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Inside this issue: John Kay — Is Intellectual Property right?

less social mobility

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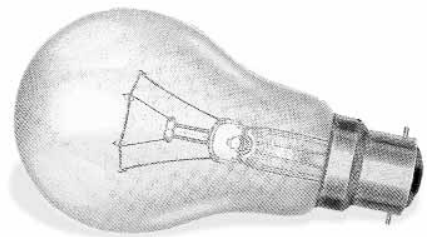

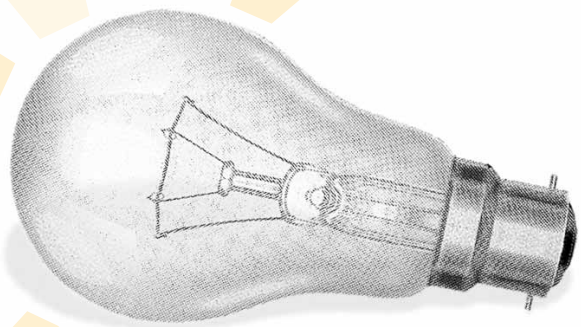


reject
accept

by Sian Moore and Stephen Wood

In place of strife

New Labour honoured a pre-election pledge to the trade unions when it introduced a statutory union recognition procedure in 2000. Sian Moore and Stephen Wood assess how it has fared in its first two years.

In the foreword to the 1998 White Paper "Fairness at Work", Tony Blair described statutory union recognition as part of the lasting industrial relations settlement that he wanted to achieve in his first Parliament, a settlement designed to maintain and extend peaceful employment relations. He stressed, though, that unions and employers should find voluntary solutions to their problems over union representation and that the statutory recognition procedure should only be used as a long stop.

Nonetheless, a new legal procedure was introduced in June 2000 to deal with cases where a recognition dispute cannot be settled voluntarily and the Conciliation and Arbitration Committee (CAC) was charged with handling it. Labour's declared aim was to provide a right for union recognition where a majority of the workforce wants it. The core features of the statutory procedure reflect this.

Its essential feature, in comparison with the two past statutory systems, is the specification of unambiguous criteria for the acceptance of applications and the subsequent granting of recognition. The CAC can only accept an application from a union to establish a bargaining unit:

- in companies with 21 or more employees;
- where at least 10% of the employees are union members;
- providing there is not already a collective agreement covering some or all employees;
- if it is satisfied that a majority of employees are likely to be in favour of recognition.

Once an application is accepted and the bargaining unit settled, if the majority in it are union members, the CAC may declare the union recognised. If less than a majority are union members, it must order a ballot in which the union has to secure a majority of those voting and 40% of those balloted. Even where 50% or more of employees are union members, the CAC must decide whether certain conditions have been met before it can grant recognition without a ballot, one of which is whether this would be "in the interests of good industrial relations".

The CAC is also empowered to make judgements on the appropriateness of the bargaining unit. If the union and employer are not agreed on the bargaining unit by the time the application has been accepted, then the CAC must

The number of applications has not been large

decide if the union's proposed unit meets certain criteria. The most significant of these is that it is "compatible with effective management". If it is not, then the CAC determines an alternative bargaining unit.

After two years it is still too early to judge the full effects of the legislation. First, the number of applications has not been large – 176 in the first 22 months. However, 24 of these were withdrawn and then resubmitted. Thus there have only been 152 distinct cases. Second, it is too soon to assess the nature of collective bargaining emerging from statutory recognition, or the effectiveness of the procedure's enforcement mechanisms. But there have been sufficient cases to give some indication of how the CAC is exercising its discretionary power and for us to speculate whether the legislation is helping to reverse the decline in union membership experienced since the early 1980s.

The CAC has so far decided on the acceptability of 102 applications. Only eleven of these have been deemed not to have met the criteria for acceptability: seven because the CAC gauged that a majority of the proposed bargaining unit was not likely to favour recognition; three because collective bargaining agreements already existed; and one because the employer had less than 21 employees.

The CAC has not settled on a rigid rule, such as a given level of current union membership, for deciding whether support for collective bargaining is likely. An application where membership was as low as 16% has been accepted, while one with 36% has been rejected. Our analysis of the cases so far does, however, suggest that, unless other really convincing evidence is provided, applications are only likely to be accepted when a union has at least 35% membership in the bargaining unit. Such evidence is usually in the form of a petition or letters of support. The CAC will also take into account a union's difficulties in securing access to workers in the workplace. For example, in the case of a television company, MTV, the CAC accepted an application from the Broadcasting, Entertainment, Cinematograph and Theatre Union (BECTU) on the basis of 19% membership and a petition in support of recognition signed by 55 of those in a bargaining unit of 119 (46%). The CAC stated that it understood that the union had conducted its petition outside company premises and was unlikely to have had access to all workers in the bargaining unit.

The CAC has ruled on the appropriateness of a bargaining unit in 31 cases. It has supported the union's proposed unit in 21 of these and a variation of the union's proposed unit in two. It has upheld employer objections in six and determined a different bargaining unit in two. In the case of 18 out of the 19 single-site companies before the CAC, the employer has argued for a "whole company" approach, including all the key occupations. In all but one of these cases, the CAC has resisted this argument on the basis that it has been demonstrated that the terms and conditions of the occupational group proposed are distinctive. The exception was the Staffordshire Sentinel newspaper, where the CAC decided that all editorial staff, and not just journalists, should be included in the National Union of Journalists' claim. In two multi-site companies, the employers successfully argued that all key occupations should be included. In one of these, the Essex Chronicle group, the CAC again determined that the bargaining unit should comprise all editorial staff and not just journalists.

In six out of eight multi-site company cases before it, the CAC has ruled that the bargaining unit should embrace workers sharing the same distinct terms and conditions on all sites in the organisation. In the case of Ryanair this ruling was in line with the union's proposed bargaining unit. However, in the other five cases the union's proposed bargaining unit was based on one site and it could not demonstrate sufficient support for recognition amongst the workers on the other sites subsequently included in the bargaining unit. In two of these cases – Hygena and DHL (Aviation) – following the redefinition of the bargaining unit the CAC ruled that the application was no longer valid on the grounds that there would not be sufficient support for recognition in the "new", larger bargaining unit. In another two – Getty Images and Maxims Casino – the union withdrew the case immediately after the CAC's decision, in the knowledge that it lacked the required support. In one case – Seabrook Crisps – the union did not withdraw and a ballot was lost.

There are two exceptions to the general trend of the CAC's rulings. In the case of Daryl Industries, the CAC backed the union and included only one of three sites because the company already had separate Works Councils for each site. And, in the case of Kwik-Fit, the CAC allowed the

Applications are only likely to be accepted when a union has at least 35% membership in the bargaining unit – unless additional evidence of support for recognition is provided

union's proposed bargaining unit, based upon the London region only.

There have been 20 submissions where the union has had more than 50% membership and the CAC has thus had to decide whether to ballot the bargaining unit. So far, recognition without a ballot has been awarded by the CAC in 12 of these cases. In one of the eight cases where a ballot was ordered – where the application at the UK branch of Turkiye Is Bankasi involved 17 union members out of a bargaining unit of 21 – three members of the union wrote to the CAC stating they did not want the union to conduct collective bargaining on their behalf. The union submitted that these employees had done this under pressure from the employer. Nonetheless the CAC was bound to call a ballot, as one of the qualifying conditions is that a significant number of union members do not wish to have collective bargaining conducted on their behalf. In the cases of Huntleigh Healthcare and Unipart DCM Jaguar, the CAC determined there should be ballots because, in the first instance, membership had been recruited on the basis of no subscriptions and, in the second, on the basis of reduced subscription rates outside of the union's rules. In the case of Red Letter, the CAC invoked the "in-the-interests-of-good-industrial-relations" criteria, as it was aware that relations between the parties had not been particularly harmonious and judged that a ballot would "resolve any uncertainty and clear the air". This contrasts with the case of Fullarton Computer Industries, where over 50.3% of the bargaining unit were union members. Here the panel stated that "in this case the holding of a formal ballot, with each side campaigning for employee support for its position, would be likely to engender further antagonism and divisiveness detrimental to developing good industrial relations".

Of the 33 ballots ordered by the CAC, unions have lost eight out of the 29 of those where the outcome is known to us. In seven of the lost ballots the proportion of workers in favour of recognition was lower than the proportion of members at the time of the application. This also happened in one case where the union was victorious. Such outcomes may reflect labour turnover in the bargaining unit, or the ineffectiveness of the union campaign. Yet our research has revealed evidence that in some cases they reflect employer hostility during the ballot or even intimidatory behaviour beforehand. For example, in the Turkiye Is Bankasi case, where only three employees had indicated to the CAC that they did not want collective bargaining, only 35% voted in favour of the union, despite a union membership level when the application was made of 80%

There have been four applications for judicial review of CAC decisions. The issues these concerned are: the confidentiality of union membership data (Essex Chronicle Series); the determination of the bargaining unit (Kwik-Fit); the impact on ballot results of recruitment into the bargaining unit after the submission of an application (Ryanair); and the decision to grant recognition without a ballot and the delegation of membership checks to the case manager (both in Fullarton Computer Industries). With the Essex Chronicle, the application was withdrawn and with Ryanair the applicant was not granted a hearing. In the first case to have been heard (Fullarton Computer Industries), CAC procedures were upheld; in the second (Kwik-Fit), they were not, but this decision was overturned on appeal. In the Fullarton case, the employer challenged the reasoning behind the panel's decision not to hold a ballot. The judge concluded that the panel's discretion had not been exercised in an irrational or flawed way, although he did suggest that a ballot might have been appropriate in the circumstances, but stressed this was a personal view.

At the end of the CAC's first 22 months, 110 cases had been dealt with and 40 are live as we write. Of the cases for which we have information, recognition was granted through the procedure in 33 cases (30% of those completed). In addition, 41 applications have been withdrawn at some stage, because the employer and union had come to or were discussing a voluntary agreement. This means that 74 (67%) of cases that have passing through the CAC procedure have resulted in recognition or discussions on recognition; and 27% of the cases are known not to have resulted in recognition. (The outcome of the remaining 5% of cases is currently not known to us.)

The number of cases processed is slightly fewer than the number of cases that the Advisory, Conciliation and Arbitration Service (ACAS) investigated in the first two years of the procedure that it operated in the 1970s, the last time there was a statutory recognition system. But the number of applications is considerably fewer, as under

Nearly half of the successful cases have been in manufacturing

ACAS unions were able to put in applications without having any members. The Association of Scientific, Managerial and Technical Staff (ASTMS) was particularly prone to do this as a first move in a recognition campaign.

The proposed bargaining units in applications thus far have been relatively small, a median of 87 employees, with 41% having over 100 workers, 29% fewer than 50 and only 17% having over 250. CAC rulings on bargaining units suggest that unions are more likely to succeed at this stage in single-site companies, or by limiting bargaining units to narrow groups of workers with distinctive terms and conditions. Faced with the difficulty of recruiting sufficient members in large, multi-site organisations, unions may be encouraged by the legislation to approach employers at national level for a voluntary agreement.

The direct impact of the CAC procedure is limited. The cases where it has granted recognition cover under 10,000 workers. And 4,000 of these are accounted for by the AEEU's successful recognition ballot at Honda at Swindon. In addition, the 22 semi-voluntary cases where we have been able to acquire figures represent around 5,000 workers.

Moreover, the CAC cases so far have been concentrated in a limited number of industrial sectors and those in which unions have historically had a presence. Nearly half of both applications and the successful cases have been in manufacturing, with around 10% each in transport, print, newspapers and finance.

However, unions have not just relied on the statutory procedure. The voluntary route to recognition, the only means available for the 20 years from 1980 to 2000, has been increasingly successful in achieving results. The TUC recorded 450 new voluntary agreements signed between November 2000 and October 2001, representing nearly three times those achieved for the previous 12 months and covering an estimated 120,000 workers. Similarly, ACAS has experienced a significant increase in requests for collective conciliation assistance over recognition, both prior to the introduction of the statutory procedure and subsequently.

For the first ten year's of ACAS's life (1975-1985), the annual number of cases was consistently over 200 (the highest figure being 697 in 1976), but this dropped steadily to a low point of 93 in 1994. The figure returned to over 200 in 2000 for the first time since 1985. As a proportion of the conciliation workload of ACAS, it reached nearly 18%, the highest figure since the 1970s. Even more significantly, full recognition was agreed in a record 65% of the cases. This trend in voluntary recognition suggests that the procedure is having an indirect effect and that its shadow is influencing unions and employers to reach agreements when they might otherwise not have done.

