm, seniority rules etc, some workers have much safer jobs than others. And second, even in case of a job loss, some workers find it much easier to get a new job than others. Consequently, the desired wage-restraint that a given aggregate rate of unemployment imposes may vary a lot between different individuals. But in European labour markets, wages are typically determined collectively; hence, at least to some extent, the 'majority' (e.g. as represented by the median worker) decides the wage for everyone. Therefore, if the threat of unemployment for some reason is raised for an unfortunate minority only (or mostly), this may fail to trigger the usual equilibrium restoring mechanisms in terms of more moderate wage demands. More generally, the equilibrium *level* of unemployment is likely to depend on the equilibrium *distribution* of unemployment. The more unemployment tends to be concentrated among a minority of workers, the less downward pressure it exerts on wage setting, and the higher is the aggregate equilibrium rate of unemployment.

A popular explanation for the current European unemployment problem runs like this: For some reason (trade, technology), the market value of individual labour services has become more dispersed. Where wages are allowed to clear the labour market (United States, United Kingdom), this development has produced a parallel increase in wage dispersion. Where relative wages are sticky (most of Europe), quantities have had to adjust instead. In short, while the low-skilled have been forced to accept lower real wages in the United States, they have been pushed out of the labour

market (with generous unemployment benefits) in most of Europe (OECD, 1994; Krugman, 1994). But because the resulting higher level of unemployment is (almost) inconsequential for the employment prospects of the median worker, the effect on the aggregate wage setting behaviour is modest. At the other end of the productivity distribution, jobs are safer than ever (Røed, 1998).

A corollary of this theory is that the rising level of unemployment should primarily be allocated to the low-skilled, and that this trend should be stronger in continental Europe than in the United States and the United Kingdom. However, attempts to confront these predictions with data are discouraging. There is no unequivocal pattern of rising relative unemployment rates for persons with low education in European countries (Nickell and Bell, 1995; 1996; Jackman et al, 1997; Manacorda and Petrongolo, 1999). And among the few countries in which such a tendency can be spotted are the United States and the United Kingdom. Is that the end of the story? Not necessarily. There are at least two reasons for being cautious about using ratios of unemployment rates for various groups to assess the skill-biased labour demand hypothesis. First, such ratios may conceal important differences with respect to the pattern of unemployment incidence and unemployment duration. While high relative unemployment rates for persons with low education appear to be a pure incidence phenomenon in the United States, it is a combined incidence- and duration phenomenon in continental Europe (see. e.g. Cohen et. al., 1997). Second, educational attainment may not be the appropriate distinguishing feature of the technological "winners" and "losers" in the labour market. In fact, the theory itself is primarily rooted in the *observation* that wage dispersion has increased dramatically in the United States, where relative wages are deemed highly flexible. The theory is rather vague with respect to the source of the presumed rise in market value dispersion. And a closer look at the US

developments reveals that only a relatively small fraction of the increased wage inequality is attributable to educational attainment (Katz and Murphy, 1992, pp. 43-45; Gottschalk, 1997, pp. 31-33). One could therefore hypothesise that the problem lies more in the wage- and productivity distributions *conditioned on education* than in the between-educational-group distribution. But since individual productivity is rarely observed, this hypothesis is not easily tested.

The purpose of this paper is to evaluate relative unemployment risks, using a supplementary measure of low skills *that condition on educational attainment and work experience*. The underlying assumption is that employment prospects not only depend on education and work experience, but also on a person's innate abilities relative to all others with exactly the same formal qualifications. In order to highlight the difference between our measure and more standard education-based skill measures, we apply the term *low (conditional) ability* rather than *low skills*. The paper takes advantage of a unique micro data set containing the Norwegian adult population in 1993 and a complete monthly record of their unemployment spells during the period from January 1989 to December 1997, together with an account of their previous yearly earnings, based on pension point accumulation. The records also contain information about individual characteristics, such as gender, age, nationality, family status and educational attainment (see Røed and Zhang, 1999, for details). The next section describes how we identify low conditional ability in terms of individual earnings capacity. Section 3 presents the econometric analysis and section 4 concludes.

2 Using Conditional Earnings Capacity to Identify Innate Ability

The 'low-ability' workers are identified with the aid of previous income, *conditioned on educational attainment and work experience*. There are two important assumptions that must be fulfilled for this to be a fruitful approach. The first is that individual

wages, conditioned on education and work-experience, are positively correlated to individual ability; otherwise, we cannot use them to identify the group of interest. Although individual earnings obviously are explained by other factors than individual ability as well (such as total working time, the market power of the firm, the power of the local trade union, and the non-pecuniary utility derived from the job), it seems likely that ability does have a role to play. The second assumption is that the same individual wages do not *fully* reflect variations in individual abilities; otherwise, there would be no reason to expect that employment prospects depend on innate ability at all. With a wage system very much focused on formal qualifications, this assumption is almost certain to be fulfilled.

Our analysis is limited to *prime aged men* (in their forties) that *have been fully employed* for at least a whole year just prior to the period in which unemployment exposure is investigated. This implies that we do not focus on particularly disadvantaged workers, but rather on one of the core groups in the labour force. Previous full-time employment is a necessary condition for identification of individual wages, since we do not observe working hours directly. We identify the group of full time employed in a given year with the aid of two criteria; i) they were not registered as unemployed at any time that year, and ii) they had an income above a given threshold, which is determined as the lowest regular full-time yearly income for an adult). The required amount is adjusted each year according to the aggregate rate of wage growth, and it corresponds roughly to 20,000 Euro in 1999. Unfortunately, this implies that high-wage part time workers may erroneously be considered low-wage full time workers. This is the main reason why we focus on prime aged men. Part time work is rare among prime aged men in Norway. According to the Labour Force Sample Surveys (Statistics Norway, various issues), only 1.8-2.9 per cent of the prime aged employed

men worked less than 30 hours a week during the 1990's, compared to 31.6-36.7 per cent of the prime aged women.

