Growing numbers of university students in Britain and the United States are staying on after their first degrees to invest in a postgraduate qualification. **Joanne Lindley** and **Stephen Machin** document this trend and assess the impact on wage inequality – among graduates and across the labour force as a whole.

# The boom in postgraduate education and its impact on wage inequality

Mass participation in higher education has altered the typical path followed by university graduates. The norm used to be that after obtaining an undergraduate degree, people would finish their studies and enter the labour market. These days, many more students stay on to invest in postgraduate education. Indeed, by 2009 just over 10% of the workforce in Britain and the United States – and more than a third of all graduates – had a postgraduate qualification.

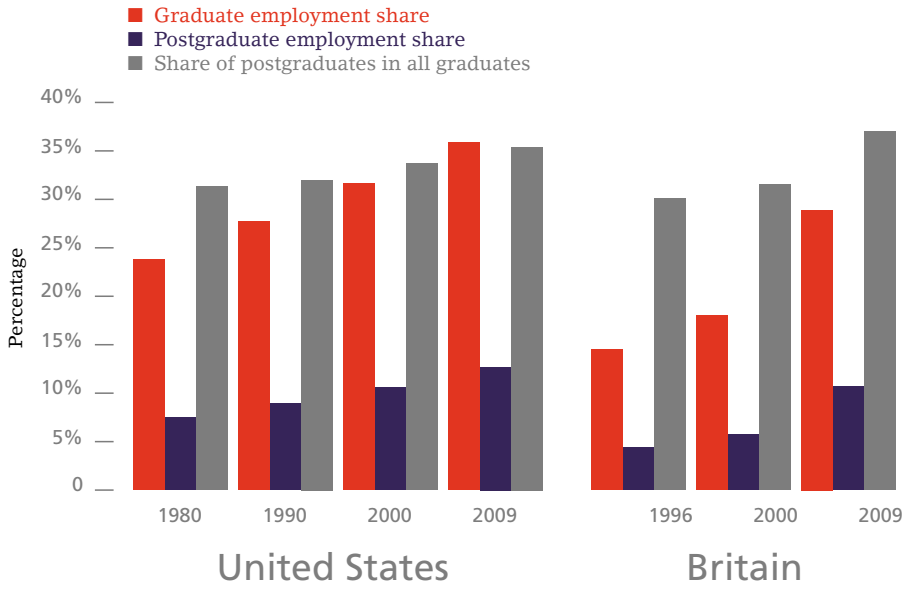
We have documented these trends in postgraduate education and how they relate to rising wage inequality in the two countries. It is now widely understood that despite rapidly growing numbers of university-educated workers, increased relative demand for their skills has been a key driver of overall wage inequality. Our research reveals that the changing composition of the graduate labour force – and widening wage differentials within this group – has also been a key feature of rising inequality.

Figure 1 shows changes in the proportions of all graduates and postgraduates in the labour force during the past 30 years, as well as the changing share of postgraduates among all graduates. In the United States, the graduate share of employment has increased steadily, rising from 24% in 1980 to 36% in 2009. In Britain, the graduate share doubled between 1996 and 2009, going from 14.5% to 29%.

Focusing on postgraduates, there has been a sharp increase in both countries: in the United States from 7.5% to 13% between 1980 and 2009; and in Britain from 4% to 11% between 1996 and 2009. The more rapid increase in the share of postgraduates compared with college-only workers means that the postgraduate share among graduates has increased in both countries: from 31% to 35% of US graduates between 1980 and 2009; and from 30% to 37% of British graduates between 1996 and 2009.

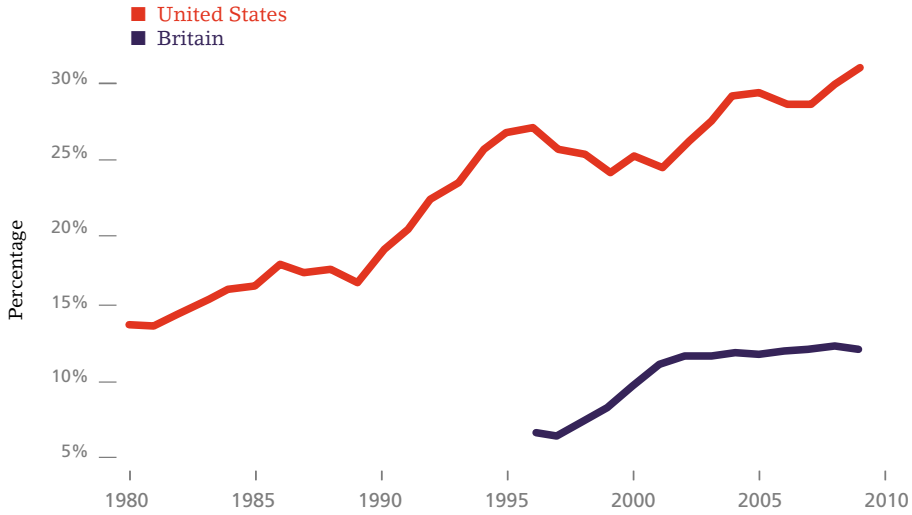
At the same time as postgraduates increased their employment share, their relative wages also rose. Figure 2 shows how the wage differential between those with a postgraduate qualification and