The limited number of CAC applications reflects a combination of factors. First, the design of the statutory procedure has prescribed which cases are likely to be accepted and to meet the thresholds required for recognition. Second, when the procedure came on stream there were very few ready-made cases that could be submitted to the CAC. This is confirmed by a survey of private sector workplaces with 50 or more employees that we conducted in August 2000. This showed, on the one hand, that there were many workplaces (90%) either with no union recognition or where groups of workers were not covered by recognition for collective bargaining. On the other hand, it showed that in only just under a third of these workplaces were there any union members. In fewer than 10% of workplaces was there 10% or more union membership – the minimum required for acceptance by the CAC – and only a tiny minority of these had more than 50% membership, or anything like the sort of level that the CAC would require to demonstrate majority support for recognition.

Third, the unions have carefully managed their use of the procedure. In line with the commitment to using the legislation as a last resort made by the TUC in its joint statement with the CBI before it came in, the majority of unions that we surveyed in early 2001 reported that they would, in the first instance, aim to achieve voluntary recognition through majority membership. In addition, unions were concerned that cases submitted to the CAC should not be lost, so they aimed to submit cases that they were confident would secure automatic recognition or win a ballot. Consistent with this, in 50% of the CAC applications that have been decided unions had at least 50% membership (and in 80% the membership was at least 35% of the proposed bargaining unit). Centralised internal procedures were

established in the majority of unions to control the flow of cases to the CAC and most TUC-affiliated unions allowed the TUC an advisory role in the submission of applications.

Taken together, these factors suggest that unions will have to substantially intensify their recruitment efforts to significantly extend union recognition, either through the legislation or under the threat of its use. Our workplace survey showed that employers are unlikely to initiate union recognition discussions. When they do, it will be where union membership is approaching the proportion where a CAC case could be won and/or to exclude a particular union in favour of another. This latter kind of behaviour is illustrated by one CAC case where the ISTC put in a claim for recognition at Bausch and Lomb, only to have it rejected on the grounds that there was already a recognition agreement in place – an agreement with an independent union that had in fact only been reached two days before the application.

The legislation has been designed to ensure that employers both co-operate with the CAC (as all were not prepared to do with ACAS in the 1970s) and reach agreements with the union involved once it has been awarded a recognition order by the CAC. It also guarantees that access to the workforce is given to the union during a ballot. But it does not prevent employers from placing undue pressure upon employees when a case is in the pipeline or from victimising activists. Neither does the procedure allow the union access to the workforce or workplace outside the ballot period.

Yet the results of our survey revealed that the aim of the vast majority of unions is to gain significant numbers of members, rather than to seek voluntary recognition regardless of the level of union membership. The largest unions are putting more resources into organising and we found that unions for whom new recognitions are important are indeed taking a systematic approach. The legislation has played a role in this, as the unions have a greater confidence that there will be a return on any investment they make in recruitment and organising.

The CAC system is the third such statutory recognition procedure to have been tried in the UK. The first, introduced by the 1971 Industrial Relations Act, was largely ineffective as the unions did not register as intended. The second (ACAS) ultimately became inoperable because rulings in key judicial reviews meant that ACAS concluded that it could not operate the procedure properly. The prospects for the survival of this third attempt look more promising. Judicial reviews have not as yet threatened its operation. Its key design features, the way the CAC has worked it so far and the unions' approach all bode well for its future. The success rate of CAC applications suggests that in most cases recognition is being granted where the majority of the workforce is in the union. Yet the number of ballots that have been lost despite majority union membership means that this outcome is not inevitable and indicates that employer resistance may be playing a role.

But the implication of our research on the procedure's first two years is that its direct effects are likely to be marginal. Its shadow effect, the signing of voluntary agreements, looks like being greater. This suggests that the statutory route can, paradoxically, support or even enhance what remains of the "voluntary" tradition of UK industrial relations. Yet the scale of the task facing unions in reversing membership decline remains great, regardless of employer opposition, and will involve their organising well beyond their conventional terrains.

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Stephen Wood is Research Chair of the Institute for Work Psychology at the University of Sheffield and a Research Associate of the CEP.

Further reading

Wood, S., Moore, S. and Willman, P. (2002), "*Third Time lucky for statutory union recognition in the UK?*", available from the CEP (Working Paper No. 1189). A version of the Working Paper will appear in the Industrial Relations Journal, August 2002.

Stephen Wood and Paul Davies, "*A sword of Damocles: New Labour and statutory recognition*", CentrePiece Summer 2000.

Both authors are members of the CEP's Leverhulme Future of Trade Unionism in Modern Britain research programme. The research they report is financed by the Leverhulme Trust.

by Jo Blanden

Mobility has fallen

Jo Blanden looks at the evidence showing that social and economic mobility in Britain fell significantly in the last decades of the 20th century and estimates the part that the expansion of higher education may have played in this process.

Most people probably think that rising living standards and wider educational opportunity in the UK have increased the opportunities available to young people from all backgrounds. But how equally distributed have these opportunities been? To what extent has family background been a factor in determining who has benefited most? And has the influence of family background in this respect altered over time?

To attempt an answer to these questions, we looked at information from two very rich British cohort datasets on all people born in one week in 1958 and one week in 1970. The information recorded includes family circumstances and educational achievement during childhood and adolescence; and data on employment and wages in later life. In 2000 the first full survey was conducted of the 1970 cohort as adults, making possible, for the first time, comparisons across the full social range between people who grew up in the different environments of the 1970s and the 1980s.

Two reasons in particular make these interesting years for comparison. First, it was a period when income inequality was growing rapidly, resulting in a dramatic rise in the number of children growing up in poverty. In the groups we are analysing here, those living at or below the poverty level at age 16 rose from 6% of those born in 1958 to 10% of those born in 1970 (see Table 1). Second, the 1970 group entered their teens just as the rapid expansion of the higher education system began. In 1980, 13% of young people entered higher education, rising by 1990 to 19% and by 2000 to 31%.

Our finding is that economic mobility between generations fell significantly between 1958 and 2000. The income levels achieved by the group born in 1970 were determined to a significantly higher extent by the income levels of their parents than was the case for those born in 1958.

Let us look at the figures. The data for parental income comes from the surveys done when our groups were 16 (i.e. in 1974 for those born in 1958 and in 1986 for those born in 1970). For the groups' earnings when adults, we took the data from the National Child Development Survey

Those living in poverty at age 16 rose from 6% of those born in 1958 to 10% of those born in 1970

Table 1 Descriptive statistics

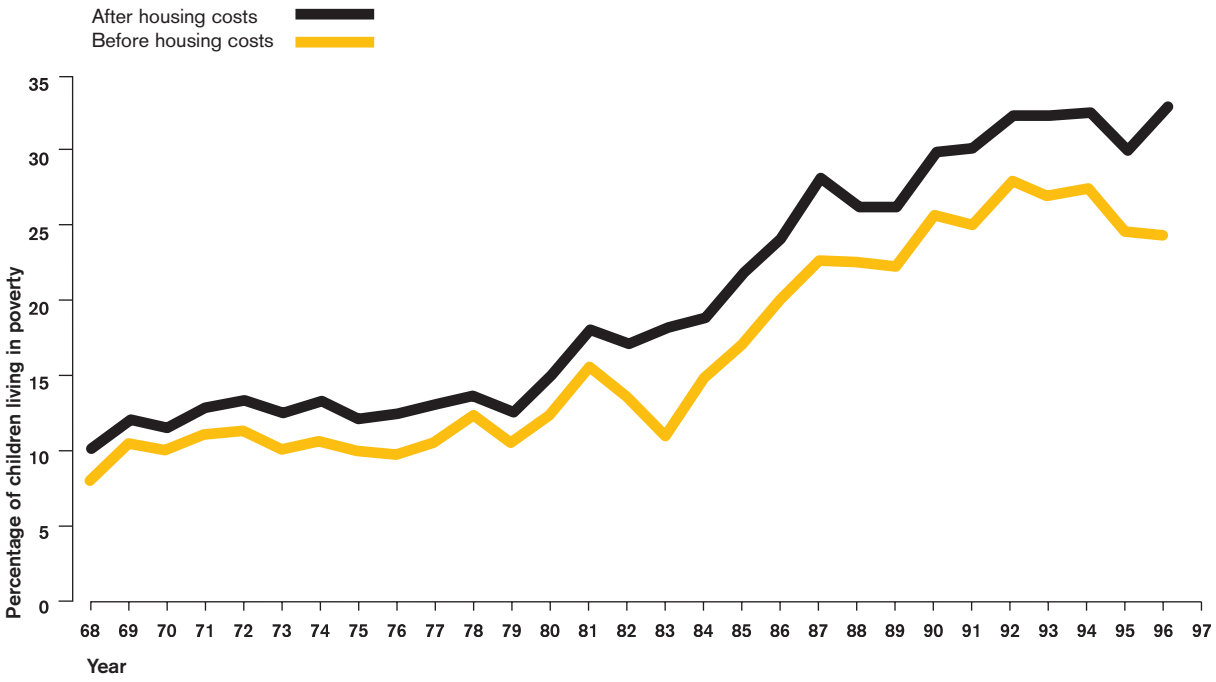
	1958 Males	1970 Males	1958 Females	1970 Females
Weekly wage £	312.28	330.77	161.35	222.26
(NCDS Age 33; BCS Age 30)	(168.04)	(229.01)	(112.85)	(173.69)
Family income £	384.29	437.17	383.29	430.70
(NCDS Age 33; BCS Age 30)	(201.38)	(323.06)	(248.70)	(300.54)
Parental income £	306.40	309.75	305.48	309.79
(Age 16)	(124.41)	(152.03)	(134.19)	(148.19)
Proportion below poverty line (Age 16)	.06	.11	.07	.09
Proportion with degree	.17	.26	.14	.26
Sample size	2503	1969	2148	1916

Notes:
1. Standard deviations in parentheses for wage and income measures.
2. Wage and income in January 2001 prices.
3. The sample sizes are as in the Table for all variables except for family income where they are: NCDS males 2348; BCS males 1930; NCDS Females 2438; BCS Females 2170.

for the 1958 cohort at age 33 and from the British Cohort Survey for the 1970 cohort at age 30. Given that these surveys are only done at certain points in time, we have restricted our sample to those who were in work when they were taken. But we also have information on the earnings of any partner in employment at that point, so we can measure the "family" income of the members of our two groups and can make comparisons of like with like across generations.

Table 1 gives a summary for our two samples. It draws out some of the key changes: family income inequality grew (as measured by the standard deviations); child poverty increased; the proportion of graduates rose, especially for daughters (as is also shown in Figure 1) where the proportion of those with degrees almost doubled in 12 years from 14% to 26%.

Figure 1 Rise in child poverty



Source: Gregg, Harkness and Machin (1999) 'Poor Kids: Child Poverty in Britain, 1966-96' Fiscal Studies, 20, pp. 163-187

Table 2: Regression estimates of the intergenerational mobility parameter

Earnings Regressions	Regression ß		ß Adjusted For Changes in Inequality		Change in Adjusted ß	Sample Size
	NCDS	BCS	NCDS	BCS		
Sons	.098	.222	.120	.246	.126	NCDS: 2503
	(.017)	(.022)	(.020)	(.025)	(.032)	BCS: 1969
Daughters	.169	.293	.117	.217	.100	NCDS: 2148
	(.030)	(.031)	(.021)	(.023)	(.031)	BCS: 1916

Family Income Regressions	Regression ß		ß Adjusted For Changes in Inequality		Change in Adjusted ß	Sample Size
	NCDS	BCS	NCDS	BCS		
Sons	.089	.272	.089	.252	.163	NCDS: 2348
	(.021)	(.025)	(.021)	(.023)	(.032)	BCS: 1930
Daughters	.120	.288	.095	.218	.123	NCDS: 2428
	(.025)	(.028)	(.020)	(.022)	(.029)	BCS: 2170