The low-ability measure is constructed as follows:. We first divide the population of fully employed workers in year *y* (N_y) into 210 groups, such that the members in each group have the same educational attainment (10 categories) and the same number of years of work experience (21 categories). We then attribute to each person a set of indicator variables, D_k, $k=1,2,3,4$, describing the position in the *within-group* (year *y*) wage distribution. These indicator variables, together with work-experience, educational attainment, and a number of other characteristics, are then used as explanatory variables in models constructed to explain unemployment exposure in a subsequent period. We consider the workers in the lowest decile in the education- and experience-specific wage distribution to constitute the low-ability group ($k=4$). According to this measure, the fraction of low-ability workers is (as a matter of definition) the same in all formal qualifications groups, i.e. 10 per cent. Due to a censoring problem associated with high incomes, the high ability group ($k=1$) contains 40 per cent of the population, i.e. the four deciles at the top of the conditional wage distribution. The rest of the workers are divided into two equally sized groups ($k=2$ for persons in the 35-60 percentiles and $k=3$ for persons in the 10-35 percentiles).

3 Econometric Analysis

The purpose of the econometric analysis in this section is to evaluate how the low-ability measure explained in the previous section affects individual unemployment exposure, and to investigate whether or not the importance of individual productivity has changed over time. The results based on our own conditional low-ability measure are compared with results based on a more standard education based low-skill measure. Since the main purpose of our analysis is to detect changes over time in the rela-

tionship between individual ability and unemployment exposure, we divide the population into seven (partly overlapping) cohorts. The members of each cohort start out in their respective base year *y* as fully employed; i.e. the econometric analysis is conditioned on employment being the initial state. Their subsequent unemployment status by the end of each calendar month is then recorded for the next two years. Hence, we have seven data sets, each consisting of 24 observations for each individual.

Table 1 provides some descriptive statistics. The first thing to note is that the survey populations constitute a relatively constant fraction (70-72 per cent) of the total male population in the relevant age group, suggesting that the composition of the risk population does not vary much over the observation period. There is a steady decline in the fraction of persons with only compulsory schooling, and also a decline in the fraction of immigrants, but these developments mirror demographic trends in Norway. The populations covered by our analysis have very low unemployment propensities. The average monthly inflow rate to unemployment is typically less than a third of a per cent, and conditional on entering unemployment, the expected completed spell duration is 4-5 months. As much as 94-96 per cent of the workers experience no unemployment at all during the two-year period. The coefficients of variation indicate, in line with findings in Røed and Zhang (1999), that unemployment exposure did become more unequally distributed during the 1990's.

Table 1. Descriptive statistics

	1989	1990	1991	1992	1993	1994	1995
Number of persons	199275	206272	213569	216928	218754	224892	229576
Per cent of total male population 40-49 (1. Jan.)	71.92	72.11	72.59	71.60	70.57	71.42	72.55
The base year y:							
Average age	44.10	44.21	44.36	44.45	44.53	44.57	44.56
Per cent with lowest education (<10 years)	21.37	20.34	19.30	18.37	17.35	16.81	16.19
Per cent with highest education (>16 years)	11.46	11.65	11.89	12.17	12.27	11.98	11.77

Table 1. Descriptive statistics

	1989	1990	1991	1992	1993	1994	1995
Average years of work experience	19.54	19.59	19.63	19.63	19.68	19.72	19.71
Per cent immigrants from non-OECD country	2.50	2.44	2.34	2.28	2.16	2.00	1.87
Per cent married	78.86	78.65	78.35	77.78	77.30	76.53	75.46
Unemployment in observation period:							
Average per cent unemployed in t=1,2,...,24.	1.19	1.34	1.42	1.22	0.90	0.78	0.67
High ability (k=1)	0.89	1.00	1.08	0.98	0.77	0.64	0.48
Medium ability (k=2)	1.21	1.40	1.39	1.16	0.82	0.68	0.57
Medium ability (k=3)	1.40	1.59	1.66	1.32	0.92	0.84	0.78
Low ability (k=4)	1.91	2.08	2.35	2.12	1.53	1.43	1.37
Average per cent inflow	0.32	0.35	0.36	0.31	0.23	0.21	0.19
Average per cent persistence	78.71	80.67	79.77	79.05	78.69	76.84	74.98
Per cent unemployed during observation period	5.78	6.14	6.51	5.63	4.33	4.09	3.65
Per cent unemployed more than six months	1.77	2.01	2.16	1.83	1.32	1.14	0.96
Coefficient of variation total unemployment	5.69	5.51	5.37	5.69	6.59	6.97	7.50

Note: average per cent persistence is the per cent unemployed in month *t*, given unemployment in month *t-1*.

Figure 1, panel (a), displays the time path for the aggregate adult male unemployment rate in Norway (collected from Røed and Zhang, 1999, Supplement). Unemployment rose sharply until 1993, and declined thereafter, with substantial seasonal variations. The lower panels of figure 1 display two series of relative unemployment rates, calculated from our own data. The first one, in panel (b), is based on the 'standard' skill measure, i.e. it is the ratio between the unemployment rate for persons with low education and for persons with medium education. The second one, in panel (c), is based on our own ability measure, i.e. it is the ratio between the unemployment rate for persons in the lowest education- and experience specific wage distribution (*k=4*) and for persons in the middle (*k=2*). While the 'standard' measure displays a substantial seasonal variation, but no trend; the earnings-based relative unemployment rate displays a marked upwards trend over the survey period. The ratio between the unem-

ployment rates for low- and medium incomes rose from around 1.5 in the first cohort to around 2.3 in the last cohort.