Figure 1:
## Employment shares of all graduates and postgraduates




**Source:** US Current Population Surveys and Labour Force Surveys in Britain – employment shares are defined for people in work with 0-39 years of potential experience and aged 26-60.

Figure 2:
## Trends in postgraduate/college-only percentage wage differentials




**Source:** US Current Population Surveys and Labour Force Surveys in Britain – employment shares are defined for people in work with 0-39 years of potential experience and aged 26-60. Percentage wage differentials are calculated controlling for gender, experience, region and ethnicity.

those with just an undergraduate degree has increased through time.

It is evident that postgraduates have significantly strengthened their relative wage position in both countries. In the United States, the postgraduate/college-only wage differential has risen sharply over time, more than doubling from around 14% in 1980 to just over 30% by 2009. In Britain, the postgraduate/college-only gap is lower but it has risen from 6% in 1996 to 13% by 2009.

So it seems that the relative labour market fortunes of postgraduate and college-only workers have evolved differently through time. The clear pattern that emerges in the two countries is of an increase in both the employment shares and wage differentials for postgraduates *vis-à-vis* college-only workers. Rising supply coupled with rising relative wages means that relative demand seems to have shifted over time in favour of postgraduate workers compared with college-only workers.

Previous research has connected the relative demand shifts for different education groups that have underpinned increased wage inequality to measures of technological change. The usual approach is to relate the two in terms of changes across industries through time. This work reports that measures of technology – such as R&D, innovation, computer usage and investment in computers – have been strongly correlated with the increased demand for more educated workers.

Our research also considers this, looking at shifts in labour demand separately for postgraduate and college-only workers, and making comparisons between these two groups of graduates and with other workers without any university education.

# More than a third of graduates in Britain and the United States now have a postgraduate qualification

It turns out that there is a stronger connection between increases in the relative demand for postgraduates and measures of technological change than for college-only graduates. Analysis of changes in employment shares and changes in computer usage in 215 US industries and 51 British industries shows that, for both countries, there is only a positive correlation for postgraduates.

That shifts in labour demand towards postgraduates seem to be (at least in part) driven by technological change is also supported by cross-country patterns of changing labour demand and technology. The analysis shows that bigger shifts in demand occurred in the *same* industries in Britain and the United States and that the changes in computer usage are very much concentrated in the same industries for the two countries.

More evidence that employers are increasingly demanding postgraduates can be seen by comparing the skill sets required by the jobs of postgraduate and college-only workers. Table 1 shows postgraduate/college-only differences in their estimates of cognitive skills, problem-solving skills, people skills, firm-specific skills, the tasks they use computers for and how routine their jobs are.

It is clear that both sets of graduates do jobs with high skill and job task requirements. But in key skills areas, the levels are significantly higher for postgraduates. For example, postgraduates have higher numeracy levels (especially advanced numeracy), higher levels of analysing complex problems and more specialist knowledge or understanding.

Breakdowns of computer usage are also striking. Postgraduate and college-only workers both report high levels of computer usage, but using computers to perform complex tasks is markedly higher among the postgraduate group.

So it seems that postgraduates possess different skills and do jobs involving different (usually more complex) tasks than college-only workers. This is in line with the finding that relative demand has shifted faster in favour of the postgraduate group, and it appears to be an important aspect of rising wage inequality among college graduates.

We have also compared the occupations of postgraduate and college-only workers. With more recent data, we can consider different forms of postgraduate degree. Table 2 shows the top five occupations in terms of their share in employment for college-only workers and postgraduates with master's degrees and doctorate degrees.

There are several notable features of the top five occupations of these three groups of workers. First, the top five tend to be different occupations in the two countries. Second, while the occupational categories are not quite the same across countries, there are some clear similarities.

Third, the postgraduate occupations are more segregated than the college-only occupations. For postgraduates, in the United States the top five (out of 497 occupations) account for almost half of employment (49%) and in Britain the top five (out of 353 occupations) account for around 45%. The college-only distribution is a lot more dispersed, with the top five accounting for only 16% of employment in the United States and 20% in Britain.