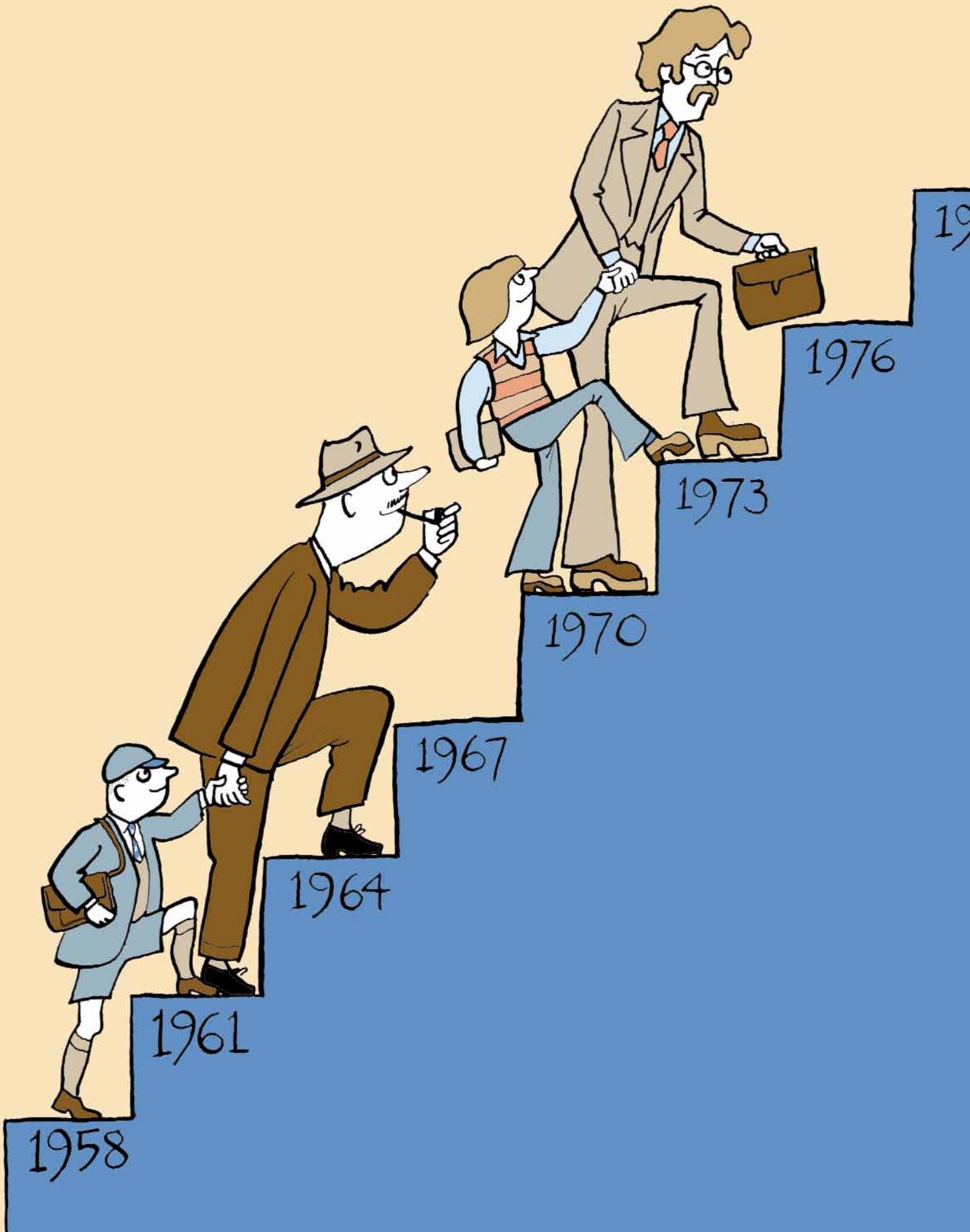
Notes:
All regressions control for parents' average age and age-squared, as these may be linked to income through earnings growth and also to how well the child does.

We used two approaches to measuring the intergenerational links. The first was a statistical regression approach that provides us with a measure of how much more income we would expect the son of one family to have, compared with the son of a family with double the income. A regression coefficient here of .3 would imply that the son of a family with income £20,000 would earn 30% more than son of a family with an income of £10,000. The smaller this estimated coefficient, the weaker the link between the income of parents and their children and thus the greater the social mobility. Our second approach was to divide the data on family income and children's subsequent wages as adults into quartiles. We then compare quartiles across the generations to obtain the probability of children ending up in each quartile, given where they started.

We use the regression approach to measure the link between the income of our groups' parents and both son's and daughter's weekly earnings and for the weekly earnings of the cohort member and any partner. As one of our concerns here is the potential effects of the increases in income inequality on mobility, we also produce an estimate of mobility that accounts for the rises in inequality across both generations. (For a detailed account of the calculation of this estimate, see Blanden, Goodman, Gregg and Machin, "Changes in Intergenerational Mobility in Britain", Discussion Paper No. 517.)

In every case, the estimates of the association between parental income and their children's subsequent wages are higher for the second group than for the first, indicating that economic mobility has fallen. There are technical reasons for believing that the actual estimates within each cohort are understated, but our research indicates that the estimate of the change between cohorts is accurate. For sons, the regression coefficient rises from .098 to .222. Even when adjustments are made for inequality, the change is similar (.126 compared with .124). Using the previous example again, a son born in 1958 from a family earning £20,000 would in his early 30s be earning 12% more than a son born the same year from a family earning £10,000. But, for comparable sons born in 1970, the difference would be 22%. Results for daughters' earnings and for the family earnings of both sons and daughters show changes of similar size.

The association between parental income and their children's subsequent wages is higher for the second group


1958
1961
1964
1967
1970
1973
1976

One of the most obvious transmission mechanisms is education

Table 3 Transition matrices for sons

1958 cohort	Sons' earnings quartile			
Parental income quartile	**Bottom**	**2nd**	**3rd**	**Top**
Bottom	.30	.28	.23	.19
2nd	.29	.25	.24	.22
3rd	.25	.26	.25	.24
Top	.17	.20	.29	.34

1970 cohort	Sons' earnings quartile			
Parental income quartile	**Bottom**	**2nd**	**3rd**	**Top**
Bottom	.38	.25	.22	.15
2nd	.30	.29	.22	.19
3rd	.19	.29	.27	.25
Top	.13	.16	.28	.43

The regression results only give a picture of changes in average mobility. We can get a more detailed picture from the transition matrices. Those for sons' earnings and parental income for the 1958 and 1970 groups are given below. (The matrices for daughters can be found in the Discussion Paper No. 517.)

Table 3 contains some interesting points. First, it is clear that there is less mobility at the top of the parental earnings distribution than there is at the bottom. In the 1958 group, 34% of those whose parents were in the top quarter of the distribution remained there, compared with 30% of those in the bottom quartile. This suggests that parents have some substantial means of ensuring the maintenance of the position of the next generation.

When it comes to changes over time, the transition matrices show the same trend as the regression results. In all cases, a higher proportion of sons born in 1970 remain within the same part of the income distribution as their parents and, for the second group, there are less extreme movements between generations. The results of the transitions matrices can be summarised by adding together the values of the cells in the diagonals and those adjacent to them. This "immobility index" also shows a sharp rise. For the 1958 cohort it is 2.74 and for the 1970 cohort it is 2.96.

So it is clear from these figures that economic mobility between generations has fallen in the UK in the last 40 years. The next step is to consider some reasons why. One of the most obvious mechanisms by which relative success and failure are transmitted between generations is education. We have already noted that there was a substantial increase in the opportunity for higher education for our second cohort. How far can differing educational achievements explain the reduction in mobility that we have observed?

A simple formal model can be used to think about how changes in intergenerational mobility can be influenced by changes in educational opportunities and returns. The basic idea is that parents' income affects children's educational attainments, which in turn influence earnings. With this model one can explain falling intergenerational mobility, because either: a) parental income has a greater impact on educational achievement; or b) educational attainment generates greater rewards in the labour market. The British evidence indicates that returns to education have, if anything, risen in the 1990s despite the rapid increase in educational attainment. In addition, we are currently looking in detail at changes in the impact of family income on education (Blanden, Gregg and Machin, forthcoming from CEP). Here, however, we just look at the combination of these two effects.

To explore this question, we added measures of educational attainment to the regression models. This demonstrates the effect of parental income on the child's earnings, if educational achievements were fixed, by taking out the effect of education as a transmisson mechanism. The difference between the falls in mobility measured in Table 2 and those in Table 4 are the part that can be explained by education.

It is clear from Table 4 that differences in educational achievements are partly responsible for the reduction in mobility. When the effect of education on subsequent earnings is removed from the figures, the fall in mobility for sons is reduced by 16 percentage points and for daughters by 27 percentage points. A similar analysis can be carried out using the transition matrix approach. This is done by subtracting the part of earnings that is explained by education and, then, dividing the children's earnings into quartiles as before. The resulting matrix then shows "mobility" with the effect of education netted out. Once again, the difference between this and the unconditional transition matrix shows the effect of education. Using this method we find that education explains around 30% of the change for both sons and daughters, as measured by the immobility index.

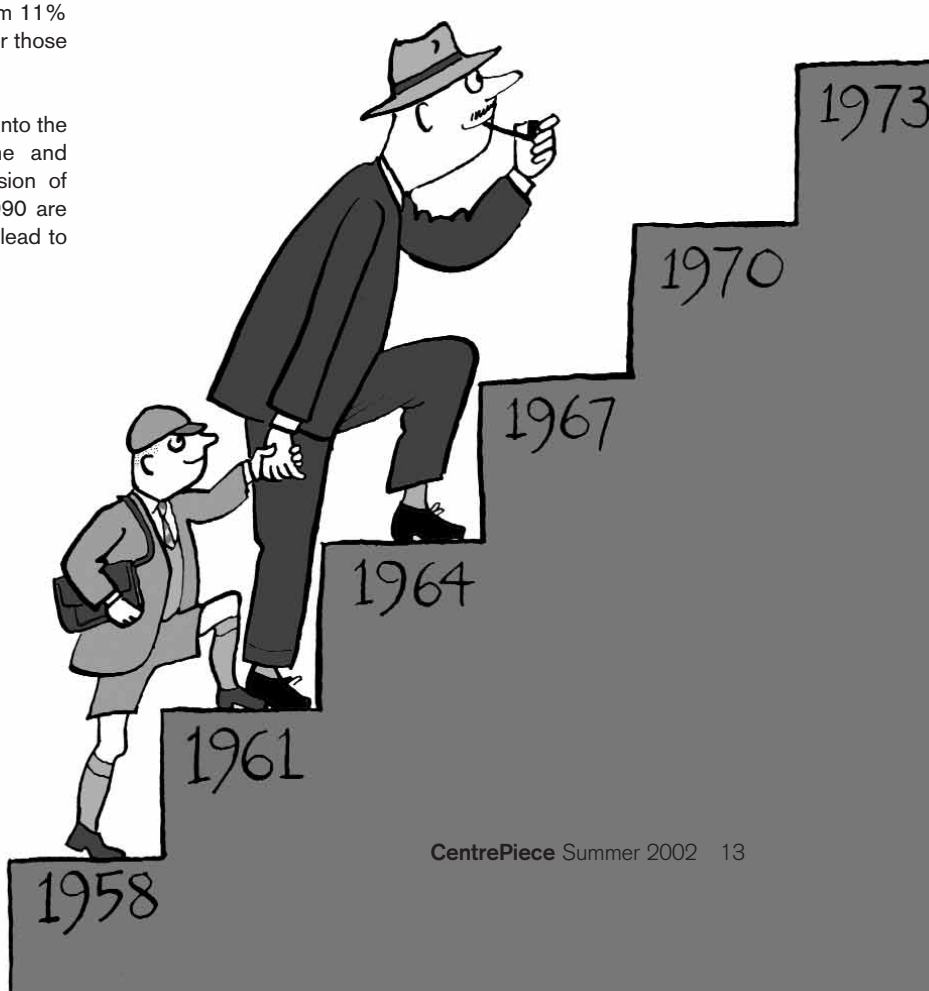
Table 4 Taking out the effect of cross-cohort differences in education

	Regression ß		ß Adjusted For Changes in Inequality		Change in Adjusted ß	Sample Size
	NCDS	BCS	NCDS	BCS		
Sons						
Table 2 upper panel	.098	.222	.120	.246	.126	NCDS: 2503
	(.017)	(.022)	(.020)	(.025)	(.032)	BCS: 1969
Plus son's education	.049	.149	.060	.166	.106	NCDS: 2503
	(.015)	(.022)	(.019)	(.025)	(.031)	BCS: 1969
Daughters						
Table 2 upper panel	.169	.293	.117	.217	.100	NCDS: 2148
	(.030)	(.031)	(.021)	(.023)	(.031)	BCS: 1916
Plus daughter's education	.057	.152	.040	.112	.073	NCDS: 2148
	(.027)	(.030)	(.019)	(.022)	(.029)	BCS: 1916

So, the UK education system played a role in the falling mobility between the cohorts. The implication of the results presented here is that those who took advantage of the expansion in university places came, in general, from higher social backgrounds. Evidence produced by the then Department for Education and Employment suggests that this trend continued beyond the time frame captured by our cohorts. Its 1998 report, "Higher Education for the 21st Century" said: "The increase in participation in the 1990s amongst socio-economic groups A to C has been double that among groups D and E". Its figures showed an increase in the participation rate of those from socio-economic groups D-E of five percentage points (from 11% to 16%) and an increase of ten percentage points for those from groups A-C from (from 26% to 36%).