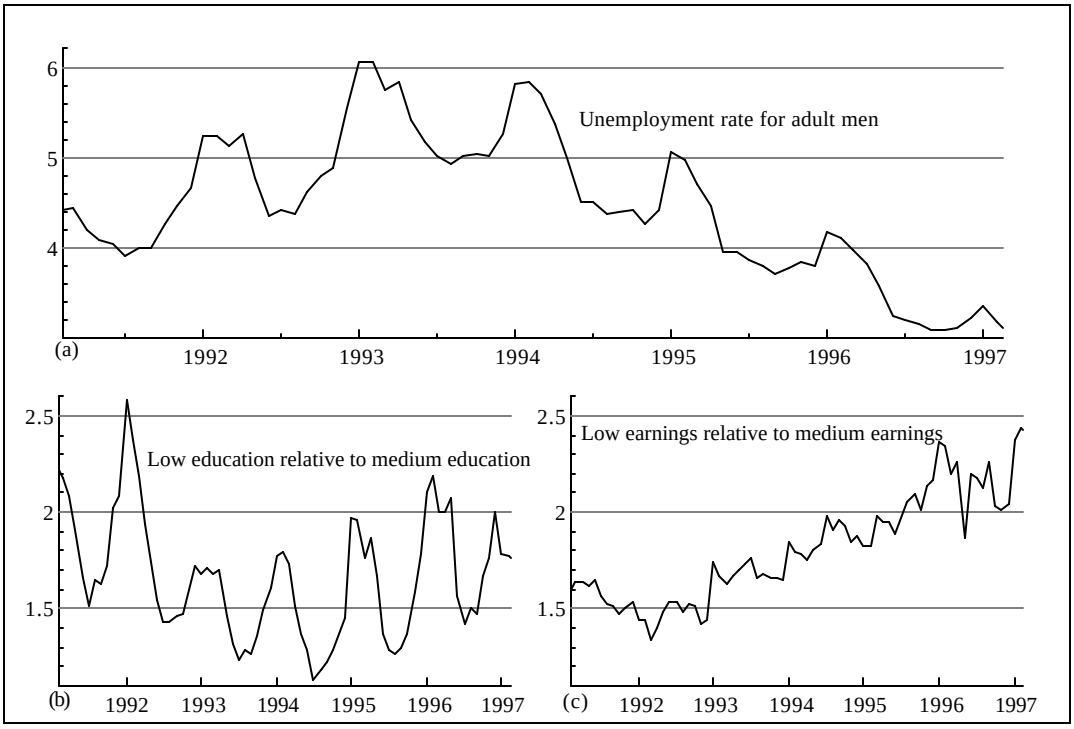

Figure 1. Unemployment rates for adult men and relative unemployment rates for different skill groups.

Notes: Unemployment rates in panel (a) comprise adult men aged 35-55, and are collected from Røed and Zhang, 1999. Panel (b) plots the unemployment rate for persons with only compulsory education relative to persons with high school. Panel (c) plots the unemployment rate for persons in the lowest education- and experience specific income distribution relative to those in the middle (35-60 percentiles). Panel (b) and (c) are based on populations that were fully employed in a given base year. The monthly rates for year *y* are based on the population of fully employed in year *y-2*.

Differences in individuals' total unemployment exposure can be decomposed into i) differences in the probability of becoming unemployed and ii) differences in the ability to get out of unemployment, once there. Given that the employer usually has more information about the personal skills of incumbents than he has about new job seekers, firing decisions may be more governed by the employers' assessments of individual wage costs and productivity than hiring decisions. In that case, one should expect individual ability to affect the incidence of unemployment more than it affects the persistence of unemployment. On the other hand, heavy restrictions on firing (e.g. in the form of seniority rules) imply that the employer may be freer to take productiv-

ity considerations into account in the hiring process than in the firing process. In order to be able to disentangle incidence- and persistence effects, we estimate dynamic binary response models that allow for first order state dependence, and unobserved person-specific effects.

Let d^*_{iyt} be individual *i's* latent unemployment propensity in the *t'th* month after the end of year *y*, and let d_{iyt} be the actual unemployment outcome (=1 if unemployed, otherwise zero). Assume that $d_{iyt}=1$ if, and only if, $d^*_{iyt} > 0$. Furthermore, assume that the unemployment propensity is determined by observed factors z_{iyt} and unobserved factors v_{iyt}, such that $d^*_{iyt} = z_{iyt} + v_{iyt}$. Among the observed factors that affect unemployment propensity in month t is the realised unemployment outcome in month *t-1* (state dependence). We have already pointed out that the state dependence effect may depend on ability. Hence, in the present analysis, we parameterise the observed part of the model in the following way:

$$\begin{gathered} z_{iyt} = c_y + l_y d_{iy(t-1)} + d_{ky}(1-d_{iy(t-1)}) + g_{ky} d_{iy(t-1)} + x'_{iy} b_y + j_y u_{yt}, \\ i=1,...,N_y;\ \ k=1,...,4;\ \ y=1989,...,1995;\ \ t=1,...24,\ \ d_{iy0}=0\ \ \forall i, \end{gathered} \tag{1}$$

where c_y and l_y are the constant term and the state dependence parameter for a reference group (characterised by medium education and medium ability ($k=2$)), and d_{ky} and g_{ky} are the state-specific effects associated with the position in the lagged within group wage distribution. When these are normalised such that $d_{2y} = g_{2y} = 0$, the remaining parameters are all identified. The vector x_{iy} contains the explanatory variables (nine education dummies, one immigrant dummy, one marital status dummy, five regional dummies, and a second order polynomial in years of work experience) and u_{yt} is the aggregate monthly rate of unemployment for adult men. In order to avoid an unmanageably large number of coefficients to estimate, all these variables (including

the education-based skill-measures) are restricted to have the same coefficient irrespective of the state in the previous month.