Table 1:
Skills and job tasks suggesting that postgraduates in Britain are more in demand than college-only graduates

| Skill/job task | Postgraduates | College-only |
|---|---|---|
| **Cognitive skills** | | |
| Literacy | 4.067 | 3.763 |
| Simple numeracy (basic arithmetic) | 3.606 | 3.583 |
| Advanced numeracy (maths and statistics) | 3.004 | 2.715 |
| **Problem-solving skills** | | |
| Thinking of solutions to problems | 4.311 | 4.277 |
| Analysing complex problems | 4.179 | 3.880 |
| **People skills** | | |
| Making speeches/presentations | 3.658 | 3.148 |
| Teaching people | 4.023 | 3.843 |
| Dealing with people | 4.658 | 4.684 |
| **Firm-specific skills** | | |
| Knowledge of products/services | 3.817 | 3.831 |
| Specialist knowledge or understanding | 4.704 | 4.548 |
| **Computer usage** | | |
| Using a computer or computerised equipment | 4.607 | 4.384 |
| Proportion that do not use a computer | 1.9% | 4.5% |
| Simple (general purpose) computer users | 7.4% | 10.9% |
| Moderate computer users | 42.8% | 48.6% |
| Complex computer users | 47.9% | 36.1% |
| **Routine nature of job** | | |
| Performing short repetitive tasks | 2.689 | 2.890 |
| Variety in job | 4.315 | 4.195 |
| Sample size | 257 | 1,095 |

**Source:** The 2006 Skills Survey. With the exception of the proportions using computers, the numbers are based on a scale of 1-5 for questions on task performance – 'How important is this task in performing your current job?' – for which the choices are 1 'not at all important', 2 'not very important', 3 'fairly important', 4 'very important' or 5 'essential'.

Overall, our findings on increasing divergences within the group of workers who go to university offer new evidence on how the changing education structure of the workforce has contributed to rising inequality. Our focus is on increasing divergences within the group of workers who go to university.

We document that there have been significant increases in the number of workers with a postgraduate qualification and that, at the same time as this increase in their relative supply, their relative wages have risen strongly compared with workers with only a college degree. Trend increases in the relative demand for postgraduates have acted as a key driver of increasing within-graduate inequality and of overall rises in inequality.

The relative demand shifts in favour of workers with postgraduate qualifications are strongly correlated with technical change as measured by computer usage and investment. It turns out that over the years as computer use has become more widespread in most workplaces, the principal beneficiaries of this revolution have not been all graduates, but those with postgraduate qualifications. As such, there has been a strong connection between the increased presence of postgraduate workers in the labour force and rising wage inequality over time.

This article summarises 'Rising Wage Inequality and Postgraduate Education' by Joanne Lindley and Stephen Machin, CEP Discussion Paper No. 1075 (http://cep.lse.ac.uk/pubs/download/dp1075.pdf).

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## The principal beneficiaries of the computer revolution have not been all graduates but those with postgraduate qualifications

Table 2:
Top five occupations – college-only, master's degrees and doctorates

**United States, 2010, 497 detailed occupations**

| | COLLEGE-ONLY | | MASTER'S DEGREE | | DOCTORAL DEGREE | |
|---|---|---|---|---|---|---|
| | Top five occupations | Employment share | Top five occupations | Employment share | Top five occupations | Employment share |
| **1** | Elementary and middle school teachers | 4.6% | Elementary and middle school teachers | 11% | Post-secondary teachers | 21% |
| **2** | Managers, all other | 3.6% | Secondary school teachers | 4.7% | Physicians and surgeons | 10.7% |
| **3** | Accountants and auditors and other judicial | 3.3% | Managers, all other | 4.3% | Lawyers, judges, magistrates | 10.2% |
| **4** | Chief executives | 2.3% | Post-secondary teachers | 3.6% | Psychologists | 3.7% |
| **5** | First-line supervisors/managers of retail sales workers | 2.2% | Education administrators | 3.1% | Pharmacists | 3.6% |

**Britain, 2010, 353 detailed occupations**

| | COLLEGE-ONLY | | MASTER'S DEGREE | | DOCTORAL DEGREE | |
|---|---|---|---|---|---|---|
| | Top five occupations | Employment share | Top five occupations | Employment share | Top five occupations | Employment share |
| **1** | Primary and nursery education teaching professionals | 5.1% | Secondary education teaching professionals | 4.8% | Higher education teaching professionals | 20.7% |
| **2** | Marketing and sales managers | 4.5% | Software professionals | 3.6% | Medical practitioners | 11% |
| **3** | Nurses | 3.6% | Marketing and sales managers | 3.5% | Bioscientists and biochemists | 7.1% |
| **4** | Software professionals | 3.2% | Management consultants, actuaries, economists and statisticians | 3.2% | Researchers | 3.2% |
| **5** | Information and communications technology managers | 3.1% | Information and communications technology managers | 3.1% | Software professionals | 3.1% |