This suggests that there should be further research into the changing relationships between parental income and education. The conclusions here from the expansion of higher education in the UK between 1975 and 1990 are that rising graduate numbers in themselves did not lead to an improvement in equality of opportunity.

Those who took advantage of university expansion came in general from higher social backgrounds



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"*Changes in Intergenerational Mobility in Britain*", by Jo Blanden, Alissa Goodman, Paul Gregg and Stephen Machin (Discussion Paper No. 517) is available from the CEP.

by Steve Machin

Upgrading the workers

Higher education levels have produced increased numbers of better qualified workers in the labour market, yet the differential between skilled and unskilled wages has risen at the same time. Stephen Machin examines the key aspects of rising labour market inequality, with particular reference to the way in which technological change has shifted the labour market in favour of skilled workers.

There have been dramatic changes in the structure of employment in the labour markets of many countries in recent years. A key aspect has been the increased demand of employers for workers with higher educational qualifications and skill levels.

Another dramatic change, certainly in the US and the UK in the 1980s, has been rapidly rising wage inequality. This coincided with the period of the most significant direct impact of the computer revolution on the labour market, namely the introduction of personal computers (PCs) on desks where there had been no computer before.

In the academic literature there has been much emphasis on the impact of the new technologies on employers' demand for skills. Some of this work uses evocative phrases like "the collapse in demand for the unskilled", "the deteriorating position of low skill workers" and "rapidly rising wage gaps between the skilled and unskilled", all of which are in line with the notion that large shifts have occurred.

Certainly, many more skilled workers are now in employment than in the past, both in absolute numbers and relative to their less skilled counterparts. Table 1 shows for the US and the UK between 1980 and 2000 the shares of employment and hours worked and the relative wages of employees with a degree as compared with non-degree holders. It confirms the rapid increases in the shares of relatively higher educated workers (graduates) that have occurred in both countries.

It is also interesting that, despite their increased numbers, the relative wages of more skilled workers have not fallen. In fact, the wage gap between graduates and non-graduates rose in both countries (though at a faster rate in the US) and widened faster in the 1980s than in the 1990s. The table shows that higher relative wages and higher levels of employment for graduates moved in tandem. This was true for both decades and for both countries, though the relative wages clearly increased by more in the 1980s than in the 1990s.

An intuitive way of thinking about this relative demand shift

Table 1 Aggregate Trends in Graduate/Non-Graduate Employment, Hours and Relative Wages, UK and US 1980-2000

UK Labour Force Survey/General Household Survey

	% Graduate share of employment	% Graduate share of hours	Relative weekly wage (full-timers)
1980	5.0	5.1	1.48
1985	9.8	10.5	1.50
1990	10.2	11.0	1.60
1995	14.0	15.4	1.60
2000	17.2	18.8	1.64

US Current Population Survey

	% Graduate share of employment	% Graduate share of hours	Relative hourly wage (full-timers)
1980	19.3	20.4	1.36
1985	22.0	23.6	1.47
1990	23.8	25.6	1.55
1995	25.5	28.1	1.61
2000	27.5	29.5	1.66

Sample is all people age 18-64 in work and earning (except for relative wages, which are for full-time workers). The relative wage ratios are derived from coefficient estimates on a graduate dummy variable in semi-log earnings equations controlling for age, age squared and gender. The UK employment and hours shares are from the LFS. The relative wage gaps are from the GHS for 1980, 1985 and 1990 and the LFS in 1995 and 2000 (relative wages for 1995, the overlap year, were very similar). They are weekly wages because the hours question in the GHS was changed in the 1980s. The CPS data is the Economic Policy Institute CPS ORG labor extracts data. I thank John Schmitt for making them available to me.

in favour of the skilled is in terms of an economic model where the wages and employment of skilled and unskilled workers are the outcomes of a race between supply and demand. The general implication is that both demand and supply curves are shifting and the question is which curve has moved the most. It would seem that, to have generated simultaneously higher wages and higher employment for the skilled, relative demand for the skilled must have increased by more than relative supply. Put alternatively, over the period of rising wage inequality, demand won the race and employers were prepared to raise the pay of workers with appropriate skills more than that for less skilled workers, despite the fact that many more skilled workers were in the labour market.

What might have caused this relative demand to increase more rapidly than relative supply? A large body of work has argued that the critical factor has been the introduction of new technologies that are biased in favour of skilled workers. This "skill-biased technology change" hypothesis is founded on the notion that employers' demand for more skilled workers has been shaped by the kinds of new technologies that are permeating modern workplaces. Such new technologies lead to higher productivity, but only some workers possess the necessary skills to use them. So employers are prepared to increase the wages of their skilled workforce. At the same time, less skilled workers, who cannot operate the new technologies, find their wages are lowered, or lose their jobs.

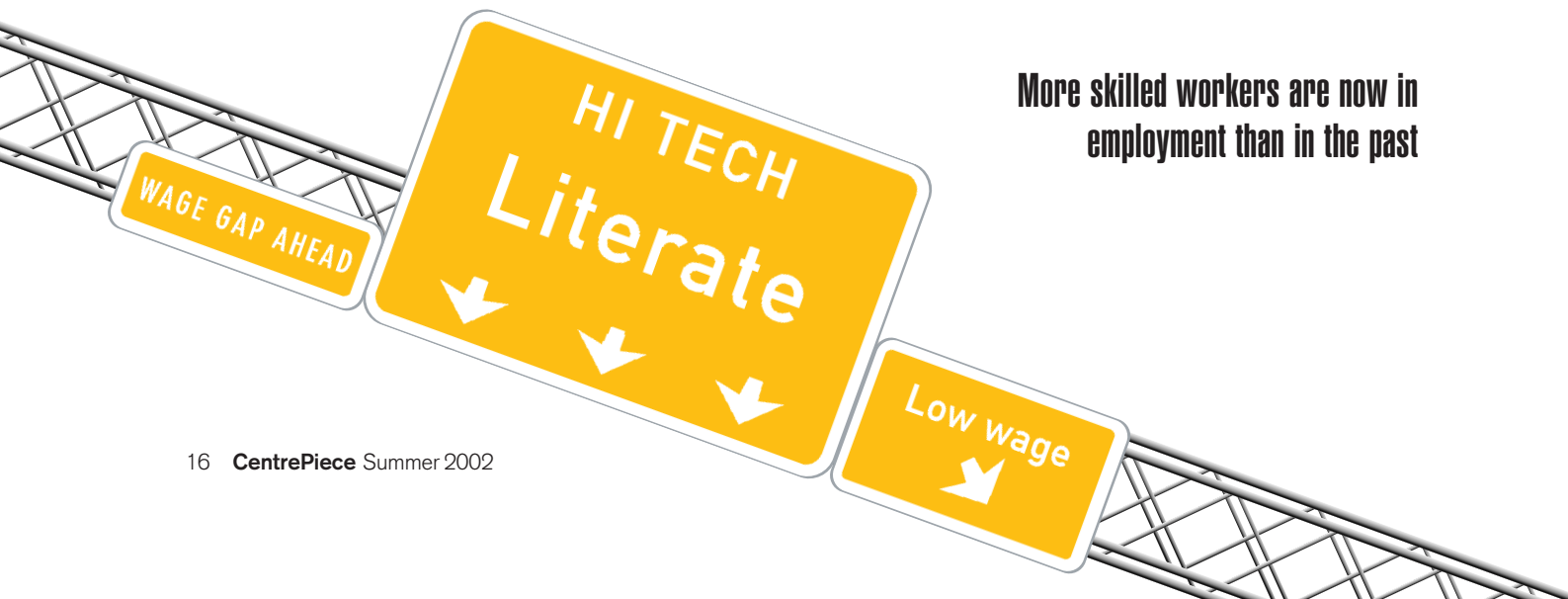
What evidence is there for this hypothesis? First, for the story to hold, shifts in skill demand must clearly be variable and that variability must be systematically related to the introduction of new technologies. Particular workplaces, firms or industries are likely to differ in the extent of their use of new technologies. So some indirect evidence on the hypothesis might come from looking at the shifts in relative demand within workplaces or firms or industries, rather than between them.

Table 2 Within/Between Decompositions of Skill Demand Changes

Study	Unit of Analysis	Time period	Skill Demand Measure	Annualised Change (Percentage Points)	Percent Within
Autor, Katz and Krueger (1998)	140 US industries	1990-96	College employment share	.300	87
			College wage bill share	.587	82
		1980-90	College employment share	.469	79
			College wage bill share	.878	70
		1970-80	College employment share	.586	79
			College wage bill share	.662	84
		1960-70	College employment share	.324	27
			College wage bill share	.511	45
Berman, Bound and Machin (1998)	450 US manufacturing industries	1979-87	Non production employment share	.552	70
			Non production wage bill share	.774	60
	360000 US manufacturing plants	1977-87	Non production employment share	.367	82
	100 UK manufacturing industries	1979-90	Non production employment share	.387	82
			Non production wage bill share	.669	83
	402 British workplaces	1984-90	Non production employment share	.41	83
Machin (1996)	402 British workplaces	1984-90	Managers employment share	.14	86
			Senior technical and professionals employment share	.19	95

Table 2 summarises the evidence from three studies for the UK and US at workplace and industry level. At both these levels of aggregation it is clear that the bulk of the observed wage and employment shifts in favour of the relatively skilled group occur within, rather than between, industries. (The only exception is the Autor, Katz and Krueger result for the 1960s.) If skill-biased technological change is even to be a starter as a possible explanation of the observed shifts in skill demand, it is essential that some industries should have faster rates of skill upgrading than others.

The second question is whether the identification of industries that have had faster rates of upgrading (and an analysis of their characteristics) can shed light on what may underpin the improving relative labour market position of the more skilled. Indeed, it is clear that those industries showing the biggest increases in relative wages and/or employment of more skilled workers are those where technological change has been more important. For example, industries that have seen the fastest skill upgrading have been those spending more on Research and



More skilled workers are now in employment than in the past

Development (R&D), producing more commercially significant innovations and employing more workers who use computers.

One way to test this formally is to estimate cost share equations that relate changes in the skilled wage bill (or employment) share in a given industry to observable measures of technology use. Table 3 summarises some results for the US and the UK. It is clear that, for a range of time periods, for different levels of aggregation and for different technology measures there is a positive association for a given industry between shifts in the skilled wage bill (or employment) shares and enhanced use of new technology. Put differently, it appears that the technologically more advanced industries have shown the faster increases in the relative demand for skilled workers. This finding certainly supports the skill-biased technology change hypothesis.

A third, more controversial, line of research has asserted that individuals receive a wage premium for working with computers. If true, this would be very much in line with the hypothesis, since it would imply that computer users are rewarded for the higher productivity linked to their use of computers. The most well known paper here is Krueger's 1993 study of US Current Population Survey data, where he adds a "computer usage" dummy to standard earnings functions. Even after controlling for a wide range of human capital and job related characteristics, his analysis found a sizable wage premium for computer users. According to his figures, the wage premium attributable simply to using a computer at work was 15% in 1984 and went up to 18% by 1989, despite the rise in the total number of computer users over the same period.

There are some clear concerns about this methodology. For example, DiNardo and Pischke in the *Quarterly Journal of*

Table 3: Regression Correlations of Skill Demand Changes and Technology Measures

Study	Unit of Analysis	Time period	Skill Demand Measure	Technology Measure	Coefficient (Standard Error)	Controls
Autor, Katz and Krueger (1998)	140 US industries	1990-96	College wage bill share	Industry computer use (1984-93)	.289 (.081)	None
		1980-90			.147 (.046)	
		1970-80			.127 (.031)	
		1960-70			.071 (.025)	
	123 US industries	1960-90		Computer investment per FTE	.130 (.027)	Change in log(capital/labour), decade dummies
	450 US manufacturing industries	1959-89	Non production wage bill share	Computer investment / investment	.027 (.007)	Change in log(capital/output), Change in log(output)
Berman, Bound and Griliches (1994)	143 US manufacturing industries	1979-87	Non production wage bill share	Computer investment / investment	.028 (.006)	Change in log(plant/output), Change in log(equipment/
				R&D / Sales	.097 (.021)	output), Change in log(output)
Machin (1996)	16 UK manufacturing industries	1982-89	Non production wage bill share	R&D/Sales	.065 (.026)	Change in log(capital), Change in log(real sales),
	16 UK manufacturing industries	1980-85		Innovation Count From 1970s	.092 (.053)	1 digit industry dummies
	398 British workplaces	1984-90	Managers , senior technical and professional employment share	Micro computers introduced	.044 (.022)	Dummy for employment decline, 1 digit industry dummies
Machin and Van Reenen (1998)	15 UK manufacturing industries	1973-89	Non production wage bill share	R&D/Value Added	.026 (.009)	Change in log(capital), Change in log(output), year dummies

Economics in 1997, replaced "computer use" variable with a "pencil use" variable and uncovered an apparent wage premium linked to pencil use. The likely explanation here is that the "computer use" variable is a proxy for other characteristics of employees not captured in the survey data and, therefore, not controlled in the regression equation. Nonetheless, the computer premia in Krueger's analysis are sizable.