We now turn to the unobserved part of unemployment propensity. Assume that

$$v_{iyt} = a_{iy} + e_{iyt}, \tag{2}$$

implying that there is a constant person-specific effect a_{iy} (unobserved heterogeneity) in addition month-specific 'error' terms e_{iyt}. Throughout the analysis, the latter are assumed independent drawings from a logistic density distribution. In the main part of the analysis, we also assume that the person-specific elements (a_{iy}) are drawings from a given probability distribution. Taking into account that a_{iy} is a scalar measure of a large number of individual characteristics, a Central Limit Theorem type argument makes the normal distribution a natural choice (Narendranathan and Stewart, 1993, p. 370). If a_{iy} is normally distributed $N(0, s_y^2)$, the probability of observing a particular sequence $\mathbf{d}_{iy} = \{d_{iy1}, d_{iy2}, ..., d_{iy24}\}$ is given as

$$P\left[\mathbf{d}_{iy} \mid x_{iy}\right] = \int_{-\infty}^{\infty} \frac{\exp\left(-a_{iy}^2 / 2s_y^2\right)}{\sqrt{2p s_y}} \left[\prod_{t=1}^{24} \left(\frac{\exp\left(z_{iyt} + a_{iy}\right)}{1+\exp\left(z_{iyt} + a_{iy}\right)}\right)^{d_{iyt}} \left(\frac{1}{1+\exp\left(z_{iyt} + a_{iy}\right)}\right)^{1-d_{iyt}}\right] da_{iy}. \tag{3}$$

The fraction of total variance explained by unobserved heterogeneity is given as

$$r_y = corr(v_{iyt}, v_{iyt-1}) = \frac{s_y^2}{1+s_y^2}. \tag{4}$$

We estimate the model, for each of the seven cohorts, with a Maximum Likelihood procedure, based on a Gauss-Hermite quadrature approximation to the integral in (3)[1].

[1] The models were estimated in STATA with the xtlogit-command. With around 5 million observations in each cohort, the estimations were very demanding in terms of CPU-time. On our computer (Dell Precision 620, with 2GB RAM), each of the seven estimations took 30-40 hours.

The main results, regarding the variables of interest, are given in table 2 (complete results are available on request).

Table 2.
Selected Maximum Likelihood Estimates from the Random Effects Model
(Standard Errors in Parentheses)

	1989	1990	1991	1992	1993	1994	1995
Reference: Upper secondary school, general subjects, *k=2*							
State dependence reference group (l_y)	4.596 (0.036)	4.587 (0.034)	4.664 (0.034)	4.668 (0.036)	4.905 (0.043)	4.833 (0.047)	4.684 (0.047)
Earnings based ability measures							
Incidence:							
High ability (d_{1y})	-0.332 (0.032)	-0.387 (0.031)	-0.266 (0.030)	-0.183 (0.031)	-0.009 (0.034)	-0.054 (0.035)	-0.123 (0.037)
Medium lower ability (d_{3y})	0.117 (0.034)	0.149 (0.033)	0.206 (0.032)	0.162 (0.034)	0.073 (0.038)	0.186 (0.038)	0.219 (0.039)
Low ability (d_{4y})	0.390 (0.043)	0.301 (0.042)	0.436 (0.040)	0.505 (0.041)	0.570 (0.045)	0.635 (0.045)	0.756 (0.045)
State dependence:							
High ability (g_{1y})	-0.176 (0.051)	-0.152 (0.050)	-0.181 (0.048)	-0.016 (0.049)	0.001 (0.056)	-0.127 (0.059)	-0.124 (0.061)
Medium lower ability (g_{3y})	0.193 (0.054)	0.091 (0.052)	0.100 (0.049)	0.076 (0.052)	0.061 (0.061)	0.189 (0.062)	0.350 (0.063)
Low ability (g_{4y})	0.383 (0.066)	0.333 (0.066)	0.511 (0.060)	0.631 (0.062)	0.521 (0.070)	0.580 (0.073)	0.719 (0.071)
Education based skill measures							
At least five years at University	-1.462 (0.079)	-1.661 (0.078)	-1.711 (0.070)	-1.596 (0.073)	-1.548 (0.081)	-1.370 (0.082)	-1.579 (0.088)
Upper secondary school, vocational subjects	0.515 (0.059)	0.443 (0.056)	0.291 (0.052)	0.327 (0.056)	0.299 (0.061)	0.483 (0.064)	0.421 (0.066)
Lower secondary school	0.501 (0.053)	0.451 (0.049)	0.333 (0.045)	0.436 (0.050)	0.482 (0.053)	0.623 (0.058)	0.636 (0.060)
Primary school only	0.995 (0.054)	1.010 (0.051)	0.846 (0.047)	0.874 (0.052)	0.812 (0.056)	0.953 (0.060)	0.915 (0.062)
Unobserved heterogeneity							
Fraction of variance explained by unobserved heterogeneity (r_y)	0.828 (0.002)	0.836 (0.002)	0.826 (0.002)	0.832 (0.002)	0.837 (0.002)	0.830 (0.003)	0.832 (0.03)
Number of observations ($N_y \times 24$)	4782600	4950528	5125656	5206272	5250096	5397408	5509824

Comparison of logit estimates across periods with different macroeconomic environments may be problematic, as the marginal effects vary with event probabilities. But most of the parameters are remarkably stable. They reveal, unsurprisingly, that the unemployment propensity is lower the higher is the educational attainment

and the higher is the innate ability. They also reveal that the roles of state dependence and unobserved heterogeneity were virtually unchanged during the 1990's. Roughly 80 per cent of variance in unexplained unemployment exposure is attributed to unobserved heterogeneity. The only parameters subject to substantial changes over time are the two low ability parameters d_{4y} and g_{4y}. The estimates suggest that these parameters have trended upwards (in tandem) during the 1990's. But, as the logit coefficients do not have any simple interpretation (e.g. in terms of marginal effects or elasticities) we take a closer look at the roles played by our skill- and ability measures in terms of predicted unemployment probabilities and relative probabilities for some 'typical' workers. In order to focus on the ability measures and avoid compositional 'noise', we fix all other individual characteristics at their mean level in 1989, and concentrate exclusively on variations in educational attainment and position in the conditional income distribution.

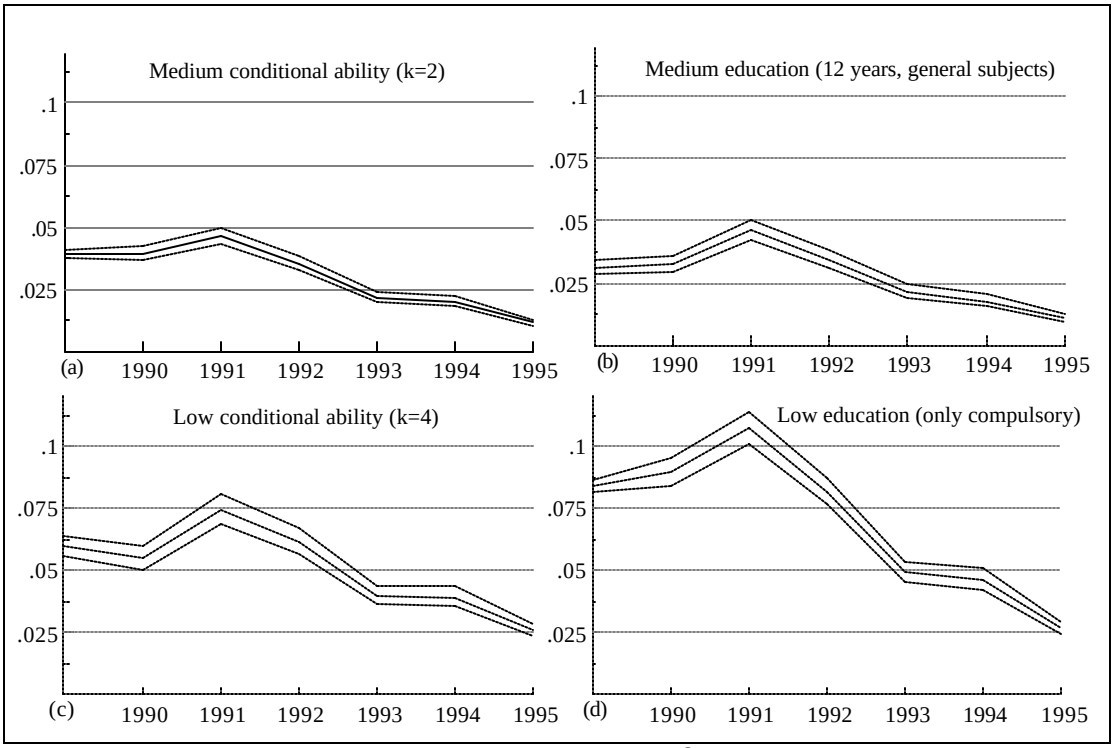

Figure 2. Estimated unemployment probabilities for a "mean" person according to ability (with 95 per cent confidence intervals).

Note: Apart from skills/abilities, explanatory variables were set to their mean values in 1989, except labour market variables, which were set to their respective period averages.

Figure 3 reports the estimated *ratios* of low- to medium skill unemployment rates according to the two alternative skill-measures[2]. According to the 'standard' education based low-skill measure displayed in the lower panel, no significant changes occurred in relative unemployment propensities. There was (perhaps) a slight fall in the relative unemployment propensity of the low-skilled during the slump, but it then returned to the initial level. No significant changes can be identified. The conditional ability measure in the upper panel of Figure 3 tells a different story. Relative to medium ability workers, the unemployment propensity for the low ability workers has increased almost continuously during the 1990's. The point estimates suggest that the ratio of low- to medium ability unemployment propensity has increased from around 1.5 for the 1989 cohort to 2.25 for the 1995 cohort, roughly in line with the observed relative unemployment rates (see Figure 1). The changes are statistically significant at conventional levels. The estimates reported in Table 2 suggest that this development is driven by higher relative unemployment incidence, as well as higher relative unemployment persistence. The incidence- and persistence coefficients associated with low ability (*k=4*) are very similar (and significantly different at the five per cent level only for the 1992 cohort). This result is mirrored in the state-specific relative unemployment propensities depicted in Figure 4.

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[2] The confidence interval for the ratio of two unemployment probabilities $(p = p_1 / p_2)$ for persons with covariate vectors (x_1^*, x_2^*) (including all explanatory variables) are calculated with the following Taylor approximation: $p \in (\hat{p} \pm 1.96\sqrt{\hat{d}' C \hat{d}})$, where hats (^) indicate point estimates, *C* is the estimated covariance matrix and $\hat{d} = \widehat{\partial p / \partial b} = \hat{p}((1-\hat{p}_1)x_1^* - (1-\hat{p}_2)x_2^*)$.