Fourth, adopting a wider international perspective, looking to see whether faster changes in skill demand are concentrated in similar industries in different countries could shed further light on the validity of the hypothesis. Table 4 gives a calculation of cross-country correlations of changes in non-production wage bill shares of particular industries for the period 1980 to 1990. It shows a wide cross-country correspondence for different industries: 31 out of 36 paired comparisons are positive and many (13) of the correlations are statistically significant. This does suggest that skill upgrading has a tendency to be clustered in the same sorts of industries in different countries.

Fifth, it seems that skill upgrading has also been happening in the more technologically advanced industries in some developing countries. This suggests that skill-biased

Table 4 Cross-Country Correlations Changes in Nonproduction Wage Bill Shares in Developed Countries: 1980-90

	USA	Sweden	Australia	Japan	Denmark	Finland	Austria	UK
Sweden	.15							
Australia	.35	.16						
Japan	.09	.14	.08					
Denmark	.66*	.06	.11	.14				
Finland	.70*	.12	.37*	.33	.52*			
Austria	.27	-.44*	.14	-.11	.31	.29		
UK	.64*	.06	.38*	.01	.53*	.39*	.47*	
Belgium	.45*	-.19	-.28	-.12	.41	.45*	.51*	.47*

Notes
Calculations based on the 28 industry data used in Berman, Bound and Machin (1998). * denotes statistical significance at the 5% level or better.

Table 5 Correlations of Country-Specific Industry Skill Upgrading With Technology Variables

	Correlations of 1980s' upgrading with US computer usage	Correlations of 1980s' upgrading with OECD R&D intensity (1980-90)	Correlations of 1970s' upgrading with US computer usage	Correlations of 1970s' upgrading with OECD R&D intensity (1973-80)
High Income Group				
Countries	10	10	12	12
Positive	10	8	10	10
Significant positive	5	4	6	4
Significant negative	0	0	1	1
Middle Income Group				
Countries	12	12	8	8
Positives	8	9	5	4
Significant positives	3	2	3	1
Significant negatives	0	0	1	2
Low Income Group				
Countries	6	6	5	5
Positives	3	3	4	2
Significant positives	1	1	0	0
Significant negatives	1	0	0	1

Notes
Taken from Berman and Machin (2000). Groups of countries are as follows.
High income: Australia, Austria, Belgium, Denmark, Finland, Germany, Japan, Sweden, UK, US ('80s), plus Norway, Germany ('70s).
Middle income: Colombia, Cyprus, Czechoslovakia, Greece, Guatemala, Hungary, Ireland, Malta, Portugal, South Korea, Spain, Turkey ('80s).
Low income: Bangladesh, Egypt, Ethiopia, India, Nigeria, Tanzania ('80s).

technology change is altering relative wage and employment outcomes globally, with the patterns seen in industrialised countries repeating themselves in the developing world. Table 5 shows correlations for 28 countries (grouped by income level) between industry changes in non-production wage bill shares and both US computer usage and the OECD's estimates of R&D intensity for those industries. The pattern in the table for the high income countries again shows a strong correspondence between skill upgrading and technology deployment. But the same pattern is also strong for the middle income countries. Indeed, patterns of skill upgrading in middle income countries in the 1980s are well predicted by the two OECD indicators of recent skill-biased technological change. The evidence of skill-biased technology transfer altering the mix of employment in the smaller sample of lower income countries is weaker, where only half the correlations with the technology indicators are positive.

Is there evidence that technology driven shifts in employer demand have continued to affect contemporary labour markets as they seem to have done in Table 1 between 1980 and 2000? The only data on technology measures that exist for similar definitions at a reasonably disaggregated level across the whole economy for both the US and the UK are those measuring computer usage in the workplace. Data on computer usage at work are available for several years in the US in various supplements of the monthly Current Population Survey. The first is for October 1984, with further supplements of the same structure in October 1989 and 1993. The most recent is for October 1997. Data for the UK are more sparse. There is the British Social Attitudes Surveys for 1985 (for a very small sample) and for 1987 and 1990. There are also data in the more recent 1997 Skills Survey.

A full description of the correlations between skill upgrad-

Table 6 Changes in Computer Usage and the Wage Structure: US 1984-97

	Descriptive Statistics			
	1984	**1989**	**1993**	**1997**
% using computer at work	25.1	37.4	46.6	50.6
Sample size	61667	62748	59852	56247
% graduate share of employment	21.6	23.4	24.8	26.2
% graduate share of wage bill	32.2	35.8	38.5	41.5
Sample size	168208	167526	166665	147033

Notes
1. All people with a job aged 18-64.
2. Computer numbers based on October Current Population Survey supplement in relevant year. Responses to question 'Does….directly use a computer at work?'.
3. Wage data from all outgoing rotation groups in each year (from the EPI ORG files).
4. Weighted using CPS person weights.

Table 7 Industry Level Regressions of Changes in Graduate Wage Bill Shares on Changes in Computer Usage in the United States 1984-97

	Annualised Change in Graduate Wage Bill Share			
	(1)	(2)	(3)	(4)
	1984-97	**1984-89**	**1989-93**	**1993-97**
Changes in % using computer at work	.069	.102	.075	.021
	(.025)	(.031)	(.050)	(.050)
Sample size	660	220	220	220

Notes
1. Dependent variable is annualised change in graduate wage bill share.
2. All regressions weighted by average of industry wage bill across the relevant time periods.
3. Year dummies included in column (1).
4. Standard errors in parentheses.

Less skilled workers, who cannot operate the new technologies, find their wages lowered

ing and changes in computer usage at work that emerge from all this data is contained in the paper on which this article is based. The most striking conclusion, however, is the strong correspondence between industry computer usage across the two countries. In other words, it is very much the same industries that have more employees working with computers. It is also clear that by 1997 some industries in both countries were at near saturation point so far as the spread of computer use was concerned. This, of course, causes problems for any hypothesis that wants to relate skill upgrading in an industry to increased computer use.

For the US, where the data go back further to 1984, it is also possible to look at things at a more disaggregated level. Table 6 shows that the proportion of workers in the US using computers doubled from 25% in 1984 to 50% by 1997. The graduate shares of both employment and the total wage bill also rose sharply over the same period, mirroring the figures in Table 1.

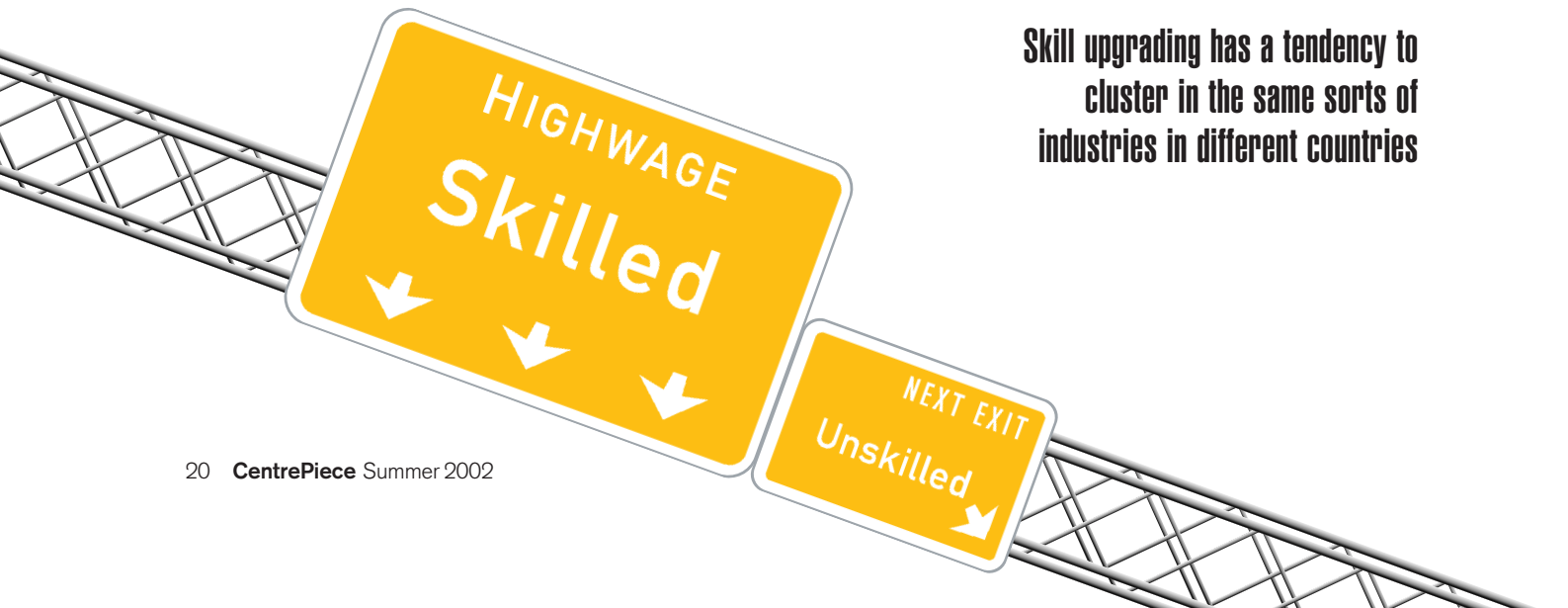
Table 7 gives estimated regression coefficients for US changes in the graduate wage bill share on increases in computer usage, first for the whole period from 1984 to 1997 and then for the three sub-periods for which I have data (1984-89, 1989-93 and 1993-97). The 1984-97 regression shows a strong association between changes in graduate wage bill shares and increased computer usage. However, when one looks at the sub-period regressions, the coefficient on computer usage falls over time and the relationship disappears by the final column specification for 1993-97. It appears that some technologically advanced industries reached saturation point in terms of computer diffusion and thus the links between skill upgrading and

Table 8 Changes in Computer Usage and Changes in Wage Structure in Britain in the 1990s

		Skills Survey Data		
	1997	**1997 if same job as 1992**	**1992**	**Change 1992-1997 (if same job)**
% Using Computer at Work	68.2	71.7	54.4	17.3
Of Which:				
Essential	30.3	28.6	15.7	12.9
Very Important	14.7	16.5	10.6	5.9
Fairly Important	12.7	14.1	12.9	1.2
Not Very Important	11.5	12.5	15.1	-2.6
Sample size	2467	1270	1270	1270

		Labour Force Survey		
	1997	**1994**	**1992**	**Annualised Change (Percent log points)** A: 1992-1997 B: 1994-1997
% Graduate Share of Employment	14.8	13.4	12.1	A: 4.0
				B: 3.3
% Graduate Share of Wage Bill	24.7	23.7	21.2	A: 3.0
				B: 1.4

Notes
1. Many thanks to Francis Green for providing me with the Skills Survey data used in the upper panel of the Table



Skill upgrading has a tendency to cluster in the same sorts of industries in different countries

Table 9 Industry Level Regressions of Changes in Graduate Wage Bill Shares on Changes in Computer Usage in Britain in the 1990s

	Annualised Change in Graduate Wage Bill Share, 1994-97			
	(1)	(2)	(3)	(4)
Changes in % Using Computer at Work	-.045			
	(.080)			
Changes in % Using Computer at Work For		.086		
Whom Fairly Important, Very Important or Essential		(.057)		
Changes in % Using Computer at Work For			.106	
Whom Very Important or Essential			(.068)	
Changes in % Using Computer at Work For				.138
Whom Essential				(.044)
Sample size	53	53	53	53

Notes
1. Dependent variable is annualized change in graduate wage bill share.
2. All regressions weighted by average of industry wage bill across the relevant time periods.
3. Standard errors in parentheses.

increased computerisation, at least measured in head count terms, no longer existed. This does not mean that skill-biased technology change no longer exerted an influence on the wage structure, but it casts doubt on simple measures of computer use as explanations for skill-biased technology change in the 1990s.

The UK situation in the 1990s is considered in Tables 8 and 9. Using the 1997 Skills Survey data, the upper panel of Table 8 compares computer usage in 1992 and 1997. It gives two 1997 numbers, one for the whole sample and one for people who were still in the same job as they had been in 1992. The top line of the table confirms that increased computerisation of jobs carried on through the 1990s.