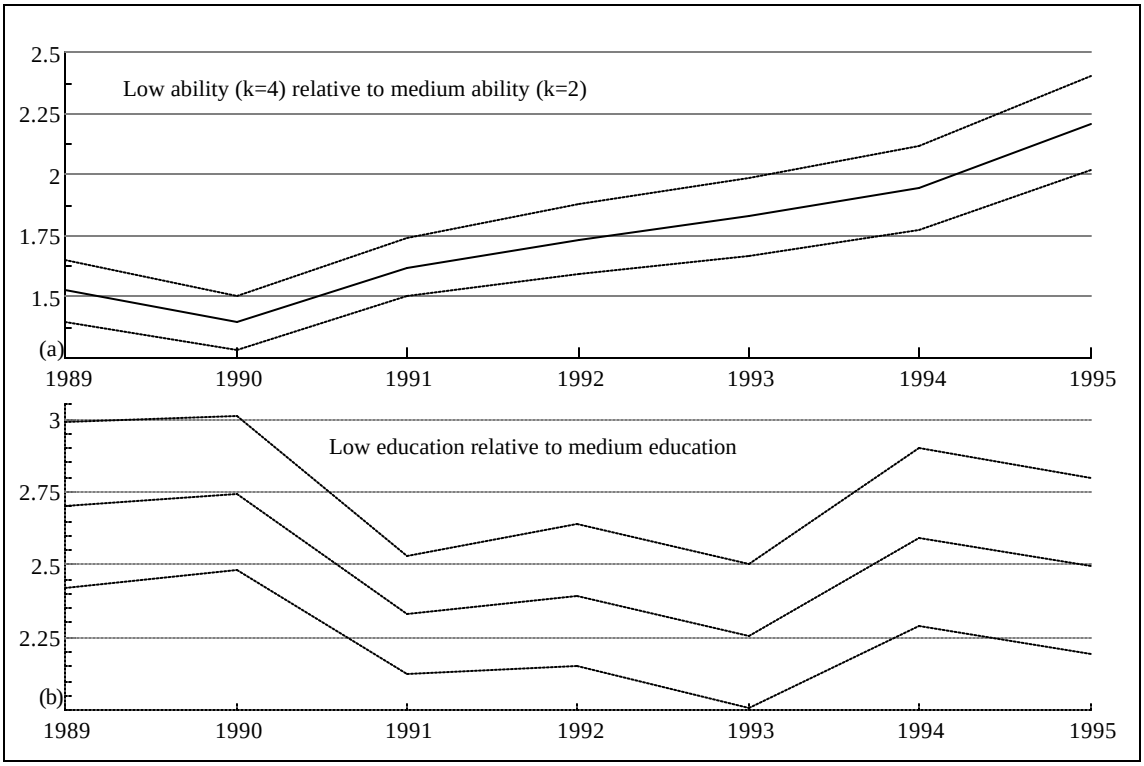

Figure 3. Estimates of relative unemployment probabilities for 'mean' workers (with 95 per cent confidence intervals).

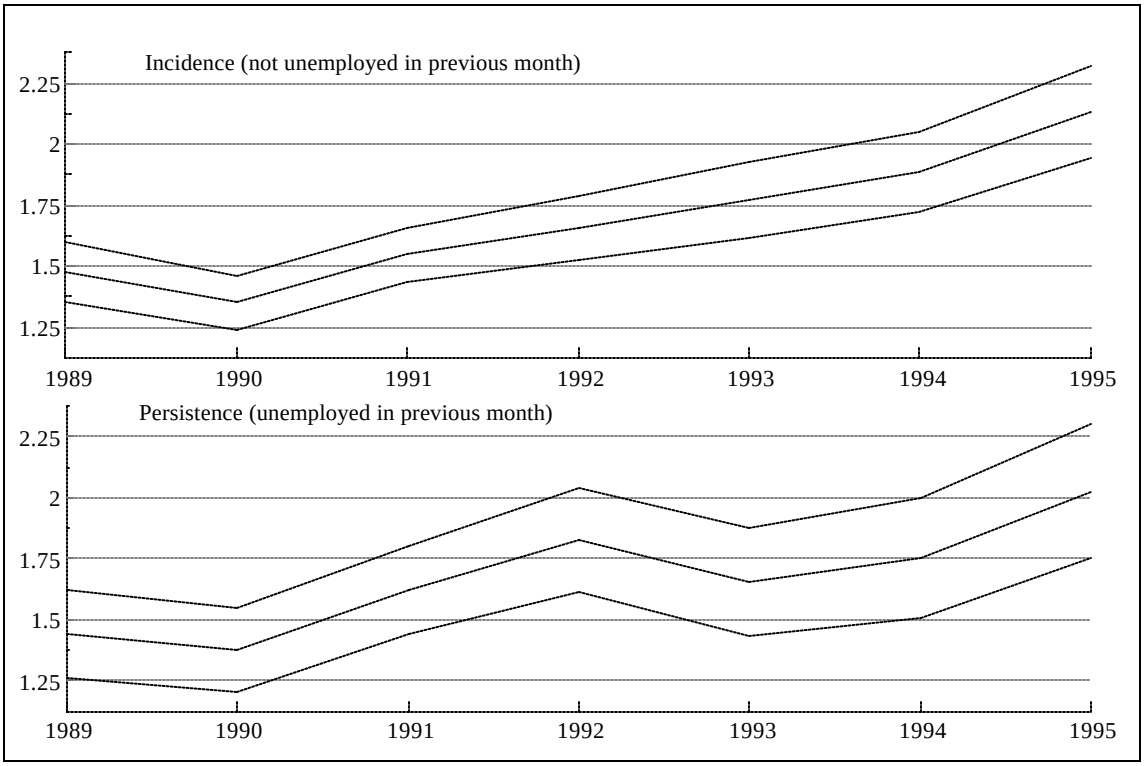

Figure 4. Estimates of relative unemployment probabilities for low (k=2) versus medium (k=4) ability workers (with 95 per cent confidence intervals), depending on unemployment status in previous month.

It is well known that the identification of incidence- and persistence effects may depend rather heavily on the distributional assumptions embedded in the random effects model. Hence, in order to assess the robustness by which incidence- and persistence effects are disentangled, we also estimated the model without distributional assumptions about unobserved heterogeneity, with the aid of conditional (fixed effect) logit-model (McFadden, 1974). This model uses $\bar{d}_{iy} = \sum_t d_{iyt}$ as a sufficient statistic, allowing all time-invariant factors, including a_{it}, to be conditioned out of the likelihood, i.e.

$$P\left[\mathbf{d}_{iy} \mid x_{iy}, \bar{d}_{iy}\right] = \frac{\exp\left(\sum_{t=1}^{24} d_{iyt}\left((l_y + g_{ky} - d_{ky})d_{iy(t-1)} + j_y u_{yt}\right)\right)}{\sum_{s_{iy}\in S_{iy}} \exp\left(\sum_{t=1}^{24} s_{iyt}\left((l_y + g_{ky} - d_{ky})d_{iy(t-1)} + j_y u_{yt}\right)\right)}, \qquad (5)$$

where s_{iyt} is equal to zero or one and S_{iy} is the set of all possible combinations such that $\sum_t s_{iyt} = \bar{d}_{iy}$. The model (5) can of course only be used to estimate the parameters attached to time-varying covariates, and only persons with at least some unemployment exposure (but not unemployed all the time) contribute to the likelihood. The results are provided in table 3.

Table 3.
Selected Maximum Likelihood Estimates from the Fixed Effects Model
(Standard Errors in Parentheses)

	1989	1990	1991	1992	1993	1994	1995
The relative effects of incidence and persistence							
Reference group (l_y)	3.031	3.036	3.066	3.048	3.099	2.997	2.878
	(0.026)	(0.025)	(0.024)	(0.026)	(0.030)	(0.032)	(0.033)
High ability (g_{1y}-d_{1y})	0.045	0.054	0.010	0.071	0.0266	-0.031	-0.028
	(0.035)	(0.034)	(0.032)	(0.033)	(0.038)	(0.040)	(0.043)
Medium lower ability	0.069	-0.014	-0.043	-0.030	0.032	0.045	0.148
(g_{3y}-d_{3y})	(0.037)	(0.035)	(0.033)	(0.035)	(0.042)	(0.043)	(0.044)
Low ability (g_{4y}-d_{4y})	0.073	0.075	0.129	0.150	0.103	0.137	0.192
	(0.044)	(0.043)	(0.040)	(0.041)	(0.047)	(0.048)	(0.049)
Number of observations	275712	302856	332472	291960	226704	219912	200928

The first thing to note is that the Fixed Effects model yields lower estimates of the state dependence effects in general, hence it implicitly attributes even more of the individual variation to unobserved heterogeneity. Despite that, it produces results indicating that persistence plays a slightly more important role in explaining changes in relative unemployment rates among ability groups than suggested by the Random Effects estimates.

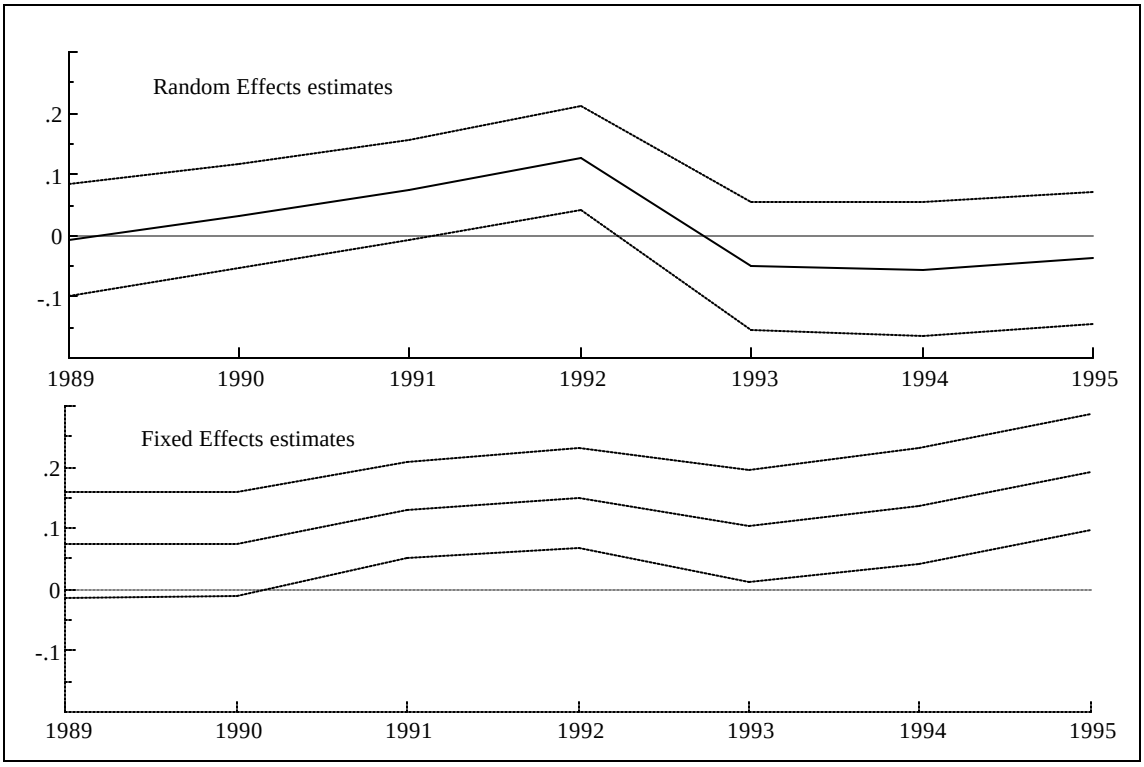

Figure 5. Estimates of 'persistence-minus-incidence' low-ability-effects $(g_{4y} - d_{4y})$ according to the Random- and Fixed Effects estimates (with 95 per cent confidence intervals).