The breakdown made possible by the 1997 Skills Survey into sub-groups for whom whether computers were "essential", "very important", "fairly important" or "not very important" shows a rise in the first three categories and a fall in the "not very important" group.

The lower part of the table gives the graduate share of employment and of the wage bill, taken from the Labour Force Survey, for three years (1992, 1994 and 1997). These years are chosen because an industry definition change occurred between 1992 and 1997, which means that it is possible to make the industry-level empirical analysis between 1994 and 1997 for a consistent set of industries.

Accordingly, Table 9 gives a set of industry-level regressions of changes in graduate wage bill shares in the UK in the 1990s on changes in the percent of people using a computer at work. The column (1) computer use variable is for all people and columns (2), (3) and (4) gradually refine the variable for those who reported varying degrees of importance to working with computers. The first column shows no relation between 1990s skill upgrading and the increased use of computers in the 1990s. This mirrors the US finding over the same period and supports the notion that simple computer usage measures may not be particularly good for looking at technology change in the 1990s, because of high computer use levels in technologically advanced industries.

However, once broken down by importance of the computer to the job, industry skill upgrading is still associated with increased computer use. The strongest positive (and statistically significant) association is between changes in graduate wage bill shares and changes in the percent using a computer for whom it is "essential" to the job. It seems that, even in the 1990s, relative demand was still shifting in favour of skilled workers in industries where computers are becoming more important.

Thus the evidence for skill-biased technology change hypothesis is substantial. But there are questions about it. For example, other hypotheses are also consistent with the evidence. There is still a debate as to whether technology change or other factors, like increased trade, account for most of the rises in labour market inequality.

In its simplest form, the trade argument goes as follows. Suppose there are two countries that, to start with, do not trade with each other. Both have skilled and unskilled workforces, which respectively manufacture skill intensive and skill unintensive products. One country (high wage/developed) has a comparative advantage in making skill intensive products with skilled labour. The other country (low wage/developing) has a comparative advantage in making skill unintensive products with unskilled labour. When these two countries begin to trade with one another, according to the standard Heckscher-Ohlin model of international trade, the developed country will begin to import

skill unintensive products from the low wage country since they are cheaper. This will then lower the wages of unskilled workers in the developed country and reduce their employment levels. In this model, the rise in the relative wages and employment of skilled workers is caused by the opening up of trade with the developing country.

This hypothesis has intuitive appeal. However, for several reasons, it has proven hard to back it with sound empirical evidence. Though trade flows with low wage countries have been rising fast in recent years, they have been from very low initial levels and do not seem big enough to explain the large changes in labour market inequality seen in a number of developed countries. What is more, those industries that have seen the biggest increases in trade with the developing world do not appear to be the ones that have seen large labour market shifts in favour of more skilled workers. Then, as we have already noted, skill upgrading (higher relative wages and employment for more skilled groups of workers) has been going on in the developing as well as the developed world. This runs counter to the Heckscher-Ohlin model, which predicts that skill upgrading should increase in developed economies, but that the less skilled should do better in the developing world as demand for the products they manufacture rises.

A further conflict with the Heckscher-Ohlin model is that skill upgrading appears to be happening in industries that do not trade across international borders. If one includes a traded and a non-traded sector in that model, the prediction would be that unskilled workers displaced from the traded sector by the opening up to trade would find jobs in the non-traded sector, or would lower the wages of unskilled workers, or both. In reality, one does not see this. In non-traded sectors (e.g. in non-manufacturing industries like retailing) skill upgrading has also been happening (and often at similar rates to those in traded sectors).

The absence of evidence that increased trade has been the prime cause of increased inequalities between skilled and less skilled workers in the past does not, of course, mean that trade will have little impact here in future. It is implausible to suggest that globalisation is without serious ramifications for labour. However, the rises in labour market inequality of the last couple of decades do not seem attributable to rising competition with low wage countries.

A second worry with the skill-biased technology change argument is that the evidence supporting it mainly covers limited time periods. Perhaps more importantly, it is also mainly confined to manufacturing industries. This is because of a lack of good data on technology outside manufacturing and because researchers have wanted to look at the same industries across countries. Some work has managed to use data to look at longer time periods and at the whole economy. The most comprehensive for the US is the work already cited of Autor, Katz and Krueger, using census data back to 1960 and focusing as much as possible on non-manufacturing as well. They seem to find important shifts in the skill structure of employment that are related to technology and that have occurred economy-wide.

A more subtle (and probably more significant) argument is that shifts in the demand for more skilled workers have been happening for years and that it is significant supply changes that matter more. This argument rests on the notion that there has been a long trend increase in demand for skills and that movements in relative wages around this trend are principally influenced by relative supply changes. For example, it is well known that the supply of graduates rose fast in the 1970s, slowed in the 1980s and then rose again in the 1990s. The wage gap between educated and less educated workers fell in the 1970s, rose sharply in the 1980s and probably rose, but at a much slower rate, in the 1990s. This outcome is entirely consistent with a steady increase in demand for skilled workers, where their wage premiums over unskilled workers are affected by 10-year changes in relative supply.

This argument warrants attention. However, more solid empirical work is required before it can be accepted as substantially undermining the skill-based technology change hypothesis. In particular, steadily rising residual wage inequality between skilled and unskilled workers, which has been a feature of the last 20 years, is hard to square with the patterns of supply change.

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This article is an edited version of his paper "*The Changing Nature of Labour Demand in the New Economy and Skill-Biased Technological Change*". The full paper can be read at http://cep.lse.ac.uk/~machin and is forthcoming in the Oxford Bulletin of Economics and Statitsics.

Rises in labour market inequality do not seem attributable to rising competition with low wage countries

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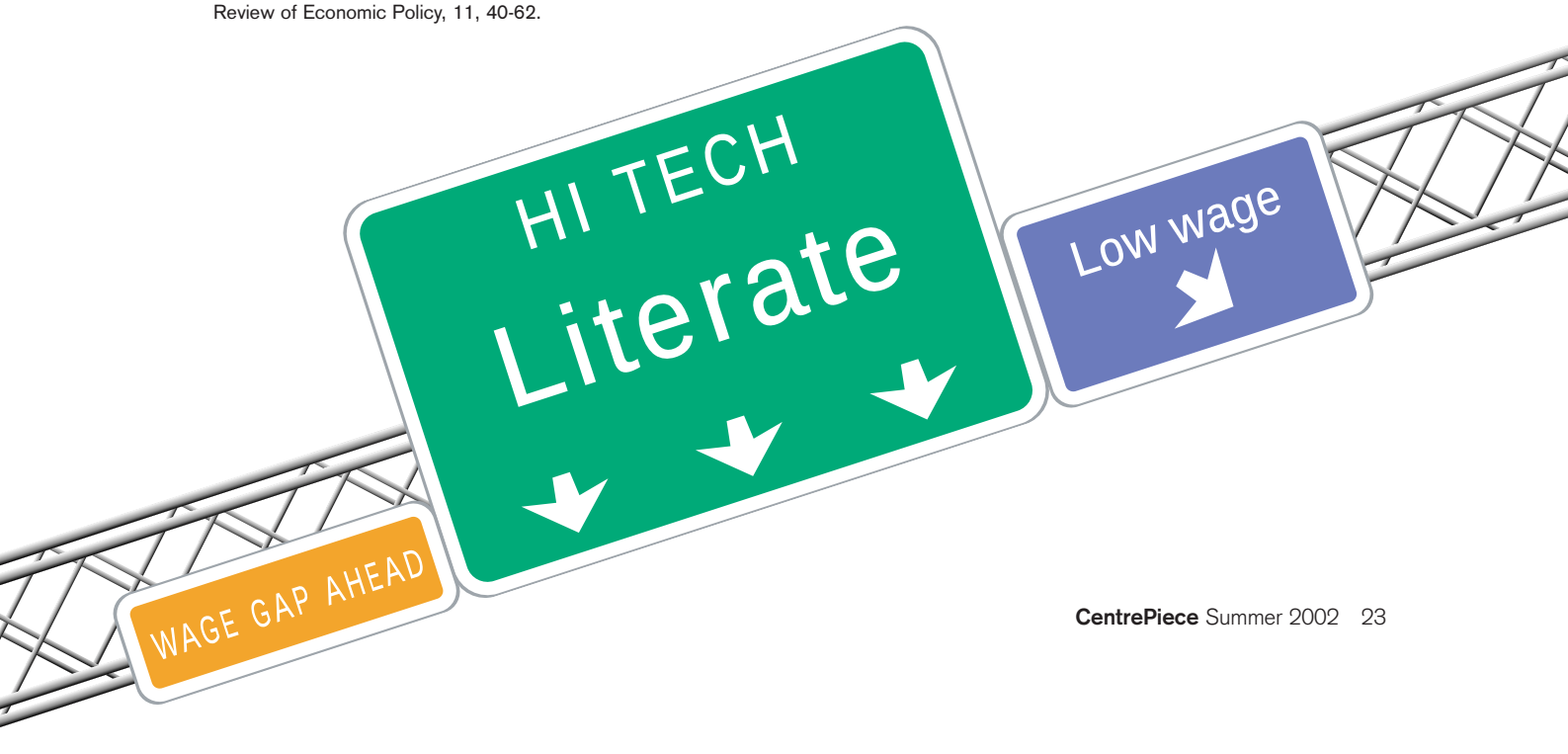



MANAGER

by Elisabeth Müller and Alexandra Spitz

Do owners make good managers?

Elisabeth Müller and Alexandra Spitz look at the evidence from a group of private German companies to see how the performance of their managements is affected by whether or not they own a share of the equity.

Does the share of a company that is owned by its management affect its financial performance? In principle you might expect that, in companies where ownership and management control are entirely separate, conflicts of interest would arise. For example, an owner might be mainly interested in profit, while a manager might have a professional interest in expansion.

So far this potential conflict of interest has mainly been analysed in relation to public companies. One reason for this may be the better availability of data for public than for private companies. Yet this conflict is potentially important also for private companies, since in this sector not all owners are managers and not all managers are owners.

In all countries, private companies are responsible for a substantial part of overall economic activity. In Germany, for example, private companies with limited liability (GmbH) have a higher share of total turnover than public companies with limited liability (AG). In theory one might expect to find a positive relationship between managerial ownership and performance, as managers owning a share of the company stand to benefit from an increase in profits. Furthermore, they are less likely to divert company resources for private use because they bear a larger share of the cost. This is the "incentive effect".

On the other hand, one might find a negative relationship between managerial ownership and profitability, especially in cases of very high levels of managerial ownership. The higher the ownership stake of the managers, the more difficult it is for outside owners or others to control or influence the management. This is the "entrenchment effect".

Here the relationship between managerial ownership and risk is also of interest. Since managers are thought to be "risk averse", one would expect a negative relationship between company risk and managerial ownership. The investment in a private company often accounts for a large share of an individual's wealth and is mostly not diversifiable. On the other hand, managerial ownership can also serve as an outward signal of a company's quality. A manager will only be willing to invest large amounts in his own company if he is convinced that it will be successful. Banks take such signals into account when deciding on loan applications. So, since banks are especially reluctant to lend to risky companies, the managers of risky companies may need to make more use of this signal. In this case, there would be a positive relationship between company risk and managerial ownership.

To explore these questions we have examined the evidence from private companies in the German business-related service sector. As can be seen from Table 1, private companies with limited liability (GmbH) are the most important company type in Germany. (The closest counterpart to this legal form in the UK is the private limited company.) The limited liability of the GmbH means that owners are not personally liable for the company's debts. The legal form of the GmbH is quite flexible. The articles can be adapted to fit very small as well as very large companies. A GmbH has at least one owner and is run by one or more managers, who can also be owners. In general, owners share profits according to the proportion of the firm's equity capital they

hold. It is important to note that the shares of a GmbH cannot be listed on a stock exchange.

Table 1 % share of total turnover by legal form 1998

Private limited liability (GmbH)	32
Public limited liability (AG)	22
Other forms with unlimited liability	46

Source: Statistisches Bundesamt, Germany, 1998.

Data for the analysis was derived from a survey of the German business-related service sector carried out by the Centre for European Economic Research in Mannheim and Creditreform, Germany's largest credit rating agency. The survey data was merged with information from Creditreform's company database. The resulting sample covers the period from 1997 to 2000. The business-related service sector here comprises IT services, consulting, marketing, technical advice, machine rental, logistics and waste disposal.

Companies were asked on a quarterly basis whether their profits had increased, stayed the same, or decreased in the last three months and what they expected of them for the three months to come. On the basis of the answers about past profitability, a performance measure was constructed to take seasonal and sectoral effects into account. This analysis has to be based on surveys to measure performance, as most private companies do not publish their accounts.