Figure 5 depicts the estimated difference in the effects associated with belonging to the low ability group (k=4) between persons that was unemployed in the previous month and persons that was not $(g_{4y} - d_{4y})$, according to the Random- and Fixed Effects models. While the Random Effects model reports no significant differences and no trend over time, the Fixed Effects model reports significant differences

by the end of the estimation period and (perhaps) a weak trend over time in terms of stronger persistence effects.

So far, we have assumed that the low ability effects are the same across different formal skill groups. This assumption may be violated if the degree of wage compression, or the employment consequences associated with it, varies according to educational attainment. In order to investigate this possibility, we re-estimated the Random Effects model with separate low-ability coefficients (d_{y4}, g_{y4}) for four different educational groups. Group A consists of workers with only compulsory education, group B of workers with a lower secondary education, group C of workers with upper secondary education (general subjects) and group D of workers with higher education than that. Given that the previous estimates did not reveal substantial differences between the low ability effects associated with incidence and persistence, we restricted these coefficients to be equal, i.e. $d_{4y}^{S} = g_{4y}^{S}, S = A, B, C, D$. Figure 6 reports the estimated unemployment probabilities for low (*k=4*) relative to medium ability (*k=2)* 'mean' workers for the four different educational groups. There are two important points to note. The first is that the effect associated with being a low ability worker according to our incomes based measure is larger the higher is the formal education. A possible interpretation of this result is that the dispersion of individual productivities is higher at higher educational levels, hence wage compression has more detrimental effects on employment prospects for the least productive. The second point to note is that the relative unemployment rates for low ability workers seems to have trended upwards within all educational groups. Hence, the forces that drive the gradual deterioration of employment prospects for low ability workers are more or less the same in all formal skill groups.

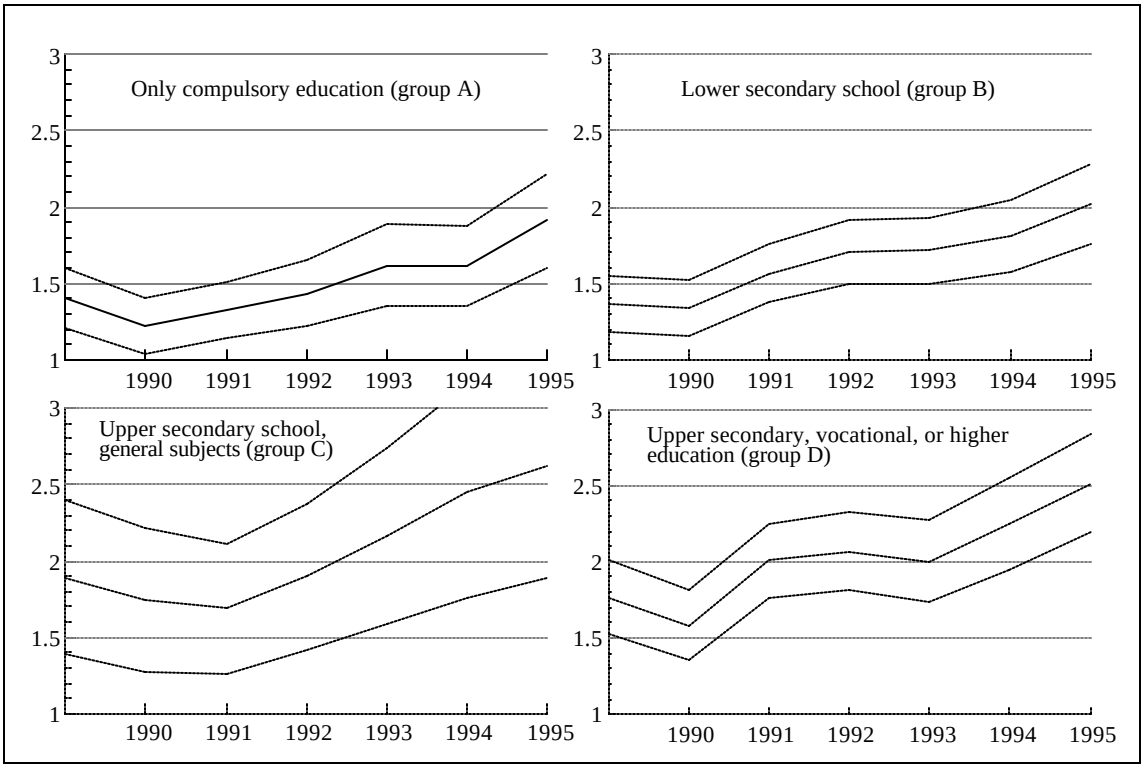

Figure 6. Estimated relative unemployment rates for low (k=4) vs. medium (k=2) ability 'mean' workers (with 95 per cent confidence intervals).

4 Concluding Remarks

The paper uses two alternative notions of 'low skills' or 'low ability' in order to account for changes in unemployment propensity for prime aged men in Norway during the 1990's; i) low education, and ii) low previous earnings, *conditioned on education and work experience*. According to the education based measure, we find that unemployment has *not* developed disproportionately for the low-skilled. The ratios of education specific unemployment propensities have not changed significantly. According to the earnings based ability measure, there has been a steady and significant deterioration of employment prospects for the low-skilled. The ratio of low- to medium ability unemployment propensity has risen from around 1.50 to 2.25. The rise is attributed to higher relative unemployment incidence as well as higher relative unemployment persistence. It has affected low ability workers within all formal (education based)

skill groups. The results suggest that if skill biased technical change, combined with rigid relative wages, is a part of the current European unemployment problem, the crucial factor is the *within-educational-group* relationship between the individual productivity level and the individual wage level.

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