Table 2 Definition of Variables

Variable	Definition
Share	Combined ownership share of all managers in the company, measured between 0 and 1
Risk I	Standard deviation of the responses to the performance question (coding: up=2, constant=1, down=0)
Risk II	Average absolute deviation of coding forecasted return minus coding realised return
Owner manager	Number of managers who are also owners
Outside owner	Number of owners who are not members of the management
Dummy No outside owner	Equal to 1, if company totally owned by managers
Bank	Number of bank relationships
Size	Natural logarithm of number of employees
Dummy West	Equal to 1 for companies in West Germany

To measure performance, we took the difference between the number of times a company reported a profit increase and the number of times it reported a decrease and compared that with the average response from its industry as a whole. This performance measure was calculated on an annual basis. The exact formula used to give this measure of relative performance is: (no. of "increases" per company per year minus no. of "decreases" per company per year) divided by (no. of "increases" per industry year minus no. of "decreases" per industry per year). For companies with above average performance, the measure will be positive and, for companies with below average performance, it will be negative. (Definitions of the other variables used are given in Table 2.)

The companies included in the sample were relatively small. They had on average only 39 employees. Their managers' average ownership share was substantial, amounting to almost 75% of overall capital. The typical company had six owners, of whom on average one and a half were also managers.

One point to be borne in mind is the possibility of reverse causality. It is possible that the performance of a company has an influence on the size of the ownership share a manager is willing to take. Managers tend to be well informed about the quality of a company before they decide how much to invest. This could lead to higher ownership shares in strong companies and lower ownership shares in weak companies. However, the price that a manager has to pay for his stake needs also to be taken into account. If a company is known to be good, the former owners will charge a high price and the share that the new manager gets will be consequently lower. Nevertheless, if managers are better informed about the potential of a company than the owners, our results might represent an overestimate of the effect of ownership on performance.

The results of the performance equation are displayed in Table 3, column 1. The effect of managerial ownership on performance has the form of an inverted "U". Managerial ownership seems to have a positive effect up to an ownership level of around 50%, but becomes negative above that. This suggests that up to about 50% we see the positive impact of the "incentive effect" for managers, whereas above 50% we see the negative impact of an "entrenchment effect". As measured, these effects on performance are statistically significant.

Other findings from the analysis include:

- Companies with 100% managerial ownership perform better than companies with some "outside" owners. The reason may be that, in these cases, there is no conflict of interest because there is no separation of ownership and control.
- The number of managers with ownership stakes has a negative influence on performance, although the effect is not significant in the first regression. It may be that, if there

are several owner-managers, it becomes more difficult to agree on company strategy and that the incentive due to ownership is smaller for each individual manager.

■ The more outside owners, the better is the performance. In theory one might have expected this effect to be negative, as a smaller number of owners with a larger share of a company should have more incentive to monitor management performance. However, the data does not show such an effect. It may be harmful to companies, if outside owners exert too much influence, since they are typically less well informed about the business than the managers. The greater the number of outside owners, the smaller the ownership share and the less the influence of each one.

■ The more bank relationships a company has, the worse is its performance. This is compatible with the argument that banks with a high loan to one company will devote more resources to monitoring its management than several banks each with smaller loans. But it could also mean that companies performing badly seek loans from several banks, because no one bank wants to make a big commitment.

Table 3, column 2, gives the results of our regression analysis, including lags of the share variables to allow for the fact

Table 3 Estimation Results of Fixed-Effect Regressions
Dep. Variable: Relative Performance

	(1)	(2)
Share	3.54*	
	(2.16)	
Share (lag)		7.34***
		(2.88)
Share squared	-3.17*	
	(1.78)	
Share squared (lag)		-4.32**
		(2.16)
Owner manager	-0.13	
	(0.11)	
Owner manager (lag)		-0.50**
		(0.21)
Dummy No outside owner	0.79**	
	(0.40)	
Outside owner	0.19**	0.15*
	(0.08)	(0.09)
Bank	-0.11*	-0.18**
	(0.15)	(0.08)
Size	-0.21	-0.23
	(0.15)	(0.26)
Number of observations:	2797	1434
Number of firms:	1351	777
F-Test:	2.06	3.10
(degrees of freedom)	(7, 1439)	(6, 651)

***,**,* = significant on the 1, 5 and 10 per cent level, standard errors are in parentheses

that it can take time before changes in ownership have an effect. This confirms the inverted U-form of the impact of managerial ownership. The maximum point increases to around 80%, i.e. we find a positive effect of managerial ownership share up to 80%, above which it becomes negative.

Our analysis of the relationship between company risk and managerial ownership share also found it to be non-linear. Ownership share first decreases as risk rises, then increases before finally decreasing again. The negative relationship between risk and managerial ownership share indicates that managers are risk averse. They prefer to diversify risk by not investing only in the company they manage, especially as they already have their "human capital" invested in it. After a certain point, banks could be reluctant to lend to risky companies. Then the only way a manager can convince the bank to lend is by holding a big personal stake. After a certain level of risk, however, the cost of risk bearing exceeds the advantage of signaling company quality. So we find that in very high risk companies the relationship between risk and managerial ownership share tends again to be negative.

Elisabeth Müller is a member of the CEP.
Alexandra Spitz is a PhD candidate at the Centre for European Economic Research (ZEW) in Mannheim.

This article is based on their Discussion Paper "*Managerial Ownership and Firm Performance in German Small and Medium-Sized Enterprises*" (DP 528), available from the CEP.

by John Kay

Arbitrary rights

Intellectual property rights have produced strikingly large financial gains for some individuals and corporations, but the big winners have seldom been involved in the creation of new "big knowledge". John Kay looks at examples to how the system has operated and concludes that it has little economic or commercial logic.

It is a cliché that we live today in a knowledge economy. But what are the economics of the process of knowledge creation?

The evidence of history is that intellectual property rights have made at best only a minor contribution to the development of the knowledge economy. But occasionally, and in an almost arbitrary way, they have conferred extraordinarily large rewards. There seems to have been little economic logic involved.

Albert Einstein devised the general theory of relativity in his spare time, while employed as a clerk in the Patent Office at Zürich. (His Swiss Patent Office salary is arguably the most important contribution that the system of intellectual property rights ever made to knowledge.) Once his genius was recognised, Einstein was never again without a university appointment and was honoured wherever he went. But he never became a rich man. Certainly not in the way in which Bill Gates or Michael Eisner became rich men.

Along with the theory of relativity, probably the most significant single pieces of new knowledge obtained in the twentieth century were the invention of computing and the unravelling of DNA. A machine that can do sufficiently long strings of calculations can do almost anything. This is now taken for granted, but it was once an insight of startling originality. While Babbage was the builder of the first "analytical engine"

in the nineteenth century, the mathematical and philosophical concepts behind the modern computer were established by Alan Turing, a fellow of King's College, Cambridge, at the time. When the Second World War broke out, Turing joined the code-breakers at Bletchley Park. This group – one of the most astonishing concentrations of intellectual firepower ever assembled – built what is generally thought of as the first operational computer. Turing – a lonely, tortured homosexual who committed suicide – spent the rest of his short life working for the British government.

The structure of DNA was specified in 1953 at Cambridge University by Francis Crick and James Watson, both postdoctoral research workers in the university. Like Einstein, Watson became a fêted scientist. Neither ever became what the City would describe as seriously rich.

Business people have sometimes argued that contributions to knowledge such as the discovery of relativity, the invention of computing and the unravelling of DNA were not "commercial". But relativity led directly to the discovery of nuclear power and, by redefining the basis of modern physics, has influenced the design of devices from spaceships to computers. If the idea of computing is not commercial, it is hard to imagine what is. And genetics and biotechnology will almost certainly transform medicine and nutrition in a very few decades.

Not even business people would deny that antibiotics, television and improved seed varieties are "commercial". The discovery that certain moulds would kill bacteria is generally ascribed to slovenly practice in Alexander Fleming's laboratory in St Mary's Hospital, Paddington, in 1928. Despite the apparently obvious practical significance of this discovery, it was a decade before research by Howard Florey and Ernst Chain at Oxford University, sponsored by the Rockefeller Foundation, led to the creation of a drug that could be administered to patients. The result was the development of the modern pharmaceutical industry and the virtual elimination of infectious disease as a cause of death in otherwise healthy adults in rich countries.

Television was invented more or less simultaneously in several countries. As is common with new technological products, when all the necessary pieces of science and engineering are available it is a matter of chance who happens to put them together first. In the United States, the individual concerned was Philo T. Farnsworth. Or so the courts decided when they upheld his patents. After years of costly litigation with the Radio Corporation of America (whose chief executive was famously reported as saying: "We don't pay royalties; we receive them"), Farnsworth ultimately won the credit for the invention. But he was almost ruined in the process and received little financial return, eventually selling out to RCA for a modest sum.

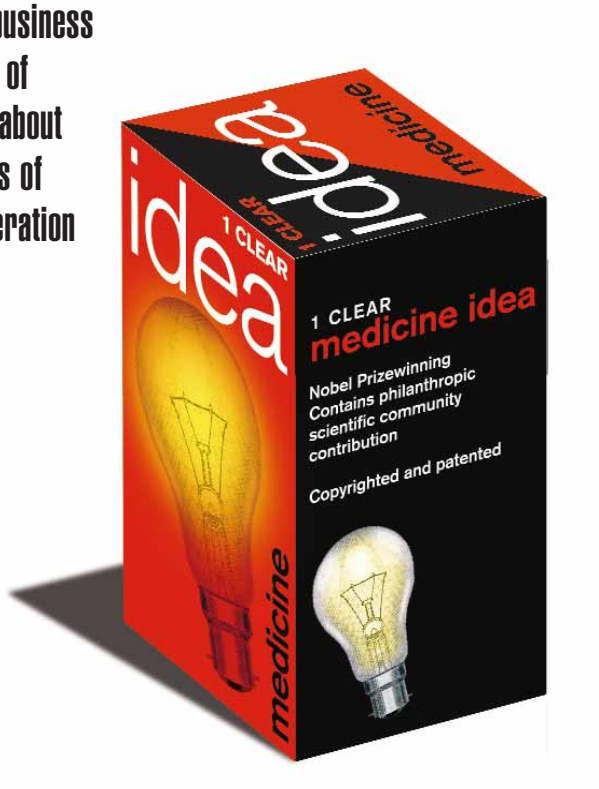
The most important economic event in Palanpur in the last fifty years was the introduction of semi-dwarf wheat – the new "green revolution" crops that have made India self-sufficient in grain. These discoveries were the result of research in Mexico promoted (again) by the Rockefeller Foundation.

My sample of major twentieth century innovations is small and controversial. Still, few people would disagree that it includes some of the twentieth century discoveries which most changed our economic lives. What motivated these innovations?

The American business model has little of interest to say about these processes of knowledge generation. Whatever may have inspired these discoveries, it was not a combination of great greed and little government. Neither Einstein nor Turing "did it for the money". Einstein was spurred by the desire to get a better job, but, in general, the excitement of the process

Einstein never became a rich man

The American business model has little of interest to say about these processes of knowledge generation



of discovery itself, and the social rewards offered to a renowned discoverer, appear to be the dominant factors.

Indeed, the record of twentieth century history is that none of its most important inventions was made by private sector companies. The strongest private sector contender is the transistor, discovered by William Shockley in Bell Laboratories in 1947. But this is an exception which proves the rule. Bell Labs was owned by American Telephone and Telegraph but had much of the character of a rich man's hobby, since regulatory restrictions prevented it from developing innovations directly relevant to the AT&T business. In the event, the transistor proved rewarding for Shockley and the company, Fairchild Semiconductor, that he established, but not for AT&T. Indeed, when the parent company spun off its research laboratories as a separate company, the resulting business, Lucent Technologies, was not particularly successful.

So neither commercial businesses, nor the prospect of large rewards to individuals, played any large part in the creation of "big knowledge". Nor did state control of innovative activity. Despite the active promotion of research by the Soviet government, the country's record in the development of original knowledge is lacklustre. Russia and the USSR have won 11 science Nobel Prizes, compared with 13 each for Switzerland and The Netherlands. Despite high standards in Russian medicine, no important new drugs were developed there and the evolution of computers and electronics – even for military use – lagged far behind the West. The worst episode in Russian science was the era of Lysenkoism. The absurd theories of an undistinguished biologist who had captured the ear of Stalin had a major influence on Soviet agricultural policy in the decade before the Second World War. Until the Great Leap Forward in China, the Russian and Ukranian famines of the 1930s were the worst in world history.

In fact, of all the inventors I have discussed, the only one employed by a government at the time of his principal discovery was Einstein. And the Swiss government employed Einstein as a clerk in the Patent Office, not to discover relativity. The remarkable fact is that the principal funding of major twentieth century innovations came from private charitable foundations. The record of the Rockefeller Foundation alone – as the principal source of finance for both the development of penicillin and the green revolution – is remarkable. When you add in the contributions to knowledge – good and bad – to have come from the University of Chicago, the economic significance of Rockefeller's philanthropy proved far greater than the economic significance of his creation of Standard Oil.

Philanthropy is important to knowledge, because it is the vehicle of pluralism in research. Of the six innovations described, three – antibiotics, computing and DNA – occurred in Britain. The institutions in which the research occurred were not dependent on state funding at the time, but are so now. The growth of government finance and control of universities in Europe has been directly paralleled by their decline as important centres of research. Europe accounted for 75% of Nobel Prizes in science before 1939; the US has taken over 75% of Nobel Prizes in science since 1969. It now seems that the new "big knowledge" is most likely to be discovered in the pluralist higher education system of the United States.

Of course, not all knowledge achieves the exquisite level of abstraction of the theory of relativity, the concept of a computer, or the nature of life. Much of it is the product of diligent record keeping. Information like the times of television programmes, or of buses, trains or planes. Lists of plumbers. Share prices. Where to find Bristol

Gardens. This is the kind of information we need and use every day.

Broadcasters compile their programme schedules well in advance. They want to disseminate that information widely – no one will watch a programme they don't know is on – but broadcasters also want to maximise the value of their information as a commercial asset. Until 1990, British broadcasters balanced these interests by themselves publishing weekly magazines, Radio Times (for the BBC) and TV Times (for commercial broadcasts), carrying their own programme listings, for which they held the copyright, but not those of their rivals. The only way to obtain comprehensive information about future programmes was to buy both magazines. Both were extremely profitable. A change in the law in 1988 removed the broadcasters' copyright in their listings. As a result, competitive listings magazines appeared, greatly reducing the profits of Radio Times and TV Times.

The first maps were compiled as products of art and scholarship. But map production became a business. Mapmakers plagiarised information and competed against each other on the basis of the clarity and accuracy of their mapping. Reputation was important to a mapmaker from the beginning: you would not know a map was defective until you had bought it, used it, and gotten lost.

Mapping gained importance as military organisation developed, since the movement of large armies required careful logistics that demanded accurate mapping. So maps were commissioned and paid for by governments. The British government's maps agency is still called the Ordnance Survey, reflecting its military origins. The needs of the armies for maps no longer seem so pressing, so governments have expected their agencies to find more commercial outlets for their data and skills. Also, the needs of the army are not the same as the needs of the person invited to dinner for the first time at a house in Maida Vale.

This insight led Phyllis Pearsall, rain-soaked by her attempt to find Bristol Gardens, to compile the first street atlas of London. Mrs Pearsall walked London, recording junctions, house numbers and construction that had taken place since the last comprehensive Ordnance Survey nearly twenty years earlier. Today there are many different street atlases of London (and of most other towns).

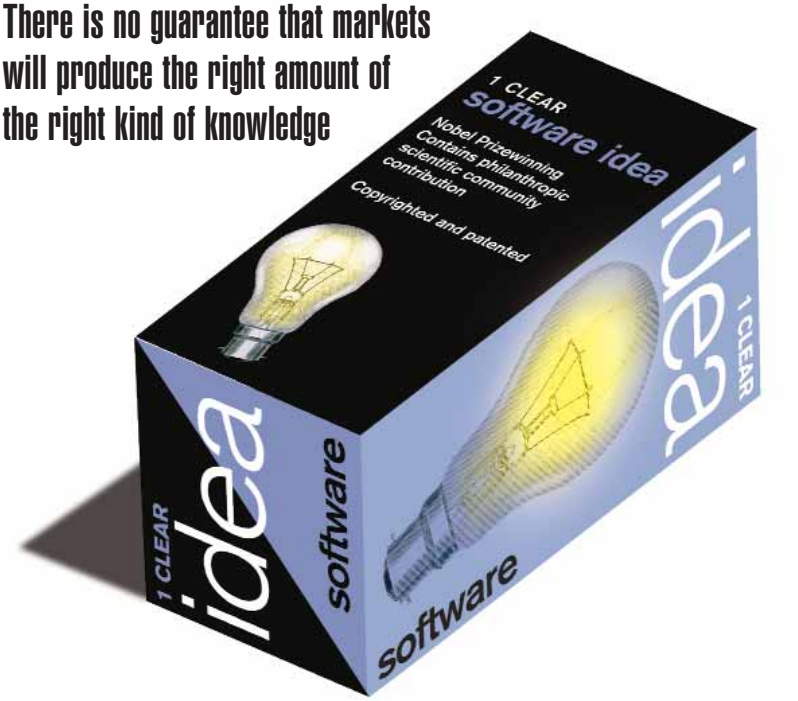
In March 2001, the Automobile Association paid £20 million to settle a legal dispute with the Ordnance Survey. Copyright law prevents the AA from copying Ordnance Survey maps. But it does not protect the knowledge that the M1 runs from London to Leeds. There is clearly a large grey area in between and the AA seemed to have moved too far to one side of it.

So can you "own" knowledge? Not really. But, if you can't, won't that discourage you from acquiring it? Probably not, if that knowledge is of the path-breaking kind developed by Einstein or Turing. But, if it is the dull but essential knowledge of the location of every house in London that can be acquired only by trudging its streets, perhaps it will. This is an issue with which the law and regulation of market economies struggles.

For there is no guarantee that markets will produce either the right amount or the right kind of knowledge. Markets may fail to produce new knowledge, because once knowledge is obtained the discoverer cannot keep it to himself or herself. Conversely, the knowledge economy may lead to monopoly, because the costs of knowledge are fixed and sunk.

Still, rich states do not, as a whole, seem to be doing badly in developing a knowledge economy. Big knowledge – relativity, computing, the structure of DNA – is produced with philanthropic support, most often in the reflective environment of

There is no guarantee that markets will produce the right amount of the right kind of knowledge



universities, and motivated by the creative instincts of its authors. Small knowledge – television listings, maps, financial information – is generated and distributed by the market like any other product. Surprisingly small amounts of differentiation seem sufficient to ensure competitive supplies of most kinds of sm all knowledge.

Big or small, to be precious, knowledge must be of kind that can be protected by copyrights or patents and leveraged by firms to establish commercial monopolies. By this standard, the two most precious pieces of knowledge of the twentieth century are not relativity, or the structure of human life. They are the software code for Microsoft's operating system, MS-DOS, and the chemical formulation of anti-ulcerant drugs.

Microsoft has benefited from several idiosyncrasies of US legislation. The law allows Microsoft exclusivity in the software code of MS-DOS, but denies Apple exclusivity in the concept of the graphical user interface. This gives the Seattle company sole rights in Windows. At the same time as US law permits this monopoly, it controls it only weakly.

Copyright and patents can often be converted around. This is what happened when James Black discovered a drug for blocking receptors on the walls of the stomach and hence reducing the acidity which causes ulcers. Following this invention, a British pharmaceutical company, Glaxo, refocused its related research and came up with another anti-ulcerant, Zantac. Zantac is similar in pharmacological effect to Black's drug but has fewer side effects. Like most best-selling drugs, it does not cure the underlying condition, but it relieves or eliminates its adverse effects. Sufferers need drug treatment for extended periods, possibly for life.

At around the same time as Glaxo launched Zantac, two Australian physicians, Robin Warren and Barry Marshall, discovered that many ulcers were caused by a bacterium, Helicobacter pylori, and could be cured by an intensive programme of antibiotics. Chemical substances such as Zantac are patentable. Treatment protocols are not. Zantac became the world's best selling drug and its $10 billion or so profits made Glaxo one of the world's largest pharmaceutical businesses. Warren's and Marshall's rewards for their discovery are limited to the academic kudos they enjoy and the gratitude of those patients who know the origins of their successful treatment.

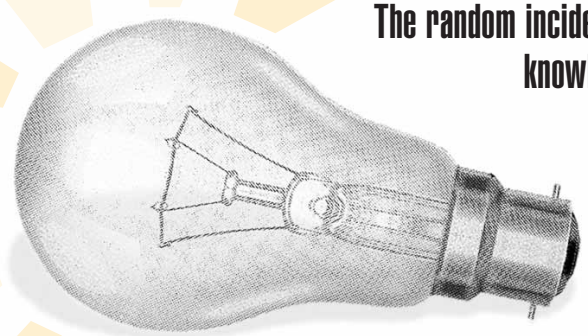
The random incidence of precious knowledge is striking. The copyrights in Microsoft's operating system and the patents in Glaxo's Zantac are probably the most valuable copyrights and patents in history. But the work they relate to was of little originality and the truly innovative work was undertaken by other companies. The returns seem altogether disproportionate to either the costs or the consequences of the activities concerned. We can be confident that there would still have been personal computers and anti-ulcerants even if no copyright or patent protection had ever existed – as there would have been relativity, transistors, radios and television.

These strikingly large but arbitrary rewards attract very considerable resources into areas where the possibility of such returns exists – such as the production of user-friendly software and drugs that relieve chronic conditions – and into essentially imitative production of popular music and pulp fiction. It also concentrates resources and market powers in a few hands, threatening the very pluralism on which innovation depends. The behaviour of Microsoft demonstrates that this is no imaginary threat.

John Kay is an associate member of the CEP and Visiting Professor at the LSE. This article is based on a chapter in his forthcoming book "How Markets Work", due to be published by Allen Lane/Penguin Press in March next year.

The Centre for Economic Performance and the Intellectual Policy Institute have launched a joint research initiative to improve knowledge and understanding of the economic and professional issues involved in Intellectual Property.

The random incidence of precious knowledge is striking



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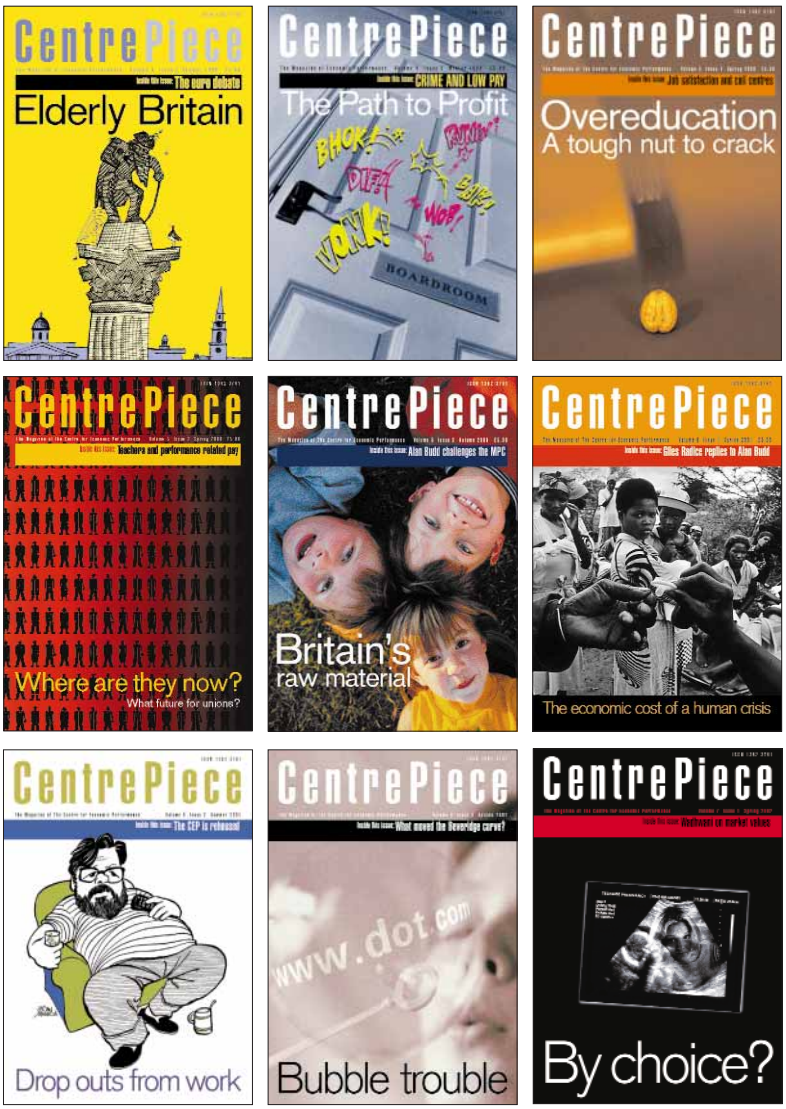

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